COMPARISON OF THE PROFITABILITY OF TOP 1000 FIRMS IN CANADA AND USA

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***Abstract**: This study examines large Canadian and US firms to decompose the variation of firm profitability into year, industry, year-industry and firm components. Return on Assets (ROA), Return on Equity (ROE) and Return on Sales (ROS) provide three measures of firm profitability. For all three measures and both countries, firm effects provide the biggest contribution to the variability in firm profits with year-industry effects second, year effects third, and industry effects last. These results match those of previous studies. Comparing Canadian and US firms, firm effects explain more of the variation in the profitability of Canadian firms. Finally, the combination of industry, year and firm factors explain more the overall variation in profitability of our sample of Canadian firms than our sample of US firms.*

***Key words**: Return on Equity (ROE), Return on Asset (ROA), Return on Sale (ROS)*

JEL Classification Codes: F65, G20.

1. INTRODUCTION

A firm's performance can be measure through different ways. One such measure is profitability. Profitability varies from firm-to-firm, industry-to-industry and year-to-year. Many factors, such as: time, industry, firms and country influence the profitability of the firms. Firm effects and industry effects capture the competitive heterogeneity with in an industry. Firm effects the unique firm characteristic which influence the variation in strategies and performance outcome across industries and firm, and industry effects refers to attribute common to industry (Alfredo J. and Max P. 1998). By describing the relative importance of industry and firm effects, the literature seeks to identify whether managerial intervention through strategic action has a significant impact on firm performance compared to the effects of industry structure. The purpose of this project is to compare the profitability of Canadian and US firms to find out what factors influence the profitability across firms and how much these factors explain the profitability of firms. For this purpose, we use the following three measures of profitability, Return on Assets (ROA), Return on Equity (ROE) and Return on Sales (ROS).

ROA tells us how much we are earning from our assets while ROE tells how much we are earning from the capital we invested. ROA compare the industries while through ROE we compare the firms in a specific industry. ROA gives an idea to the investor about the conversion of investment to net income, higher ROA generates more income from less investment. While ROE tells us the change in profitability over the period. ROA is more preferable when the credit union are building up, while ROE is more preferable when the credit union has steady growth. Both ROA and ROE tell us about the health of firm profitability. ROS measure analyse the performance of a firm in two; performance of a firm with its past performance and with the other firms within the industry. An increasing ROS shows firms growth and efficiency, while a decreasing ROS could signal the financial problems of a firm.

Schmalensee (1985) study is the first published empirical work on the industry and firm effects on the profitability of firm. He applied a simple analysis of variance framework on the existence and importance of firm market, and market share effects on profitability. McGahan and Porter (1997) also explored firm profitability and find that year, industry, corporate-parent, and business-specific effects all contribute to variation in firms profitability. Subsequent studies by Amel and Froeb (1991) show that firm effects are more important than market effects in determining profitability.

Similar to Schmalensee Richard (1985) and McGahan and Porter (1997), this project uses ordinary least squares regression estimation to find the explained sum of squared residuals and R^2 under different specifications of included factors. We then decompose the variance of profitability into the components using the explained sum of squares from the regressions. The R^2 from various specifications is used to investigate the influence of the factors on the variation of profit across firms. Our results show that firm specific effects dominate in explaining differences in profitability for our sample of large Canadian and US firms.

This paper has the following structure. In the first section the literature review is performed as well as a comparison between different studies. The second section covers data and methodology used for the development of the model. The third section discusses the empirical results and compares them with the findings of other studies. The final section provides conclusions and discusses further studies.

2. LITERATURE REVIEW

Schmalensee (1985) study is the first published empirical work on the industry and firm effects on the profitability of firm. He applied a simple analysis of variance framework on the existence and importance of firm market, and market share effects on profitability. His results explain that industry differences are significant and account for over 75% of the observed variance in industry average rates of return. Market share effects are statistically significant but account for less than 1% of the variance in business unit rates of return.

Amel and Froeb (1991) study cross-sectional data of multimarket banking firms in Texas over the period 1982-87. Their results suggest that firm effects are more important than market effects in determining profitability. Their results show that during the recession (In 1982, Texas began to be affected by the worldwide recession) in the Texas banking industry, firm effects are large and significant, market share effect and market concentration are also significant but very small.

Schiefer and Hartmann (2009) use the panel data to analyze the variation in the profitability within European food industry. They decompose the variation in Return on Asset (ROA) into year, industry country and firm effects, while also including an interaction between country and industry term. They find that industry, firm, year, and country effects, as well as industry-country interactions significantly influence food industry ROA by explaining about 40 percent of the variation in profitability across firms.

Furman (2000) looks at firm profits using data from 1992 to 1996 by comparing year, industry, corporate parent, and business specific effects across Australia, Canada, the United Kingdom, and the United States. His work focuses on the importance of understanding geographic influence on the firm's profit of the above countries and finds that the year effects explain a rather small proportion of variance and often enter insignificantly in the models. Business segment effects generally predominate, while industry effects and corporate parent effects explain some, but a substantially less, of the fraction of the variance.

