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A COMPARISON OF THE FINANCIAL CHARACTERISTICS OF U.S. AND EUROPEAN MANUFACTURING FIRMS

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Abstract:

Comparing the financial characteristics of firms in different countries and regions has been a popular research topic in finance. In this paper, we compare the financial characteristics of U.S. and European manufacturing firms with the MANOVA (Multivariate Analysis of Variance) method and financial ratios. Our findings indicate that the overall financial characteristics of U.S. and European manufacturing firms are significantly different. We find that U.S. manufacturing firms are more profitable and they have less liquidity and bankruptcy risks compared with European manufacturing firms. European manufacturing firms are more efficient in managing their fixed assets. However, U.S. manufacturing firms are more efficient in managing their accounts receivable and total assets. U.S. manufacturing firms are able to achieve significantly higher sales and total assets growth rates compared with European manufacturing firms.

Key words: *Financial Characteristics, U.S. manufacturing firms, European manufacturing firms, MANOVA (Multivariate Analysis of Variance)*

1. Introduction

Comparing the financial characteristics of different groups of firms has long been a popular methodology in finance. Altman (1968), Beaver (1968), Deakin (1972), Moyer (1977), Edmister (1972), and Dambolena and Khoury (1980) predict bankruptcy by comparing the financial characteristics of bankrupt and non-bankrupt firms. Stevens

(1973), Belkaoui (1978), Rege (1984), and Meric at al. (1991) identify the financial characteristics of firms that have been corporate takeover targets by comparing them with firms that have not been corporate takeover targets. Hutchinson at al. (1988) and Meric and Meric (1992) identify the financial characteristics of firms which achieve stock market quotation by comparing them with firms that do not have stock market quotation. Meric at al. (2000) compare the financial characteristics of Japanese *kieretsu*-affiliated and independent firms to identify the financial characteristics of *kieretsu*-affiliated firms.

A number of studies compare the financial characteristics of firms in different countries. Kester (1986) and Wald (1999) compare the capital and ownership structures of firms in different countries and they find significant differences. Meric and Meric (1989 and 1994) compare the financial characteristics of U.S. and Japanese manufacturing firms and they find significant differences. Meric et al. (2003) find significant differences between the financial characteristics of U.S. and Canadian manufacturing firms. In this paper, we compare the financial characteristics of U.S. and European manufacturing firms.

2. Macroeconomic Conditions and Manufacturing Activity in the U.S. and Europe

Table 1 shows average values of selected macroeconomic indicators and measures of manufacturing activity for the three year period, 2012 through 2014. Regional and local variations in economic growth are likely to affect sales and profitability in the manufacturing sector. Average annual GDP growth rates varied substantially among the fifteen European countries (EU 15) included in our study. For example, real GDP declined in Greece at a 3.27 percent annual rate, while Luxemburg experienced an average annual growth rate of 2.53 percent. The overall average annual growth rate for EU 15, 0.29 percent, is substantially lower than the 2.30 percent that occurred in the U.S. Inflation can affect the profitability of manufacturing firms to the extent that some production costs are fixed by contract in the short run. Inflation rates vary among the EU 15, but the overall average, 1.49 percent annually, is comparable to the 1.73 percent average annual rate for the U.S. economy.

Annual growth rates in value-added by manufacturing show a pattern similar to the real GDP growth rates. Manufacturing value-added showed the largest decline in Greece and the largest positive growth in Luxemburg. Overall, manufacturing value-added declined by 0.39 percent annually in the EU 15, but grew by 1.15 percent in the U.S. The relative importance of the manufacturing sector to the EU 15 economies varies considerably. Value-added by manufacturing accounted for an average of 22.27 percent of GDP in Germany, and only 5.20 percent of GDP in Luxembourg. However, the overall average for the EU 15, 14.86 percent of GDP, is comparable to the 12.55 percent figure for the U.S.

Table 2 includes 2012 information about selected key manufacturing sectors for the U.S. and the EU 15. We matched the International Standard Industrial

Classification (ISIC) codes for the EU 15 with North American Industrial Classification System (NAICS) codes for the U.S. The two industrial classification coding systems correspond closely with the exception of the Coke, Petroleum, Nuclear products category. Nuclear products are included in the ISIC category for the EU 15 but not in the NAICS category for the U.S.

