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**International Variation of Return on Equity
in the Food and Beverage Industries**

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The objective was to analyze the effects of country and firm specific factors on the return on equity in the beverage and tobacco and food and consumer products industries for eleven industrialized nations. The results indicated that country and firm specific factors were important in explaining variation in return on equity within countries but not generally across countries or time.

Key Terms

variation in return on equity, country and time specific factors, beverage and tobacco industry, food and consumer products industry, globalization, unbalanced panel data

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Analysts have resorted to the use of derived ratios from a firm's financial statements as indices of how well a firm is doing. Return on equity (ROE) is one of the most popular of such indices.¹ It is widely used as a comparative measure of profitability and financial performance of firms in industrialized countries.² For example, ROE is used widely by investors in appraising common stock purchases and by corporate planners in evaluating corporate performance.

In a world characterized by global markets and competition, investors face a maze of risky prospects. Thus, there is a need for organized and relevant information concerning the financial performance of firms in a global environment. ROE, a measure of profitability, can be used in comparative analysis to help investors make informed investment decisions. However, a more in-depth analysis is possible by studying the forces that shape ROE within countries, across countries, and over time. A knowledge of the impacts of these forces facilitates more accurate management decisions, thus enabling firms to mount a competitive edge in a global setting.

Interest in the variation in financial ratios and consequently ROE dates back to the turn of the 20th century. Studying seven different ratios of 981 firms, Wall³ stratified firms by industry and by geographical location. He found great variation in the ratios between geographical areas and types of businesses. Since then, other studies on ROE have been conducted to explain the variation of ROE across country and time. As the century draws to an end, substantial changes in the business environment are taking place resulting in markets becoming more integrated due to the effects of globalization. It is important to examine, therefore, how these changes are affecting the variation in ROE across country and time.

In this study, an investigation of whether a significant difference exists in ROE in different countries over time is undertaken. Also, country and firm specific factors that could influence ROE in the various countries are explored. The focus industries in this study are the beverage and tobacco and food and consumer products industries. For these two industries, the forces of global integration are strengthening, driven among other forces, by the growing proliferation of regional and global brands.⁴

The rest of this paper is organized as follows. A literature review and theoretical basis are provided for the study. The data description and empirical model are presented, followed by the method of analysis, and results. Finally, conclusions and implications are derived.

Literature Review

Among other objectives, studies undertaken on this subject have aimed at determining factors that cause variation in ROE over time within a given country because business environments have been thought to be different for each country.⁵ The importance of evaluating the impact of differences in accounting and business practices in comparative studies of firm performance and consequently ROE has been emphasized by Hirschey and Koch.⁵ Research in this vein has yielded different results. Some results indicated that there were differences in ROE across countries and time. Geringer, Beamish, and daCosta⁶ revealed that there were large differences in the average ROEs of various groups from 1977 to 1981. For the period 1979 to 1983, Soenen and Van den Bulke⁷ compared the performance of foreign and domestic firms within a single national market (Belgium) and concluded that differences in ROE existed among the American, European and domestic Belgian firms. Lee and Blevins,⁸ examined the profitability, based on ROE, of 400 firms in the United States (US), Japan, the Republic of Korea and Taiwan.

They found that variation in firms' ROE in each country was due to firm-specific measures over the 1980 to 1987 period. In the above studies, ROE was not adjusted for differences in accounting and tax practices, that is, the rate of corporate taxation was not taken into account. The rate of corporate taxation affects the indicators used to measure firm performance, and consequently ROE.

While the preceding arguments are compelling, they are predicated on the assumption that most firms and industries are not global in nature. The International Monetary Fund (IMF) defines globalization as “the growing economic interdependence of countries worldwide through increasing volume and variety of cross-border transactions in goods and services, freer international capital flows, and more rapid and widespread diffusion of technology.”⁹ Two factors, technological advances and changing trade policies, have played important roles in the growing integration of the world economy.⁶ While technological advances have facilitated the efficient flow of goods, information and communications, various policies have led to countries lowering artificial barriers to the movement of goods, services, and capital, resulting in multilateral trade liberalization.

Thus, due to increasing globalization, firms in the same industries in industrialized nations face similar environmental threats and opportunities and consequently earn similar rates of return.¹⁰ Comparing the profitability of firms in Germany, Japan, and the US, Blaine¹⁰ observed that although there were some statistical differences in profitability, firms in general earned roughly equivalent rates of return across countries.