Schumacher and Boland (2013) investigate US firms for the period 1980 to 2001. Their results suggest that firm specific effects provide the largest component explaining the variation of

business segment profits within food economy. They used random and fixed effects methods to estimate the source of variance in firm profitability. The fixed effects model finds that firm effects account for 48.69 percent of the variation in business-segment performance. Firm effect is followed in importance by year-industry, industry and year respectively. Their random effects model explains 49.3 percent of the variation in the business-segment.

McGahan and Porter (1997) use US data for the year 1981-84 and find that, of the variation in firm profits, year effects explain 2 percent, industry effects explain 19 percent, stable corporate-parent effects explain 4 percent and stable segment-specific effect account for 32 percent for their sample of firms. In manufacturing, industry and corporate-parent effects account for a relatively lower portion of variance, while segment-specific effects account for a relatively high portion of variance. Their analysis provides strong supports that industry effects matter in three important ways. First, industry directly accounts for 19 percent of aggregate variation in business-specific profits and 36 percent of explained variation. Second, industry influences the effect of the corporate parent on business-specific profitability. Third, the absolute and relative influence of industry, corporate-parent and business-specific effects differs substantially across broad economic sectors.

Lieu Pang and Chi Ching (2006), using Taiwanese manufacturing data for the period 1994-00, look at the relative importance of the year, industry, corporate, business unit, and transient industry (transient industry measure the year-to-year variations in industry-specific effects while stable industry effects are the (unobserved) time-invariant components of business-unit returns associated with membership in each industry) effects on profitability. They find business unit effects in Taiwan to be considerably more important to profitability than any other effects. Further, transient industry effects are four times as large as stable industry effects.

Gabriel Hawawini, Venkat Subramanian and Paul Verdin (2003), using US data set for the period 1987-1996, find that industry and firm-level factors influence performance in two ways. First, they test for the effects using new measures (profit to capital employed) of performance; and second, they consider the impact of outliers. Their results show that industry factors, on average, matter little to firm performance. Further, they also examine the impact of firm specific and industry factors (are the primary determinants of firm performance) on those firms that do not outperform or underperform in relation to the rest of their industry. The results suggest that industry-specific factors may have different meaning for different types of firms within an industry.

Schiefer J., HirschS., Hartmann M. and Gschwandtner A.(2013) use three different methodologies to investigate firm profit variability: (1) Components of variance analysis (COV) and Nested (i.e. hierarchical) analysis of variance (ANOVA) techniques to decompose the variation in firm profitability into firm and industry specific effects. Hierarchical linear modelling (HLM) is a multilevel approach technique in order to decompose the variance in profitability. Method (COV and HLM vs. ANOVA increment to R^2); (2) maximum likelihood techniques (ML) and Minimum norm quadratic unbiased estimation (MINQUE) Its application was originally to the estimation of variance components in random effects models- estimation technique (MINQUE vs. ML); and (3) ‘sample A’ "size-restricted sample" eliminate enterprises with less than two million Euros in average assets while ‘sample B’ considers all size classes, sample type (A vs. B). Their results suggest that the food industry's ROA is significantly influenced by industry, firm, year, and country effects, as well as two- and three way interactions of these effects.

3. DATA SETS

This project uses two datasets: (i) Report on Business (ROB) top 1000 Canadian firms; and (ii) Fortune 1000 US corporate database. For each country, the respective database contains information on the top 1000 firms in terms of revenue each year from 1998 to 2011. Thus, there

are 1000 companies for each year, but many firms appear multiple years, and thus, are tractable over time. The databases contain firm characteristics such as profit, revenue, employees, location, and assets. All companies in both lists are ranked by their revenues. The time periods covered and yearly sample sizes in both countries are the same.

The nature of the data allows for two ways to perform the analysis. First, we look at the whole unbalanced sample for both countries. Second, we look at the balanced panel for each country or the sample of firms appearing in the top 1000 for all year. The balanced sample for Canada contains 201 firms while the balanced sample for the US has 493 firms.

Foster (1978) in his book financial statement analysis identifies three widely used measures of firm profitability. They are:

i). Return on Asset (ROA) is simply the ratio of net income after taxes to total assets;
ii). Return on Equity (ROE) is calculated by dividing net income available to common (i.e. after taxes and preferred dividend payments) by common shareholder's equity; and
iii). Return on Sales (ROS) (i.e. Operating Margin) is the ratio of operating income (i.e. sales minus operating expenses) to sales.

In the Canadian data set, data on assets are missing for year 2000 and 2001 and data on equity are also missing for all years. We use return on common equity instead. We will calculate the profitability of firm with all the above three different ways and then will compare the profitability of firm by using the three different measures.

4. MODEL AND METHODOLOGY

This section discusses the modeling techniques to get the results. We are going to start from very basic model to examine the variation in firm profitability.

i) $r_{yif} = \alpha_y + \beta_i + \gamma_f + \delta_{yi} + \mu_{yif}$

where r_{yif} (dependent variable) is the profitability of firm f in year y and industry i. The independent variables include the increment to average profit that is particular to year y (α_y is the year effect), the increment particular to industry i (β_i is the industry effect), the increment particular to firm f(γ_f is the firm effect), δ_{yi} are year-industry effect and random disturbance (μ_{yif}).

