DETERMINANTS OF CAPITAL STRUCTURE IN CANADIAN NON-FINANCIAL FIRMS: A RECENT STUDY

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ABSTRACT

The purpose of this research is to examine firm-specific determinants of capital structure in Canadian non-financial firms. The research uses a sample of 208 firms listed on Toronto Stock Exchange from 1999 to 2016. Panel data analysis has been performed using a fixed effects model estimation. The study also investigates the impact of firm-specific factors on capital structure in three different phases: pre-crisis (1999-2006), during crisis (2007-2009), and post-crisis (2010-2016).

The analysis suggests that age, liquidity, asset tangibility, size, growth opportunities, and profitability are the determinants of capital structure in Canadian non-financial firms. The findings suggest that Pecking Order Theory better explains capital structure choices across Canadian non-financial firms. However, some hypotheses of Trade-off Theory are also applicable in certain contexts. This study adds to the existing literature on factors influencing capital structure of Canadian non-financial firms. Both practitioners and academicians may benefit from the findings of this study.

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CHAPTER 1: INTRODUCTION

Financial resources play an important role in a firm's success because it is one of the key factors that drive firms' operations and growth. Managers spend a significant amount of time and effort in choosing between debt and equity (or the best possible combination of both) to finance their firms' operations and growth. It is known as "capital structure decision". There are costs and benefits associated with each financing option. Therefore, capital structure decision is crucial for survival of a firm (Danso & Adomako, 2010).

Capital structure has been one of the most argumentative issues in the area of finance since the late 1950s (Bradley, Jarrell, & Kim, 1984). After Modigliani and Miller proposed the concept of optimal capital structure in 1958 (revised in 1963) and provided foundation for Trade-off Theory, several theories were introduced to explain capital structure choices across firms. Agency Theory (introduced by Jensen and Meckling in 1976) and Pecking Order Theory (introduced by Donaldson in 1961 and reintroduced by Myers and Majluf in 1984) added new dimensions in capital structure theory by introducing agency cost and information asymmetry cost associated with issuance of shares, respectively.

Empirical works in the area of capital structure have not come up with a universal model because each model has a set of concepts and relationships that are completely different from others (Titman & Wessels, 1988; Myers, 2001). It is difficult to reject any theoretical framework based on available evidence. Therefore, empirical works should be aimed particularly at figuring out determinants of capital structure in various contexts (Harris & Raviv, 1991). Empirical works on capital structure must formulate and test the hypotheses that can be rejected. This is regarded as a challenge to both theoretical and empirical research (Shyam-Sunder & Myers, 1999).

As per the traditional concept, firms strive to minimize Weighted Average Cost of Capital (WACC) by choosing the least expensive financing option. Borrowing debt is supposedly cheaper than issuing shares. Therefore, firms try to achieve an optimal capital structure (minimize WACC) by adding more debt to their capital structure. Beyond the optimal point, WACC begins to rise because excess debt financing creates unnecessary devaluation of the firm and puts it at a higher risk of bankruptcy (Ross, Westerfield, Jordan, & Roberts, 2016).

The term "capital structure" is commonly used as a synonym of corporate debt or firm leverage. Many researchers have found a relationship between firm-specific factors and firm leverage. Bhaduri (2002) stated that capital structure is determined by a firm's operating cash flow, growth opportunities, size, restructuring costs, products, and industry characteristics. Mishra (2011) suggested that firm leverage is affected by profitability, asset structure and effective tax rate. Adhegaonkar and Indi (2012) found asset tangibility, Non-Debt Tax Shields (NDTS) and Interest Coverage Ratio (ICR) to be significant determinants of capital structure. Majumdar (2012) argued that asset tangibility, growth opportunities, profitability and firm-specific risk are significant determinants of capital structure. Mukherjee and Mahakud (2010) stated that market-to-book ratio, size, profitability, and asset tangibility are significant determinants of firm leverage. Sinha and Ghosh (2010) claimed that growth opportunities, size and profitability are the significant determinants of capital structure. Rajagopal (2009) stated that fixed asset ratio, size, profitability, market-to-book ratio, NDTS and earnings volatility are determinants of capital structure. Purohit and Khanna (2012) concluded that growth opportunities, collateral value of assets and Research and Development (R&D) expenditures are significant determinants of capital structure. Lim (2012) claimed that profitability, size, NDTS, earnings volatility and non-circulating shares are significant determinants of capital structure.

Cortez and Susanto (2012) claimed that asset tangibility, profitability and NDTS are the significant determinants of capital structure. Kouki and Said (2012) empirically proved that size, profitability, growth opportunities, and NDTS are the significant determinants of capital structure (as cited in Chadha & Sharma, 2015).