Previous literature includes studies concerning the relationship between rates of return and various economic variables and firm specific variables. In a discussion of the determinants of

ROE, interest rates, inflation, and other risk factors have been said to determine the returns on shareholders' equity.¹¹ A risk factor that influences the operations of firms is the political risk of doing business. This risk factor thus influences ROE. Fuller and Petry¹² stated that a relationship existed between ROE and each of the following factors: cost of capital, corporate tax rates, and productivity. The exchange rate of a country affects the profitability and thus the ROE of firms who trade with other countries. Firms that are largely dependent on the export market tend to fare better when their country's currency is weak because their goods are more competitive in a global market.¹³ The gross domestic product, an indicator of the level of economic activity in a country, affects the profitability and hence the ROE of firms. Teitelbaum² stated that the profit margin of a firm affects its ROE. Leovonian¹⁴ explained that a firm's market value influenced its ROE.

Theoretical Framework

The theoretical underpinnings for this study are derived from Arbitrage Pricing theory (APT) and the Dupont formula. These frameworks are presented in turn.

According to APT, rates of return can be specified as a function of general factors impacting all firm returns but in different ways and factors pertaining to firm-specific risks.¹⁵ The rate of return, R , therefore, is a function of general factors, f_1, f_2, \dots, f_n and some firm-specific risks, ϵ_a .

$$R = b_{0a} + b_{1a}f_1 + b_{2a}f_2 + \dots + b_{na}f_n + \epsilon_a \tag{1}$$

for a = 1, \dots, A.

The vector of factors, (f_1, f_2, \dots, f_n) are regarded as "macroeconomic," economy, or

country-wide factors that influence returns. Each asset has a particular sensitivity b_{ia} to factor i , and ϵ_a is independent of the country-specific factors. Thus, from the APT, country-specific factors influence returns.

A look at the Dupont formula illustrates the composite nature of ROE² and reveals the factors pertaining to firm-specific risks. The ROE formula is given as:¹⁶

$$ROE = PMAG \times AT \times EM \quad (2)$$

where Profit Margin (PMAG) = Profits/Sales,

Total Assets Turnover (AT) = Sales/Assets,

Equity Multiplier (EM) = Assets/Equity.

Equation (2) shows that the ROE of a firm is directly influenced by firm-specific factors.

Data and Empirical Model¹⁷

From the APT and Dupont formulae, it can be inferred that ROE is influenced by both country and firm-specific risk factors. Panel data used for this study covered 129 firms in the beverage and tobacco industry and 258 firms in the food and consumer products industry from 1989 to 1995 in twelve industrialized countries including Australia, Britain, Canada, Denmark, France, Germany, Japan, the Netherlands, Switzerland, Singapore, and the United States.

A major data source for the analysis was the Business Week Global 1000¹⁸ ranking of firms. Other sources of data were two annual publications of the International Monetary Fund, 1996 and 1997 editions of the “International Financial Statistics Yearbook,”¹⁹ various issues of the Political Risk Yearbook,²⁰ and various issues of a Price Waterhouse publication on worldwide corporate taxes.²¹

The data are unbalanced, meaning that data were not available for some firms for all years. In other words, not all firms were ranked among the Global 1000 for all years.

Estimates from three models, ordinary least squares (OLS), OLS with fixed effects (FEM), and generalized least squares (GLS) with random effects (REM), were used in analyzing the influence of country and firm-specific effects on ROE, within and across countries and time. The firm-specific factors specified in the model are profit margin and market value. The country-specific factors specified in the model are the rate of inflation, cost of capital, cost of labor, political risk of doing business in a country, nominal exchange rate, gross domestic product, corporate tax rate, and industrial productivity.

The empirical model for ROE, is given as

$$ROE_{ct} = \beta_t + \psi_c + Q_{ct}\phi + v_{ct} \quad (3)$$

where β_t and ψ_c are time and country effects, respectively, the vector Q_{ct} is a [1 x k] set of time-varying country and firm-level economic variables, and the error term v_{ct} represents the factors that influence return on equity but which are unobservable to the financial analyst.

The variables for the empirical model are defined below. The expected impacts of the explanatory variables on ROE and the basis for such impacts are also presented.