Table 1: Selected Macroeconomic Indicators and Manufacturing Activity, 2012-2014 Averages

Country	Annual GDP Growth Rate (%)	Inflation Rates (% change in CPI)	Manufacturing Value-added, Annual Growth Rate (%)	Manufacturing Value-added (% GDP)
Austria	0.50	2.03	1.10	18.60
Belgium	0.50	1.40	1.00	13.97
Denmark	-0.03	1.27	3.00	13.53
Finland	-0.97	1.77	-3.97	16.83
France	0.37	1.13	-0.20	11.27
Germany	0.77	1.47	0.57	22.67
Greece	-3.27	-0.23	-5.00	9.37
Ireland	2.27	0.80	0.07	20.53
Italy	-1.63	1.47	-2.10	15.37
Luxembourg	2.53	1.67	6.00	5.20
Netherlands	-0.20	2.00	-0.10	11.90
Portugal	-1.40	0.93	-0.17	13.13
Spain	-0.97	1.23	-1.47	13.13
Sweden	1.07	0.23	-2.93	16.80
U.K.	2.10	2.30	-0.07	10.57
United States	2.30	1.73	1.15[a]	12.55[a]
EU 15 Countries[b]	0.29	1.49	-0.39	14.86

Data Source: The World Bank Databank

[a] Average values for 2012 and 2013; 2014 data are unavailable.

[b] Real GDP-weighted averages for 15 EU countries.

The distribution of output across manufacturing sectors is similar in the EU 15 and the U.S. The top five sectors for both the EU 15 and the U.S. are Food and Beverages, Chemicals and Products, Machinery and Equipment, Motor Vehicles and Coke, Petroleum and Nuclear products. These five sectors represent about 69% of manufacturing output for the EU 15 and 74 percent of output for the U.S. The smallest manufacturing sectors for both areas are Textiles and Apparels accounting for 2.5

percent of EU 15 manufacturing output and about 1 percent of U.S. manufacturing output. This similarity can be further illustrated by considering the Hirschman-Herfindahl Index (HHI) using the output share of manufacturing percentage for each of the twelve sectors in the EU 15 and the U.S. If there was a perfectly equal distribution of output between the twelve sectors, the HHI would equal 826.7. Using the output/manufacturing shares in Table I, the HHI for the EU 15 equals 1157.7 and 1282.5 for the U.S. The higher HHIs for the EU 15 and U.S. reflect the disproportionate shares for the top five manufacturing sectors and a roughly similar distribution for the other seven sectors.

While there is a close relationship between the rank order of the manufacturing sectors for the EU 15 and the U.S. in absolute and relative terms, there is a considerable difference in terms of scale. There are about five times as many establishments in the twelve selected manufacturing sectors in the EU 15 compared to the U.S. (950,918 establishments in the EU 15; 182,724 in the U.S.). With the exception of the Coke, Petroleum and Nuclear products sector, the output per establishment is considerably higher in the U.S. compared to the EU 15, ranging from 1.26 times higher in Motor Vehicles to 7.04 times higher in Textiles. The exception for the Coke, Petroleum and Nuclear sector could be due to the inconsistency between the ISIC and NAICS codes noted earlier. Overall output per establishment is about 4 times higher in the U.S. compared to the EU 15. This difference in scale could affect the financial ratios examined in this paper to the extent that scale economies are important in manufacturing.

Table-2: Descriptive Manufacturing Data for the EU and U.S.

	EU 15 Countries			U.S.		
Industry	Output[a]	Output/ Estab[b]	Output/ MFG, %	Output[a]	Output/ Estab[b]	Output/ MFG, %
Food and Beverage	1153	5.00	18.1	827	27.04	16.7
Textiles	84.33	1.83	1.3	30	12.88	0.6
Apparel	76.29	.94	1.2	12	1.89	0.2
Coke, Petroleum, Nuclear[c]	649	812.27	10.2	851	388.05	17.2
Chemicals and Products	891.28	36.27	14.0	785	58.95	15.8
Rubber & Plastics	291	7.23	4.6	219	17.15	4.4
Basic Metals	410	30.06	6.4	270	59.46	5.4
Fabricated Metal Products	551.89	2.37	8.7	340	6.13	6.9
Machinery and Equipment	866.52	4.45	13.9	402	16.61	8.1

Acc. and Computer Machinery	276.50	7.21	4.3	314	23.64	6.3
Electrical Machinery	310	10.69	4.9	124	21.67	2.5
Motor Vehicles	783	52.23	12.3	786	65.96	15.8
TOTAL	6362.81	6.69	100	4960	27.14	100

Data Sources: http://stat.unido.org/ (EU countries, retrieved January 7, 2016; www.census.gov/econ/isp/ (U.S. retrieved January 4, 2016); http://unstats.un.org

[a] In billions of U.S. dollars (2012)

[b] In millions of U.S. dollars (2012)

[c] Data for the U.S. only includes coke and petroleum products.