Canada is one of the G-7 countries with stable GDP structure. Canadian economy seemed more stable compared to the U.S. economy during the financial crisis of 2007 to 2009 (Hossain & Nguyen, 2016b). Canada is different from other countries on several aspects, such as culture, institutions, and operating environment of firms. Thus, what is relevant to other countries may not be relevant to Canada (Nunkoo & Boateng, 2010).

Publicly traded Canadian non-financial firms significantly depend on corporate debt and bonds. Therefore, it is essential to understand the effects of firm-specific factors in determining capital structure of non-financial firms in Canada. This study adds to the existing knowledge on capital structure in Canada, since the study covers pre-crisis (1999-2006), during crisis (2007-2009), and post-crisis (2010-2016) investigations of capital structure determinants across Canadian non-financial firms.

The remainder of this research paper is organized as follows: The second chapter provides the review of literature and theories on capital structure decisions of firms; the third chapter discusses research methodology; the fourth chapter analyses the results, the fifth chapter provides findings and concluding remarks, and the sixth chapter discusses limitations and scope of future research.

CHAPTER 2: LITERATURE REVIEW

2.1 M&M Theory and Optimal Capital Structure

The noble prize-winning professors, Modigliani and Miller or M&M (1958), were the first scholars to start debate on the relevance of capital structure on a firm's value. They argued that in a perfect capital market without taxes, transaction costs, and information asymmetry, a firm's value is unaffected by its capital structure. According to this concept, whether a firm uses debt or equity as a financing option, it should have no material effect on a firm's value. Therefore, firms can use any proportion of debt and equity in their capital structure, as any combination is just as good as the others, and could be considered as an optimal capital structure (Modigliani & Miller, 1958). Their theory is based on following assumptions: capital market is efficient and there is no communication gap between internal and external stakeholders; there are no transaction costs or bankruptcy costs; and choosing between debt and equity financing is a needless effort. This model served as a starting point for presenting more realistic concepts that explain why debt is preferred over equity (Chen & Strange, 2005).

In 1963, Modigliani and Miller revised their theory of "optimal capital structure" and added the role of tax advantage in determining capital structure. According to the revised theory, firms use debt to take advantage of tax shields, to reduce cost of capital, and to subsequently maximize firms' value. They further added that transaction costs associated with debt should be equivalent to the tax-benefits from debt financing. Therefore, even in the imperfect capital market with taxes and transaction costs, capital structure choice has no effect on firms' market value (Modigliani & Miller, 1963).

After Modigliani and Miller (1963), Kraus and Litzenberger (1973) took the concept of "optimal capital structure" further and explained the possibility of trade-off between tax-benefits of debt and the cost of financial distress associated with debt. An optimal debt ratio (optimal capital structure) can therefore be attained by creating a reasonable balance between the tax-free benefit of debt and the distress cost associated with debt (Kraus & Litzenberger, 1973). The concept of optimal capital structure later developed into "Trade-off Theory".

Jensen and Meckling (1976) explained "Trade-off Theory" from an agency cost perspective. Agency cost is the cost to control and monitor activities of managers so that they act in best interest of shareholders, and there is no conflict between managers and shareholders. This perspective is also known as "Agency Theory". As per the theory, optimal debt ratio (optimal capital structure) minimizes agency costs. When a firm borrows debt, managers have a responsibility to ensure efficient functioning of business activities so that interest obligations are met (M. Jensen & Meckling, 1976).

2.2 Evolution of Alternative Theories and Concepts

Miller (1977) proposed a concept of debt and taxes, which is an extension of Modigliani and Miller Proposition II (1963). In his analysis, he mentioned three different taxes: corporate tax rate, personal tax rate applicable to common stock gains, and personal tax rate applicable to interest income from bonds. Personal tax rate applies to interest income from bonds, but corporations can deduct the "interest paid to bondholders" from their taxable income. Personal tax rate applies to common stock gains as well, but it may be exempted in special cases. Additionally, if personal tax rate on income bonds is greater than personal tax rate on common stocks, the bondholders will have no interest to make investments, although corporations may

want to use more debt instead of equity due to tax advantages. In this case, bondholders will demand higher before-tax return on their investments, other things equal, to offset the tax disadvantage. The equilibrium point is where the net effect of all taxes is zero, and that is the point at which optimum debt ratio is created (Miller, 1977).

DeAngelo and Masulis (1980) introduced a concept of Non-Debt Tax Shields (NDTS), and stated that there are alternatives to debt-related tax shields, such as depreciation, investment tax credits, tax loss carried forward, etc. The tax shields on interest payments may look attractive, but it decreases earnings and make it insufficient to offset taxes. Therefore, firms with higher NDTS are likely to use less debt in their capital structure (DeAngelo & Masulis, 1980). This indicates that non-debt tax shields can substitute tax shields on debt, which is why the relationship between NDTS and leverage should be negative (DeAngelo & Masulis, 1980; as cited in Sheikh & Wang, 2011).