ROE, the dependent variable, represents the profitability of firms. It measures the return on shareholder's investment. This after-tax measure of return on equity is the latest 12-months earnings per share as a percentage of the most recent book value per share.¹⁸

IFLATN is the rate of inflation for the relevant country measured as the annual percentage change in the consumer price index with 1990 as the base year.^{19,22} Teitelbaum² explained that an

increase in the rate of inflation causes ROE to increase. Sales increase due to higher prices. However, assets recorded on the balance sheet are replaced gradually over time and lag in nominal amounts. The result is an increase in turnover and an increase in ROE.

WAGES is a proxy for the cost of labor in a country. Labor costs are measured as the hourly earnings in dollars per worker employed.¹⁹ Lower wages reduce costs resulting in higher profits, all else equal. Thus, wages are inversely related to ROE.

PRDVTY is the industrial productivity in each country. Industrial productivity is measured by dividing industrial production by amount of labor employed. Industrial production and employment are measured as indices with 1990 as the base year.¹⁹ Productivity is expected to be positively related to profitability since increasing productivity increases profit margin¹² and consequently, ROE.

The cost of capital or the interest rate in percentage form in a country is represented by COSTCAP.¹⁹ It is the bank lending rate to meet short and medium-term financing needs of the private sector. Lower interest rates lead to lower costs and increased profitability. Thus, an inverse relationship is expected between the cost of capital and ROE.

FINTRA is the political risk of doing business. This is represented by a dummy variable, 1 if low risk, 0 otherwise. It is a rating of the ease with which financial instruments can move across the borders of countries.²⁰ The greater the political risk of investing in a country, the lower is the profitability of firms in that country. Thus, ROE is inversely related to FINTRA.

The income of each country is represented by GDP. It is measured as the nominal value in billions of U.S. dollars of the total output of goods and services the country's economy produced in a year, regardless of its allocation to domestic or foreign factors.²⁰ With an increase in

economic activity, economies of size and agglomeration (large industries that attract specialized resources) are achieved leading to increased profitability. Thus, GDP is expected to be directly related to ROE.

MKTVAL is the market value of each firm. It is measured as the share price on May 31st for the year multiplied by the latest available number of shares outstanding, converted into U.S. dollars at May, month-end exchange rates in millions of U.S. dollars.¹⁸ Market value may include several classes of stock; price and yield data are based on the company's most widely held issue. The Efficient Market Hypothesis suggests a positive relationship between market value and ROE.²³

PMAG is the ratio of the profits to sales of each firm. The sales of each firm are measured as the net sales reported by the firm in dollars.¹⁸ The profits of the firm are the latest after-tax earnings available to common shareholders in dollars and are from companies' continuing operations before extraordinary items.¹⁸ From the Dupont formula (eq. 2) profit margin is directly related to ROE. The effect of profit margin on ROE can further be determined by the trend of profits and sales. Teitelbaum² observed that when growth in profits outstrips growth in sales, profit margins increase causing a subsequent increase in ROE.

CORPTAX represents the corporate tax rate of each country. It is measured in percentage form and is levied on varying amounts of taxable income determined by the government.²¹ High tax rates are thought to increase costs and lower profitability. Thus, the corporate tax rate is expected to be inversely related to ROE.

EXRATE is the nominal effective exchange rate index of the different countries. This index represents the ratio (base of 1990=100) of an index of the period average exchange rate of

the currency in question to a weighted geometric average of exchange rates for the currencies of selected countries. The selected countries encompass 22 industrialized nations selected by the International Monetary Fund.¹⁹ A high-valued currency inhibits export sales and thus profitability.¹³ The exchange rate, then is expected to be negatively related to ROE.

Summary statistics for the beverage and tobacco industry and the food and consumer products industry are presented in Tables I and II respectively.

Method of Analysis

Five models were estimated for each of the two agribusiness industries in a common approach for panel data: OLS, one and two-factor fixed effects models (FEM), and one and two-factor random effects models (REM) (Limdep Version 7.0 User's Manual, p.310).¹⁷

Dummy variables in panel data, in this case one and two-factor models, are used to account for factors unique to various parts of the panel which cannot be explained by the regressors. The one-factor model includes dummies to represent countries, while the two-factor models includes dummies to represent countries and time. Each of these models can be estimated in a FEM or REM framework.