In order to compare the profitability we will use the same approach used by Schmalensee Richard (1984), McGahan and Porter (1997) and Lieu P.and Chi C.(2006). The approach is an analysis of variance into the various components:

ii) $\sigma^2_r = \sigma^2_\alpha + \sigma^2_\beta + \sigma^2_\gamma + \sigma^2_{yi} + \sigma^2_\mu$

The variance of the dependent variable in equation i) is a linear combination of the variance of independent variables under the assumption with mean zero and constant variances. We find ROA, ROE and ROS with the above mention formulas. The ANOVA is a decomposition of R^2. We follow the following procedure to decompose the variance of profitability into the various components:

1. Run regression of profit measure on year dummy variables, and obtain the total sum of square (TSS), explain sum of square (ESS) and R^2 (ESS to TSS). The analysis of variance uses R^2 from this regression.
2. Add industry dummy variables (two-digit) to the regression in step 1. Obtain the total sum of square (TSS), explain sum of square (ESS) and R^2(ESS to TSS). The analysis of variance uses R^2 from this regression.
3. We add year-industry dummy variables to the regression in step 2 and obtain the total sum of square (TSS), explain sum of square (ESS) and R^2(ESS to TSS). The analysis of variance uses R^2 from this regression.

4. Add firm dummy variables to the regression in step 3. These firm effects regressions are estimated using the within estimator in STATA (xtreg, fe). We note that the industry dummy variables are dropped in this regression due to multicollinearity. We then obtain the total sum of squares (TSS), explain sum of squares (ESS), and R^2 (ESS to TSS) from this regression. The TSS and ESS are calculated for the full regression not the within regression. The analysis of variance uses R^2 from this regression.
5. Decompose the variance of profitability into the various components using the explained sum of squares from the regressions in steps 1-4.

These five steps are done separately for Canadian and US firms. We compare the results for the two countries.

5. SUMMARY STATISTICS

Tables 1 to 6 provide the summary statistics of Canada and US. Tables 1 to 3 presents the yearly tabulations, while Tables 4 to 6 present summary statistic across the industries.

Table 1 examines yearly summary statistics for the return on assets. Initially, the mean ROA of Canadian firms is negative in most years with a low value of -5.92 occurring in 2008 and a high value of 3.30 occurring in 2004. The median is positive in every year except 2009. For the US, the mean value of ROA is always positive but decreasing initially till 2002. It starts rising in 2003 and reaches a maximum in 2006. The mean returns start decreasing in 2007 until 2009.The median follows a similar pattern.

Return on assets of Canadian firms show similar behaviour as US firms, we have two recessions ended in 2002 and 2008 in both countries. The only difference is the mean Return on assets of Canadian firms is negative during recession while the US firms remain positive.

Table 1: Summary Statistics for Return on Assets

Year	Canadian Firms			US Firms		
	Mean	St.Dev	Median	Mean	St.Dev	Median
1998	-1.63	21.98	1.82	4.06	8.08	3.55
1999	-0.86	18.17	2.34	3.73	9.74	3.75
2000	Na	Na	Na	3.72	9.79	3.40
2001	Na	Na	Na	0.71	20.60	2.40
2002	-3.96	24.73	1.38	0.56	18.77	2.40
2003	0.11	16.76	2.79	3.52	10.27	3.20
2004	3.30	27.72	3.36	4.57	7.33	4.30
2005	1.16	14.01	2.96	5.18	8.27	4.80
2006	0.44	18.20	2.66	5.47	8.16	4.80
2007	-1.69	17.94	1.22	4.83	8.04	4.60
2008	-5.93	30.44	0.22	1.26	13.97	3.30
2009	-3.71	26.99	-0.10	2.76	11.73	3.00
2010	-0.97	16.64	1.12	4.55	6.41	4.10
2011	-1.77	19.75	1.47	4.92	6.53	4.60
All	-1.29	21.81	1.84	3.57	11.45	3.70

Table 2 presents the yearly summary statistics of return on equity (ROE). Initially, the mean ROE of Canadian firms is negative in most years with a low value of -8.33 occurring in 2008 and a high value of 5.87 occurring in 2004. The median is positive in every year except 2009. Initially, the mean and median return on equity of US firms are increasing until 2000, and its start decreasing in 2001 and further decrease in 2002.The mean US ROE starts increasing until 2006 and reaches to maximum in 2007.