3. Methodology and Data

Multiple Discriminant Analysis - MDA (see, e.g., Altman, 1968; Stevens, 1973; Belkaoui, 1978) and Multivariate Analysis of Variance - MANOVA (see, e.g., Hutchinson et al., 1988; Meric et al., 1991) are the two multivariate techniques most commonly used in previous studies to compare the financial characteristics of different groups of firms. In this study, we use the MANOVA technique to compare the financial characteristics of U.S. and European manufacturing firms. Detailed information about the MANOVA technique can be found in Marascuilo and Levin (1983) and Johnson and Wichern (2007).

Financial ratios are generally used in empirical studies to compare the financial characteristics of different groups of firms. The financial ratio data used in this study were obtained from the Research Insight/Global Vintage database in October 2015. Manufacturing industries with SIC codes between 2000-3999 are included in the study. Our research sample consists of 828 U.S. and 1,228 European (15 countries) manufacturing firms. We use the financial ratios presented in Table 3 as measures of firm financial characteristics in the comparisons.

4. Empirical Findings

Our MANOVA test results are presented in Table 4. The multivariate F value test statistic (44.89) in the table indicates that the overall financial characteristics of U.S. and European manufacturing firms are significantly different at the 1-percent level.

Liquidity

The univariate F value statistics in Table 4 for the current and quick (acid-test) ratios (195.5 and 112.3, respectively) are both significant at the 1-percent level. The mean current ratio is significantly higher in U.S. manufacturing firms than in European manufacturing firms (3.08 vs. 2.01, respectively). The mean quick (acid-test) ratio is significantly higher in U.S. manufacturing firms than in European manufacturing firms (2.04 vs. 1.34, respectively). These results indicate that U.S. manufacturing firms have

less liquidity risk (i.e., U.S. manufacturing firms are better able to meet their maturing obligations) compared with European manufacturing firms.

Table 3: Financial Ratios Used in the Study as Measures of Firm Financial Characteristics

Financial Ratio	Financial Ratio Definition
Liquidity	
Current Ratio	Current Assets / Current Liabilities
Quick (Acid-Test) Ratio	(Current Assets - Inventories) / Current Liabilities
Asset Management	
Average Collection Period	Sales / (Accounts Receivable / 365)
Inventory Turnover	Sales / Inventories
Fixed Assets Turnover	Sales / Net Fixed Assets
Total Assets Turnover	Sales / Total Assets
Financial Leverage	
Equity Ratio	Common Equity/Total Liabilities
Profitability	
Net Profit Margin	Net Income / Sales
Return on Assets	Net Income / Total Assets
Return on Equity	Net Income / Common Equity
Growth	
Sales Growth Rate	Average for the Last Three Years
Total Assets Growth Rate	Average for the Last Three Years

Asset Management

The univariate F value statistic (197.04) in Table 4 indicates that the mean accounts receivable collection period is significantly shorter in U.S. manufacturing firms (53.4 days) than in European manufacturing firms (76.83 days) at the 1-percent level (i.e., U.S. manufacturing firms are more efficient in collecting their accounts receivable compared with European manufacturing firms). The univariate F value statistic (0.001) indicates that mean inventory turnover is about the same in U.S. and European manufacturing firms.

The univariate F value statistic (5.188) indicates that the mean fixed assets turnover ratio is significantly higher in European manufacturing firms than in U.S. manufacturing firms (11.27 vs. 9.23, respectively) at the 5-percent level. This implies that European manufacturing firms are able to generate more sales per dollar invested in their fixed assets compared with U.S. manufacturing firms. The univariate F value

statistic (3.017) indicates that the mean total assets turnover ratio is significantly higher in U.S. manufacturing firms than in European manufacturing firms (1.06 vs. 1.02, respectively) at the 10-percent level. This implies that European manufacturing firms are able to generate more sales per dollar invested in their total assets compared with with U.S. manufacturing firms.