The REM differs from the FEM in that for the REM the dummies or individual specific constant terms are randomly distributed across cross-sectional units. In the analysis of firms, we can view them as the collection of factors not in the regression that are specific to a firm. Also, GLS is necessary to estimate the REM (Limdep Version 7.0 User's Manual, p.289).¹⁷ Both OLS in the FEM and GLS in the REM are consistent, but OLS is inefficient. Thus, under the null hypothesis the two estimates should not differ systematically. Hausman's (H) test is used to test this null hypothesis.

The remaining question regards the actual necessity for the dummy variables. That is, do indicator variables representing countries and time add significant information to the ROE model? A Lagrange multiplier (LM) test for the REM developed by Breusch and Pagan can be used for this purpose (Limdep Version 7.0 User's Manual, p.291).¹⁷ The LM test for the REM is based on OLS residuals to check for evidence or the absence of such evidence that suggests that the error components model (REM) is favored.

Results

Beverage and Tobacco Industry

The results, shown in Table III, for the one-factor and two-factor models were the same. The FEM and REM were not found to be significantly different according to the H statistic. Further, the LM test was not significant for the REM. This indicates that the dummy variables for country and/or time did not add explanatory power to the model. Thus, the OLS model without dummy variables appears sufficient to explain ROE.

The significant coefficients for the OLS model were for the following variables: GDP, profit margin (PMAG), market value (MKTVAL), exchange rate (EXRATE), and corporate tax rate (CORPTAX). All had the expected signs except for the corporate tax coefficient.

The CORPTAX coefficient was expected to be negative indicating the penalty of high tax rates on ROE. However, tax rates may only opaquely reflect actual taxes. Moreover, WAGES were found to be negatively correlated (-0.357) with tax rates. Thus, the positive sign for the tax rate coefficient could indicate that a combination of low wages and some level of taxes not necessarily as high as indicated by the tax rate, are relatively profitable.

Food and Consumer Products Industry

Results regarding the appropriate model for this industry were identical to that for the beverage and tobacco industry. Again, the OLS model without dummy variables appears sufficient to explain ROE, Table IV.

The significant coefficients for the OLS model were for GDP, profit margin (PMAG), and exchange rate (EXRATE). All had the expected sign.

Conclusions and Implications

Previous studies^{6,7,8} conducted from 1977 to 1987 indicated that return on equity varied across countries. These studies used paired tests and analysis of variance to determine if differences existed between countries. The differences were attributed to dissimilar accounting practices across countries. Our study shows that though there was no significant variation of return on equity across countries, explainable variation within countries was present for the two industries observed. Our analysis went beyond analysis of variance, encompassing an econometric procedure for panel data. Country and time dummy variables were included in the analysis to determine their effects on return on equity, a measure of profitability. Although the two-factor, fixed effects-model for the food and consumer products industry showed that differences existed between some countries, the general specification tests used in the analysis showed that country and time specific variables were not important in explaining variation in return on equity. The general specification tests used in the analysis served as a means of checking for differences among countries as they interact in a global market.

The basis for this study is found in economic theory which states that for competitive markets, rates of return will tend to equilibrate. Evidence from Arbitrage Pricing theory and the

Dupont formula show that in various countries, return on equity is influenced, respectively, by country and firm specific factors. Blaine's study for 1984 to 1990¹⁰ affirms that firms in different countries appeared to earn roughly equivalent rates of return during the latter half of the 1980s. In a study on corporate performance of firms across various industries in an improving economy, Hergert¹ concluded that certain macroeconomic and firm specific factors were imperative in the analysis of a firm's return on equity.

The results of our study and Blaine's differ from previous studies perhaps due to the increasing intensity of globalization in recent years. The IMF⁹ reports that the globalization process was intensified after World War II by the Bretton Woods institutions. Lubbers²⁴ believes that 1989 was the year in which the effects of globalization actually became manifest which coincides with the beginning of our study period. Further, Ghoshal and Nohria⁴, emphasizing that the forces of global integration were strengthening, stated that firms in the same industries tend to adopt similar organizational responses (strategies and structures). They went on to say that since performance is a function of the "fit" between a firm's structure and its environmental context, firms that adopt similar organizational responses should also tend to earn similar rates of return. Our study confirms these assertions for two agribusiness industries.