Table 2: Summary Statistics for Return on Equity

	Canadian Firms			US Firms		
Year	**Mean**	**St.Dev**	**Median**	**Mean**	**St.Dev**	**Median**
1998	-1.63	44.61	6.15	12.03	59.90	12.5
1999	0.79	41.02	6.49	14.12	31.66	13.1
2000	10.27	441.71	7.49	13.54	61.68	12.8
2001	-7.48	62.34	4.44	2.22	93.86	9.4
2002	-4.32	58.34	4.48	-4.35	288.92	9.8
2003	3.38	34.38	7.39	12.98	125.17	11.6
2004	5.87	49.25	8.61	19.63	183.48	13.1
2005	3.77	39.63	7.99	14.29	59.35	13.5
2006	2.86	46.67	7.43	26.07	347.54	14.1
2007	-3.60	51.52	3.40	19.46	132.13	13.4
2008	-8.33	50.95	0.38	-7.26	157.68	11.2
2009	-5.26	53.81	-0.09	322.55	9480.87	9.6
2010	-0.28	33.29	3.23	8.64	181.59	11.1
2011	-0.84	42.57	4.26	13.88	179.73	12.7
All	-1.63	44.61	6.15	33.14	2518.25	12.1

Table 3 shows the summary statistics of yearly Return on Sales (ROS) for Canada and US firms. The mean Return on Sales are negative initially and decreases further until 2001. In 2002 it start increasing but remains negative. In 2003-04 it becomes positive and increasing, in 2005 it starts decreasing and becomes negative until 2011. The median Return on Sales are positive and increases in 2004-05, and then decreases from 2006 until 2011. The US mean and median Return on Sales decreases in 1999 and further decrease in 2001-02. The recession ended in 2002 and in 2003 ROS increases until 2006, then we have second recession in 2007-08. In 2009 ROS increases until 2011.

Return on assets of Canadian firms show similar behaviour as US firms, we have two recessions ending in 2002 and 2008 in both countries. The only difference is that the mean Return on Assets of Canadian firms is negative during recession, while the US firms remain positive.

Table 3: Summary Statistics for Return on Sales

	Canadian Firms			US Firms		
Year	**Mean**	**St.Dev**	**Median**	**Mean**	**St.Dev**	**Median**
1998	-299.08	3793.75	3.25	5.73	30.07	4.10
1999	-117.69	1481.30	3.92	4.90	10.23	4.60
2000	-268.69	4341.84	3.72	4.76	10.72	4.15

2001	-740.69	11877.40	2.42	-0.92	60.58	3.00
2002	-216.30	1947.17	3.27	-0.73	35.80	3.30
2003	439.08	13796.90	4.76	5.00	11.46	4.20
2004	3507.84	65007.09	7.17	6.06	9.51	5.10
2005	-210.53	1961.46	5.16	6.74	10.04	5.50
2006	-152.68	1375.40	5.26	7.00	10.40	5.70
2007	-4.38	3383.53	3.01	5.95	11.62	5.35
2008	-858.12	15205.79	1.22	-0.63	37.10	3.50
2009	-939.73	7545.80	0.08	2.83	21.19	3.70
2010	-536.26	30441.10	2.85	6.01	9.00	5.20
2011	-1155.61	18377.44	2.84	6.51	8.69	5.50
All	-111.27	20990.66	3.59	4.24	24.90	4.50

Table 4 presents the summary statistics of Return On Assets(ROA) in different industries. Canadian firms are divided in eight different categories while US in seven. For Canada, the table shows that the mean and median values for return on assets are highest in wholesale trade industry, followed by Arts, Entertainment and Recreation. Arts, Entertainment and Recreation have the lowest standard deviation followed by Agriculture, Forestry, Fishing and Hunting.

The US results show manufacturing has the highest mean and median values for ROA followed by wholesale and Arts, Entertainment and Recreation respectively. Mining, Quarrying, and Oil and Gas Extraction having minimum standard deviation followed by wholesale trader and Agriculture, Forestry, Fishing and Hunting.

Table 4: Summary Statistics for Return on Assets

	Canadian Firms			**US Firms**		
Industry	**Mean**	**St.Dev**	**Median**	**Mean**	**St.Dev**	**Median**
Agriculture, Forestry, Fishing and Hunting	0.77	9.91	1.26	1.71	10.21	3.30
Mining, Quarrying, and Oil and Gas Extraction	-2.81	21.08	0.36	2.93	7.25	3.10
Manufacturing	-4.42	25.47	0.87	4.34	12.91	5.00
Wholesale Trade	3.52	13.58	4.80	4.25	9.63	4.80
Information and Cultural Industries	0.57	22.29	2.22	2.31	12.21	1.70
Educational services	-5.27	34.77	0.32	3.41	15.95	4.40
Arts, Entertainment and Recreation	2.84	9.45	4.32	3.19	14.48	4.10
Other Services (except Public Administration)	-2.66	11.09	1.11	n.a.	n.a.	n.a.
All	-0.93	18.46	1.91	3.16	11.81	3.77

Table 5 shows Industries wise distribution of mean, median and standard deviation of return on equity (ROE). In Canadian industries wholesale trade industry has the highest mean ROE followed by Information and Cultural Industries while median values is highest in Information and Cultural Industries followed by Educational services. In the US mean ROE is highest in wholesale followed by manufacturing industry, while median is highest in manufacturing followed by wholesale.