Table 4: MANOVA Statistics

Financial Ratios	Means and Standard Deviations†		Univariate Statistics	
	U.S.	Europe	F-Value	P-Value
Liquidity Ratios				
Current Ratio	3.08	2.01	195.5***	0.00
	(2.17)	(1.32)		
Quick (Acid-Test) Ratio	2.04	1.32	112.3***	0.00
	(1.93)	(1.13)		
Asset Management Ratios				
Average Collection Period	53.4	76.83	197.4***	0.00
	(26.25)	(42.88)		
Inventory Turnover	5.86	5.87	0.001	0.98
	(5.78)	(8.56)		
Fixed Assets Turnover	9.23	11.27	5.188**	0.02
	(12.62)	(23.57)		
Total Assets Turnover	1.06	1.02	3.017*	0.08
	(0.54)	(0.48)		
Financial Leverage				
Equity Ratio	1.89	1.36	42.66***	0.00
	(2.18)	(1.49)		
Profitability Ratios				
Net Profit Margin	5.37%	3.06%	22.74***	0.00
	(10.24%)	(11.13%)		
Return on Assets	4.78%	3.35%	16.01***	0.00
	(7.97%)	(7.87%)		
Return on Equity	11.88%	7.24%	26.09***	0.00
	(22.62%)	(18.39%)		
Growth				
Sales Growth Rate	5.51%	4.33%	3.776**	0.05
	(13.29%)	(13.7%)		
Total Assets Growth Rate	7.36%	4.87%	16.18***	0.00
	(13.48%)	(13.95%)		
		Multivariate Statistics:	*44.89****	*0.00*

The Multivariate Analysis of Variance (MANOVA) technique is used to compare the financial ratios of U.S. and European
manufacturing firms. This table presents the mean ratios of U.S. and European manufacturing firms, the standard deviations
of the ratios, and the univariate and multivariate test statistics.

† The figures in parentheses are the standard deviations.

***, **, * indicate that the difference is significant at the 1-percent, 5-percent, and 10-percent levels, respectively.

Financial Leverage

The univariate F value statistic (42.6) in Table 4 indicates that the mean equity ratio (common equity/total liabilities) is significantly higher in U.S. manufacturing firms than in European manufacturing firms (1.89 vs. 1.36, respectively) at the 1-percent level (i.e., U.S. manufacturing firms use more equity financing and less debt financing compared with European manufacturing firms). This implies that European manufacturing firms have greater bankruptcy risk compared with U.S. manufacturing firms.

Profitability

All three profitability ratios are significantly higher in U.S. manufacturing firms than in European manufacturing firms. The univariate F value statistic (22.74) in Table 4 indicates that the mean net profit margin ratio is significantly higher in U.S. manufacturing firms than in European manufacturing firms (5.37% vs. 3.06%) at the 1-percent level. The univariate F value statistic (16.01) indicates that the mean return on assets is significantly higher in U.S. manufacturing firms than in European manufacturing firms (4.78% vs. 3.35%, respectively) at the 1-percent level. The univariate F value statistic (26.09) indicates that the mean return on equity is significantly higher in U.S. manufacturing firms than in European manufacturing firms (11.88% vs. 7.24%, respectively) at the 1-percent level.

Growth

Both sales and total assets growth rates are significantly higher in U.S. manufacturing firms than in European manufacturing firms. The univariate F value statistic (3.776) in Table 4 indicates that the mean annual sales growth rate is significantly higher in U.S. manufacturing firms than in European manufacturing firms (5.51% vs. 4.33%, respectively) at the 5-percent level. The univariate F value statistic (16.18) indicates that the mean annual assets growth rate is also significantly higher in U.S. manufacturing firms than in European manufacturing firms (7.36% vs. 4.87%) at the 1-percent level.

5. Summary and Conclusions

Comparing the financial characteristics of firms in different countries and regions has been a popular research topic in finance. MDA (Multiple Discriminant Analysis) and MANOVA (Multivariate Analysis of Variance) are the two popular statistical techniques used in comparisons. In this paper, we compare the financial characteristics of U.S. and European manufacturing firms with the MANOVA technique. We use eleven financial ratios in the comparisons as measures of liquidity, asset management, indebtedness, profitability, and growth characteristics of the firms. The data of the study were obtained from the Research Insight/Global Vintage database in October 2015. Our research sample includes 828 U.S. and 1,228 European manufacturing firms with SIC codes between 2000-3999.