In conclusion, the findings of this study reflects the significance of the effects of globalization and country specific economic factors on the profitability of agribusiness firms. For the food and consumer products industry, gross domestic product, the exchange rate, and profit margin were important in explaining the variation in return on equity. For the beverage and tobacco industry, market value was also important.

Our study has delineated the important factors in the face of intensifying globalization that

firms in two of the largest agribusiness industries should consider in investment decisions in developed countries. These important factors impacting return on equity tend to be comparable across developed countries. As globalization unfolds, other risk factors for investment undoubtedly will emerge. This, of course, makes for a rich area for continued research.

Table I. Descriptive Statistics for the Beverage and Tobacco Industry

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
FINTRA	0.88	0.32	0.00	1.00
IFLATN	3.75	2.01	1.00	9.50
GDP	3258801.70	2540.01	129120.00	7245799.80
PMAG	0.09	0.06	0.0035	0.33
WAGES	109.18	16.25	91.10	180.00
PRDTVTY	1.02	0.04	0.89	1.21
COSTCAP	8.98	2.79	4.41	14.75
MKTVAL	12242.17	14653.50	1749.00	78629.00
EXRATE	22.46	56.43	0.74	191.21
CORPTAX	0.35	0.02	0.31	0.40
ROE	19.71	15.84	1.20	105.40

Table II Descriptive Statistics for the Food and Consumer Products Industry

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
FINTRA	0.83	0.37	0.00	1.00
IFLATN	3.63	1.72	1.00	9.50
GDP	4200915.70	2297.82	177520.00	7245799.80
PMAG	0.05	0.03	-0.0004	0.17
WAGES	107.48	14.03	91.10	180.00
PRDTVTY	1.01	0.04	0.89	1.13
COSTCAP	8.29	2.49	4.41	14.75
MKTVAL	6503.47	6245.19	1822.00	49405.00
EXRATE	35.52	69.41	0.74	191.21
CORPTAX	0.35	0.05	0.10	0.56
ROE	20.61	13.42	1.20	107.90

Table III. Regression Coefficients for the Beverage and Tobacco Industry^a

Variable	OLS	One Factor		Two Factor	
		FEM	REM	FEM	REM
Intercept ^b	-130.05 (-2.78)		-179.55 (-3.42)	-269.58 (-2.38)	-183.33 (-2.95)
FINTRA	-3.83 (-1.18)	-5.74 (-1.03)	-5.64 (-1.51)	-3.99 (-0.50)	-5.11 (-1.26)
IFLATN	0.43 (0.48)	-0.19 (-0.13)	0.18 (0.16)	-0.99 (-0.51)	0.14 (0.12)
GDP	0.0013 (2.47)	0.0017 (0.40)	0.002 (1.12)	-0.90 (-0.51)	0.14 (0.12)
PMAG	149.68 (9.58)	146.82 (9.34)	147.54 (9.43)	145.74 (9.03)	147.10 (9.20)
WAGES	0.03 (0.42)	0.036 (0.53)	0.32 (0.49)	0.70 (0.76)	0.04 (0.61)
PRDTVTY	-0.59 (-0.02)	14.38 (0.31)	13.38 (0.48)	63.57 (0.79)	17.23 (0.51)
COSTCAP	-0.79 (-1.02)	-0.39 (-0.33)	-0.59 (-0.50)	0.67 (0.39)	-0.41 (-0.43)
MKTVAL	0.002 (3.09)	0.0002 (3.14)	0.0002 (3.16)	0.0002 (3.12)	0.002 (3.12)
EXRATE	-0.11 (-3.76)	-0.05 (-0.15)	-0.11 (-1.29)	-0.18 (-0.38)	-0.10 (-1.17)

CORPTAX	398.07	519.35	488.76	584.60	475.71
	(4.40)	(4.50)	(4.88)	(3.05)	(4.32)
AUSTRALIA		-203.37		-29.14	
		(-2.18)		(-0.65)	
BRITAIN		-186.04		0.09	
		(-2.31)		(0.003)	
DENMARK		-206.74		-29.22	
		(-2.31)		(-0.71)	
FRANCE		-185.65		-1.17	
		(-2.30)		(-0.05)	
JAPAN		-203.92		8.56	
		(-3.63)		(0.12)	
NETHERLANDS		-186.76		-5.82	
		(-2.17)		(-0.17)	
W. GERMANY		-191.54		-8.76	
		(-2.28)		(-0.29)	
UNITES STATES		-190.25		1.93	
		(-2.86)		(0.08)	
1989				0.73	
				(0.08)	
1990				0.18	
				(0.02)	
1991				-1.21	
				(-0.31)	
1992				-1.71	
				(-0.40)	