Agriculture, Forestry, Fishing and Hunting has the lowest standard deviation in US industries. Both countries present similar results with a small difference in Canada wholesale industry has the higher mean value of ROE followed by Agriculture, Forestry, Fishing and Hunting while in US wholesale followed by manufacturing industry.

Table 5: Summary Statistics for Return on Equity

	Canadian Firms			US Firms		
Industry	**Mean**	**St.Dev**	**Median**	**Mean**	**St.Dev**	**Median**
Agriculture, Forestry, Fishing and Hunting	2.05	3.90	24.00	-3.78	55.73	8.10
Mining, Quarrying, and Oil and Gas Extraction	-2.31	1.45	41.03	9.84	61.97	11.10
Manufacturing	-7.12	2.17	62.69	15.18	163.42	13.00
Wholesale Trade	7.21	12.31	33.55	77.20	4426.98	12.60
Information and Cultural Industries	3.61	7.44	210.70	10.85	132.10	11.60
Educational services	-13.30	0.05	80.34	13.68	75.87	12.10
Arts, Entertainment and Recreation	3.14	9.02	33.02	9.55	61.95	11.75
Other Services (except Public Administration)	-12.02	3.88	42.61	n.a.	n.a.	n.a.
All	-2.34	5.03	65.99	18.93	711.15	11.46

Table 6 presents the summary statistics of industry wise distribution of Return on Sales (ROS) for Canada and US. In Canada, Information and Cultural Industries have the highest mean, median values and lowest standard deviation return on. In US, Information and Cultural Industries have the highest mean and median values followed by Mining, Quarrying, and Oil and Gas Extraction. Results are similar for Canada and the US.

Table 6: Summary Statistics for Return on Sales

	Canadian Firms			US Firms		
Industry	**Mean**	**St.Dev**	**Median**	**Mean**	**St.Dev**	**Median**
Agriculture, Forestry, Fishing and Hunting	-9.19	143.36	1.68	1.42	4.57	1.90
Mining, Quarrying, and Oil and Gas Extraction	-1184.30	15489.70	2.35	5.16	13.82	5.50
Manufacturing	-569.52	4581.30	1.29	3.73	32.57	4.70
Wholesale Trade	-0.88	122.59	3.49	3.63	8.45	3.10
Information and Cultural Industries	1172.97	33045.10	6.67	6.02	33.42	7.80
Educational services	-7.81	49.17	0.21	2.68	9.70	3.20
Arts, Entertainment and Recreation	1.50	62.89	3.15	0.93	35.55	4.90
Other Services (except Public Administration)	-7.95	27.06	1.79	n.a.	n.a.	n.a.
All	-75.65	6690.15	2.58	3.37	19.73	4.44

We concluded from the above summary statistics that, in both countries, Return on Asset and Return on Equity explain that wholesale trade industry is earning more profit then the other industries, while in Return on Sales explain Information and Cultural Industries and Arts, Entertainment and Recreation industries are earning more profit in Canada and US respectively.

6. EMPIRICAL RESULTS

Table 7 to 18 shows the variance components analysis estimation of equation ii) based on our dataset. These tables give the percentage of total variance of dependent variable explain by independent effects of the models. Table 7, 8 and 9 compare the finding of full sample for Canada and table 10, 11 and 12 compare the finding of full sample for US. Tables 13-15 and table 16-18 present the results for the balanced sample, appearing in the top 1000 firms for of Canadian and US, respectively.

Full sample

Tables 7, 8 and 9 explains the variance components analysis estimation of equation ii) for the Canadian data set by using three different measures of firm profits. ROA, ROE and ROS respectively. The full model explains 48 percent of the variation in ROA, 27.27 percent of the variation in ROE and 92 percent of the variation in ROS. Of these, firm effects explain 46.79 percent, 91.72 percent and 55.77 percent of the variation in these measures, respectively. Year effects explain 1.18 percent, 0.16 percent and 0.27 percent variation in profitability; industry effects explain 1.4 percent, 0.15 percent and 0.22 percent, the year-industry effects account for 3.63 percent, 0.52 percent and 0.88 percent of the total variation in profitability of Canada data respectively.

Tables 10 (ROA), 11 (ROE) and 12 (ROS) show the components explaining variation in firm profits for the full sample of US firms. The full model explains 38.34 percent, 17.75 percent and 38.40 percent of the total variation for the three measures. Of these, firm effects again dominate by explaining 35.57 percent of the variation in ROA, 16.78 percent of the variation in ROE and 36.18 percent of the variation in which is larger than any other effect. Of the other effects, year effects explain 1.91 percent, 0.1 percent and 1.25 percent; industry effects explain 0.57 percent, 0.01 percent and 0.26 percent; and the year-industry effects account for 3.92 percent, 0.33 percent and 2.9 percent of the total variation of ROA, ROE, and ROS respectively, for our US firms.

When comparing Canadian and US firms, the results indicate that firm, year, industry and year-industry components explain the same amount of variation in ROA and ROS for both groups, while these factors explain less of the variation in ROE for US firms. For both sets of firms, firm effects dominate, followed by the year-industry component, second, year effect, third, and industry effects last in explaining the variability of firm profits.