Our multivariate test statistic indicates that the overall financial characteristics of U.S. and European manufacturing firms are significantly different. Our univariate test statistics indicate that U.S. manufacturing firms have higher liquidity ratios and lower liquidity risk (i.e., U.S. manufacturing firms are better able to meet their maturing obligations) compared with European manufacturing firms. U.S. manufacturing firms use more equity financing and less debt financing (U.S. manufacturing firms have less bankruptcy risk) compared with European manufacturing firms. U.S. manufacturing firms are more efficient in collecting their accounts receivable compared with European manufacturing firms (i.e., accounts receivable collection period is shorter in U.S. manufacturing firms than in European manufacturing firms). European manufacturing firms have significantly higher fixed assets turnover. However, U.S. manufacturing firms have significantly higher total assets turnover. U.S. manufacturing firms have significantly higher profitability ratios and sales and assets growth rates compared with European manufacturing firms.

6. References

Altman, E. I. 1968. Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankruptcy. *Journal of Finance,* 23 (4): 589-609.

Beaver, W. H. 1968. Alternative Financial Ratios as Predictors of Failure. *Accounting Review,* 43 (1): 113-122.

Belkaoui, A. 1978. Financial Ratios as Predictors of Canadian Takeovers. *Journal of Business Finance and Accounting,* 5 (1): 93-108.

Dambolena, I. G., and S. J. Khoury. 1980. Ratio Stability and Corporate Failure. *Journal of Finance,* 35 (4): 1017-1026.

Deakin, E. B. 1972. A Discriminant Analysis of Predictors of Business failure. *Journal of Accounting Research,* 10 (1): 167-179.

Edmister, R. O. 1972. An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction. *Journal of Financial and Quantitative Analysis,* 7 (2): 1477-1493.

Hutchinson, P., I. Meric, and G. Meric. 1988. The Financial Characteristics of Small Firms which Achieve Quotation on the UK Unlisted Securities Market. *Journal of Business Finance and Accounting,* 15 (1): 9-19.

Johnson, R. D., and D. W. Wichern. 2007. *Applied Multivariate Statistical Analysis*, 6th ed. Englewood Cliffs, NJ: Prentice Hall.

Kester, W. C. 1986. Capital and Ownership Structure: A Comparison of United States and Japanese Manufacturing Firms. *Financial Management,* 15 (1): 5-16.

Marascuilo, L. A., and J. R. Levin. 1983. *Multivariate Statistics in the Social Sciences*. Monterey, California: Brooks/Cole Publishing Company.

Meric, G., L. Kyj, C. Welch, and I. Meric. 2000. A Comparison of the Financial Characteristics of Japanese Kieretsu-Affiliated and Independent Firms. *Multinational Business Review,* 8 (2): 26-30.

Meric, G., S. S. Leveen, and I. Meric. 1991. The Financial Characteristics of Commercial Banks Involved in Interstate Acquisitions. *Financial Review,* 26 (1): 75-90.

Meric, G., and I. Meric. 1992. A Comparison of the Financial Characteristics of Listed and Unlisted Companies. *Mid-Western Journal of Business and Economics,* 7 (1): 19-31.

Meric, I., H. E. Gishlick, C. W. McCall, and G. Meric. 2003. A Comparison of the Financial Characteristics of U.S. and Canadian Manufacturing Firms. *Midwestern Business and Economic Review,* 31 (1): 25-33.

Meric, I., and G. Meric. 1989. A Comparison of the Financial Characteristics of U.S. and Japanese Manufacturing Firms. *Financial Management*-FM Letters-, 18 (4): 9-10.

Meric, I., and G. Meric. 1994. A Comparison of the Financial Characteristics of United States and Japanese Manufacturing Firms. *Global Finance Journal,* 5 (1): 205-218.

Moyer, R. C. 1977. Forecasting Financial Failure: A Re-examination. *Financial Management,* 6 (1): 11-17.

Rege, U. P. 1984. Accounting Ratios to Locate Take-over Targets. *Journal of Business Finance and Accounting,* 11 (3): 301-311.

Stevens, D. L. 1973. Financial Characteristics of Merged Firms: A Multivariate Analysis. *Journal of Financial and Quantitative Analysis,* 8 (2): 149-158.

Wald, J. K. 1999. How Firm Characteristics Affect Capital Structure: An International Comparison. *Journal of Financial Research,* 22 (2): 161-187.