1993				4.30	
				(0.77)	
1994				-0.69	
				(-0.05)	
1995				-3.56	
				(-0.16)	
N	129				
R ²	0.63	0.66	0.59	0.67	0.60
F	20.05	12.77		8.66	
H statistic ^c			0.00		2.03
LM statistic			0.67 ^d		1.89 ^e

^a t statistics are in parenthesis.

^b No intercept for the one factor FEM model (Limdep Version 7.0 User's Manual, p.289).¹⁷

^c Chi square statistic for 10 degrees of freedom at the 0.95 probability level is 18.31.

^d Chi square statistic for 1 degree of freedom at the 0.95 is 3.84.

^e Chi square statistic for 2 degrees of freedom at the 0.95 probability level is 5.99.

Table IV. Regression Coefficients for the Food and Consumer Products Industry^a

Variable	One Factor			Two Factor	
	OLS	FE M	REM	FEM	REM
Intercept ^b	-7.09 (-0.276)		-3.71 (-0.12)	99.35 (0.92)	-4.28 (-0.13)
FINTRA	2.16 (0.91)	-2.11 (-0.56)	1.78 (0.65)	-4.32 (-0.61)	2.07 (0.72)
IFLATN	-0.67 (-0.77)	-0.36 (-0.27)	-0.81 (-0.68)	0.14 (0.07)	-0.83 (-0.68)
GDP	0.0008 (1.96)	0.0005 (1.49)	0.0006 (0.42)	-0.0009 (-0.13)	0.0005 (0.29)
PMAG	89.61 (3.17)	82.75 (2.90)	86.37 (3.04)	83.39 (2.90)	86.62 (3.02)
WAGES	0.06 (1.00)	0.04 (0.63)	0.05 (0.86)	0.02 (0.24)	0.06 (0.88)
PRDTVTY	10.91 (0.46)	-48.26 (-1.12)	9.50 (0.37)	-119.61 (-1.29)	9.52 (0.34)
COSTCAP	1.05 (1.49)	0.41 (0.42)	0.99 (1.17)	0.86 (0.56)	1.02 (1.18)
MKTVAL	0.00008 (0.69)	0.00007 (0.59)	0.00008 (0.59)	0.00006 (0.46)	0.00007 (0.56)
EXRATE	-0.06 (-3.22)	0.38 (1.54)	-0.02 (-0.24)	0.67 (1.56)	-0.02 (-0.28)
CORPTAX	-11.49 (-0.57)	-41.36 (-0.37)	-16.43 (-0.40)	-30.35 (-0.20)	-15.52 (-0.38)
BRITAIN		71.27 (1.08)		22.88 (0.75)	

FRANCE	65.10	20.26
	(0.99)	(0.68)
GERMANY	67.09	5.33
	(0.83)	(0.11)
JAPAN	-20.51	-110.78
	(-0.47)	(-1.77)
NETHERLANDS	83.52	32.48
	(1.21)	(0.83)
SWITZERLAND	61.95	28.77
	(1.21)	(0.75)
W. GERMANY	66.00	17.06
	(0.86)	(0.43)
UNITED STATES	48.78	28.45
	(0.85)	(1.46)
1989		-18.00
		(-1.53)
1990		-9.01
		(-1.16)
1991		-3.96
		(-1.12)
1992		-0.52
		(-0.21)
1993		-6.70
		(-1.25)
1994		33.22
		(1.56)

1995			37.31	
			(1.42)	
N	258			
R ²	0.29	0.32	0.33	
F	10.26	6.65	4.72	
H statistic ^c			0.00	5.27
LM statistic			0.98 ^d	3.04 ^e

^a t statistics are in parenthesis.

^b No intercept for the one factor FEM model (Limdep Version 7.0 User's Manual, p.289).¹⁷

^c Chi square statistic for 10 degrees of freedom at the 0.95 probability level is 18.31.

^d Chi square statistic for 1 degree of freedom at the 0.95 is 3.84.

^e Chi square statistic for 2 degrees of freedom at the 0.95 probability level is 5.99.

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