Balanced panel sample of firms

Table 13, 14 and 15 show the components of variation for Canadian balance panel sample, measuring the profit through ROA ROE and ROS, respectively. We obtained the following result that the full model explains 30.28 percent, 23.82 percent and 32 percent of the total variation in the respective measures of firm profits. The firm components capture 26.81 percent, 20.74 percent and 30.36 percent of the variation, while year effects explain 0.58 percent, 0.64 percent and 0.42 percent of the variation in the profitability of firm. Industry accounts for 2.09 percent, 2.1 percent and 1.03 percent of the variation and year-industry accounts for 5.57 percent, 5.12 percent and 1.46 percent of variation in the profitability of firm.

Table 16, 17 and 18 show the results for the US firms who appear for all 14 years (*Balanced panel sample of firms).* For ROA, ROE and ROS models, the full model explains 37.67 percent, 12.36 percent and 20.76 percent of variation across firms, respectively. Firm effects explain 33.35 percent, 11.46 percent and 16.95 percent, while year effects explain 2.85 percent, 0.42 percent and 1.85 percent of the variation in the respective measures of profitability. Industry contributes 1.96 percent, 0.01 percent and 0.78 percent of the total variation. The year-industry component accounts for 6.14 percent, 0.92 percent and 4.54 percent of the total variation in ROA, ROE and ROS, respectively, of US firms.

In the balance panel of Canadian firms, ROE has the most explained variation, ROS has the second most and ROA has the least for the full model. For the balance panel of US firms, ROA has the most explained variation, ROS has the second most and ROA has the least for the full model.

Comparison with Other Studies

Table 19 compares our results with previous studies, Lieu Pang T. and Chi Ching W. (2006) report the contribution of year effects, industry effects, firm effects, and year-industry effects to variation in profitability as -0.25, 3.14 percent, 36.15 percent and 11.28 percent respectively which is similar to my results. Furman (2000) study on OECD countries finds that year, industry, firm explain 0.1 percent, 14.5 percent and 40.0 percent for US data and 0.6 percent, 30.3 percent and 16.8 percent for Canada respectively. In our study the Canadian and US industry effect is lower than those numbers. Gabriel H., Venkat S. and Paul V. (2003) used US data for 1000 listed firms for a period of 21 years. Their results concluded that year, industry, firm, year-industry explain 1 percent, 8.1 percent, 35.8 percent and 3.1 percent of variation in profitability of firm. Which is similar to our results in the case of firm results but different in industry and year-industry. McGahan and Porter (1997) also have similar results as Lieu Pang T. and Chi Ching W. (2006).

Table 19 compares the result of the variance components analysis of profitability from the previous studies to our estimates. As can be seen from table 19, Lieu Pang T. and Chi Ching W. (2006) reported the year, industry, firm, year-industry variation in profitability as -0.25,3.14 percent, 36.15 percent and 11.28 percent respectively which is slightly different our US result, we have higher year effect followed by industry. Our results for Canadian data set it similar to ROE and different from ROA and ROS. Gabriel H., Venkat S. and Paul V. (2003) results concluded that year, industry, firm, year-industry explain 1 percent, 8.1 percent, 35.8 percent and 3.1 percent of variation in profitability of firm. The results show that firm is followed by industry, year-industry and year which is different from our analysis because firm is followed year-industry, year and industry.

7. CONCLUSION

The objective of the study is a decomposition analysis and comparison of the profitability of firms in Canada and US, and to find out the determinants which affect it. Three measures of firm profitability are examined: Return on Assets (ROA); Return on Equity; and Return on Sales (ROS). Firms effects provide the biggest contribution to the variability of firm profits, which matches the findings of the previous studies. In Canadian and US results, firm effects contribution the most to profit variability and is followed by year-industry effect. This result is similar to Lieu Pang T. and Chi Ching.(2006) but differs from the findings of Gabriel H., Venkat S. and Paul V.(2003). Difference between Canadian and American results can be seen only in one case where industry effect is greater than year. We do not have any evidence from geographic effects. Both countries are on the same continent and the limited geographical information does not allow for the study of geographical influences on profits. Comparing the industries wise distribution, our

results show that wholesale industry is highly profitable in both countries with the lowest standard deviation in firm profits.

Comparing Canadian and US results for the whole data set, Canadian results for firms explain more variation in the profitability of the firm. On the other hand, when comparing results for "Firms those appear in all 14 years", for the ROA measure of profits, there is more of the variation explained for US firms, which is the opposite to the results for the ROE and ROS measures. The overall result shows that Canadian firms explain more variation in the profitability of firms than compared to US firms.

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ANNEX

Table no. 7: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for full sample. Return on Equity(ROE) for Canada dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	5707332	67337.8	1.18	2.46
INDUSTRY	5707332	79644.4	1.40	2.92
FIRM	5707332	2670573	46.79	97.46
YEAR*INDUSTRY		207200	3.63	7.56
YEAR & INDUSTRY	5707332	142279	2.49	5.19
YEAR & FIRM	5707332	2702411	47.35	98.62
YEAR, INDUSTRY & YEAR*INDUSTRY	5707332	207200	3.63	7.56
YEAR, FIRM & YEAR*INDUSTRY	5707332	2740232	48.01	100.00
YEAR, INDUSTRY FIRM& YEAR*INDUSTRY	5707332	2740232	48.01	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 8: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 full sample. Return on Equity(ROE) for Canadian dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	2.180E+08	352110.6	0.16	0.17
INDUSTRY	2.180E+08	320894.8	0.15	0.16
FIRM	2.180E+08	2E+08	91.72	99.70
YEAR*INDUSTRY	2.180E+08	1140068	0.52	0.57
YEAR & INDUSTRY	2.180E+08	651519.1	0.30	0.33
YEAR & FIRM	2.180E+08	2E+08	91.80	99.78
YEAR, INDUSTRY & YEAR*INDUSTRY	2.180E+08	1140068	0.52	0.57
YEAR, FIRM & YEAR*INDUSTRY	2.180E+08	2E+08	91.90	99.89
YEAR, INDUSTRY ,FIRM & YEAR*INDUSTRY	2.180E+08	2E+08	92.00	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 9: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for full sample. Return on Sales(ROE) for Canadian dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	6.15E+12	1.63E+10	0.27	0.48
INDUSTRY	6.15E+12	1.34E+10	0.22	0.39
FIRM	6.15E+12	3.43E+12	55.77	99.43
YEAR*INDUSTRY	6.15E+12	5.42E+10	0.88	1.57
YEAR & INDUSTRY	6.15E+12	2.78E+10	0.45	0.80
YEAR & FIRM	6.15E+12	3.44E+12	55.87	99.61
YEAR , INDUSTRY & YEAR*INDUSTRY	6.15E+12	5.42E+10	0.01	1.57
YEAR , FIRM & YEAR*INDUSTRY	6.15E+12	3.45E+12	56.09	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	6.15E+12	3.45E+12	56.09	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 10: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for full sample. Return on Asset(ROA) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	1829402	34874.66	0.019063	4.97
INDUSTRY	1829402	10438.18	0.005706	1.49
FIRM	1829402	650829.6	0.355761	92.78
YEAR*INDUSTRY	1829402	71765.85	0.0392	10.22
YEAR & INDUSTRY	1829402	44949.98	0.0246	6.42
YEAR & FIRM	1829402	677424.7	0.370298	96.57
YEAR , INDUSTRY & YEAR*INDUSTRY	1829402	71765.85	0.039229	10.23
YEAR , FIRM & YEAR*INDUSTRY	1829402	701462.7	0.383438	100
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	1829402	701462.7	0.383438	100

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model)

Table no. 11: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for full sample. Return on Equity(ROE) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	8.51E+10	85957923	0.10	0.56
INDUSTRY	8.51E+10	12504952	0.01	0.06
FIRM	8.51E+10	1.43E+10	16.78	94.52
YEAR*INDUSTRY	8.51E+10	2.82E+08	0.33	1.87
YEAR & INDUSTRY	8.51E+10	98872243	0.12	0.68
YEAR & FIRM	8.51E+10	1.44E+10	16.87	95.02

YEAR , INDUSTRY & YEAR*INDUSTRY	8.51E+10	2.82E+08	0.33	1.86
YEAR , FIRM & YEAR*INDUSTRY	8.51E+10	1.51E+10	17.75	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	8.51E+10	1.51E+10	17.75	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 12: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for full sample. Return on Sales(ROE) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	8646924	108291.2	1.25	3.26
INDUSTRY	8646924	22762.14	0.26	0.68
FIRM	8646924	3128303	36.18	94.21
YRAR*INDUSTRY	8646924	250547.1	2.90	7.55
YEAR & INDUSTRY	8646924	131600.3	1.52	3.96
YEAR & FIRM	8646924	3212532	37.15	96.75
YEAR , INDUSTRY & YEAR*INDUSTRY	8646924	250547.1	2.90	7.55
YEAR , FIRM & YEAR*INDUSTRY	8646924	3320499	38.40	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	8646924	3320499	38.40	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 13: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for sub sample. Return on Asset (ROA) for Canadian dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	295206.4	1711.209	0.58	1.92
INDUSTRY	295206.4	6170.874	2.09	6.90
FIRM	295206.4	79141.78	26.81	88.53
YEAR*INDUSTRY	295206.4	16429.46	5.57	18.39
YEAR & INDUSTRY	295206.4	7882.083	2.67	8.82
YEAR & FIRM	295206.4	80852.99	27.39	90.44
YEAR , INDUSTRY & YEAR*INDUSTRY	295206.4	16429.46	5.57	18.38
YEAR , FIRM & YEAR*INDUSTRY	295206.4	89400.37	30.00	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	295206.4	89400.37	30.00	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 =(R^2/ $R^2$of full model).

Table no. 14: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for balance sample. Return on Equity(ROE) for Canadian dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	1730000	11092.05	0.64	2.69
INDUSTRY	1727839	36328.57	0.21	8.82
FIRM	1730000	358000	20.74	87.09
YEAR*INDUSTRY	1727839	88484.97	5.12	21.49
YEAR & INDUSTRY	1727839	47571.75	2.75	11.54
YEAR & FIRM	1727839	369651.7	21.39	89.81
YEAR , INDUSTRY & YEAR*INDUSTRY	1727839	88484.97	5.12	21.49
YEAR , FIRM & YEAR*INDUSTRY	1727839	411570.3	23.8	99.92
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	1730000	412000	23.82	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 15: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for balance sample. Return on Sales(ROE) for Canadian dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	3.9E+07	163773	0.42	1.31
INDUSTRY	3.9E+07	401634	1.03	3.22
FIRM	3.9E+07	1.2E+07	30.36	94.87
YEAR*INDUSTRY	3.9E+07	1038947	2.68	8.37
YEAR & INDUSTRY	3.9E+07	565407	1.46	4.56
YEAR & FIRM	3.9E+07	1.2E+07	30.78	96.19
YEAR , INDUSTRY & YEAR*INDUSTRY	3.9E+07	1038947	2.68	8.36
YEAR , FIRM & YEAR*INDUSTRY	3.9E+07	1.2E+07	32.00	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	3.9E+07	1.2E+07	32.00	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 =(R^2/ $R^2$of full model).

Table no. 16: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for balance sample. Return on Asset(ROA) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	362356.8	10315.64	2.85	7.57
INDUSTRY	362356.8	7116.848	1.96	5.20
FIRM	362356.8	120870.5	33.36	88.55
YEAR*INDUSTRY	362356.8	22249.69	6.14	16.30
YEAR & INDUSTRY	362356.8	17424.31	4.81	12.77
YEAR & FIRM	362356.8	131226.3	36.21	96.14
YEAR , INDUSTRY & YEAR*INDUSTRY	362356.8	22249.69	6.14	16.30
YEAR , FIRM & YEAR*INDUSTRY	362356.8	136493.3	37.67	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	362356.8	136493.3	37.67	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 17: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for balance sample. Return on Equity (ROE) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	125465130	522912.78	0.42	3.40
INDUSTRY	125465130	12821.713	0.01	0.08
FIRM	125465131	14375445	11.46	92.67
YEAR*INDUSTRY	125465131	1149086.9	0.92	7.44
YEAR & INDUSTRY	125465130	534426.06	0.00	3.48
YEAR & FIRM	125465130	14843306	11.83	95.69
YEAR , INDUSTRY & YEAR*INDUSTRY	125465130	1149086.9	0.92	7.41
YEAR , FIRM & YEAR*INDUSTRY	125465131	15511691	12.36	100.00
YEAR , INDUSTRY, FIRM & YEAR*INDUSTRY	125465131	15511691	12.36	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table no. 18: Industry, firm and year*industry effect in percentage of total variation for the year 1998-2011 for balance sample. Return on Sales(ROS) for US dataset.

	TSS	ESS	R^2	Fraction of Full Model R^2
YEAR	1491439.99	27587.201	1.85	8.91
INDUSTRY	1491439.99	11659.805	0.78	3.76
FIRM	1491439.99	252832.69	16.95	81.63

YEAR*INDUSTRY	1491439.99	67695.906	4.54	21.86
YEAR & INDUSTRY	1491439.99	39156.034	2.63	12.64
YEAR & FIRM	1491439.99	280450.8	18.80	90.55
YEAR , INDUSTRY & YEAR*INDUSTRY	1491439.99	67695.906	4.54	21.86
YEAR , FIRM & YEAR*INDUSTRY	1491439.99	309733.87	20.77	100.00
YEAR , INDUSTRY ,FIRM& YEAR*INDUSTRY	1491439.99	309733.9	20.77	100.00

Note: Total sum of square (TSS), Explain sum of square (ESS), Percentage of total variation (R^2) and Fraction of R^2 = (R^2/ $R^2$of full model).

Table 19: Comparison of the variance component analysis of profitability from previous studies.

	Lieu P. T. & Chi C. W. (2006)	McGahan and Porter (1997)	Schiefer and Hartmann (2009) sample		Furman (2000)		Gabriel, Venkat and Paul (2003)	Results for ROA of full sample	
			A	B	Canada	US		Canada	US
YEAR	-0.25	2.39	0.60	0.60	0.6	0.1	1	1.18	1.9
INDUSTRY	3.14	18.68	2.30	0.90	30.3	14.5	8.1	1.4	0.57
FIRM	36.15	31.71	51.9	38.1	16.8	40.0	35.8	46.8	35.57
YEAR_ INDUSTRY	11.28	n.a.	n.a.	n.a.	n.a.	n.a.	3.1	3.63	3.92
Full Model	51.03	51.6	60.8	41.5	56.5	48.1	48	48.01	38.34

All these value are in percentage.
Return on asset (ROA).
The results not available (n.a.)