Myers and Majluf (1984) redefined Pecking Order Theory, which was initially proposed by Donaldson (1961) in his book "A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity". The theory is based on notion of information asymmetry between shareholders, managers, and creditors (also referred as debtholders or bondholders), when raising capital. Pecking Order Theory rejects the existence of an optimal debt ratio and argues that firms usually follow a hierarchy of corporate finance in choosing a financing option; that is, preferring internal funding instead of external funding and choosing debt over equity (Donaldson, 1961; Myers & Majluf, 1984). According to the theory, raising equity is not worthy because managers know more about a firm and its prospects, but the outside investors do not (information asymmetry). Those investors may discount the firm's stock price if managers issue more equity

instead of debt. To avoid such unnecessary discounts, managers avoid equity as far as possible, whenever internal financing is insufficient to fund capital expenditures. The assumption is that managers act in the best interest of existing shareholders, and refuse to issue undervalued shares to new investors (as cited in Myers, 2001).

Free Cash Flow Theory (FCFT) introduced by Jensen (1986) discusses that when a firm generates free cash flow, conflicts between shareholders and managers arise over dividend payout policies. The challenge is to motivate managers to distribute free cash flow among the shareholders, instead of using the cash in inefficient organizational activities (M. C. Jensen, 1986). Therefore, debt can be used as a mechanism that monitors the activities of managers and encourages them to run the organization more competently, while lowering the risk of bankruptcy (M. C. Jensen, 1986; as cited in Myers, 2001).

FCFT also states that increase in firm leverage can create a threat of financial distress, however, it maximizes the value of a firm if the firm's operating cash flow substantially surpasses its profitable investment prospects. If debt is completely risk-free, debtholders would have no concern for either income or value of their investment firm. However, disputes between debtholders and shareholders take place when there is a risk of non-payment. Managers act in the best interest of shareholders so that shareholders can achieve economic benefits at the expense of debtholders. Managers take numerous approaches to transfer the value from debtholders to shareholders. For example, the managers can invest in riskier assets and borrow debt to pay out dividends to the shareholders. The managers can also limit the proportion of equity-financed capital investments. Furthermore, the managers may defer immediate bankruptcy or restructuring to hide financial problems from the debtholders. The debtholders, however, would have

predicted the smart move of the managers in the initial stage of investment and would have confined them into debt contracts in accordance with rules and regulations (Myers, 2001).

Baker and Wurgler proposed "market timing theory" of capital structure in 2002. The theory states that the existing capital structure of a firm is the collective outcome of its prior attempts to "time the equity market" (Baker & Wurgler, 2002). According to Baker & Wurgler (2002), share (stock) price fluctuations can significantly affect a firm's capital structure and optimal capital structure does not exist. Moreover, this theory indicates that a firm issues bonds and stocks only when their market value is in a good standing. Whenever their market value is lower, they repurchase their shares from the existing shareholders (as cited in Alipour, Mohammadi, & Derakhshan, 2015).

2.3 International Research on Capital Structure

Harris and Raviv (1991) and Rajan and Zingales (1995) summarized many studies and suggested that tangibility of assets, Non-Debt Tax Shields (NDTS), investment opportunities, firm size, volatility, advertisement expenses, R&D expenses, probability of bankruptcy, profitability, etc. are determinants of capital structure. Studies conducted around the globe reveal that there is no consensus on what determinants of debt ratio or capital structure are. It is possible that determinants of capital structure vary by industry, geography, or both. Those studies have proven that determinants of capital structure either share a negative or positive relationship with financial leverage. Fama and French (2002) found that there exists a positive relationship between leverage and firm size, and between dividend payout and size of the firm. If larger firms have less volatile earnings and net cash flows, it negatively affects payout ratio and leverage, as jointly predicted by Trade-off and Pecking Order Theories (Fama & French, 2002).

Determining an optimal capital structure for a company is a complicated subject that has perplexed many academicians and practitioners for decades (De Wet, 2006). Both debt and equity have been criticized under various assumptions. For example, debt financing is widely misunderstood as a factor increasing a firm's risk of bankruptcy (Smyth & Hsing, 1995). On the other hand, equity financing is broadly criticized for having a dilution effect or reducing price per share (Akkranupornpong & Kleiner, 2004). In practice, depending on the relative complexity of these two financing options, either debt or equity can overshadow the other. This view has been proven by Fluck (1998), who conducted debt versus equity analysis and found that both debt and equity can be used to finance projects with unlimited life, but equity inevitably dominates debt (Dybvig & Wang, 2002). When a firm can borrow debt, it can also raise equity, but not the other way around. Depending on firm characteristics and their projects, firms who cannot borrow debt can still raise equity. When cash flows are steady, firms may borrow debt, issue equity, or use a combination of both. Even if cash flows are inconsistent and funds cannot be raised through debt, outside investors may still provide equity financing (Fluck, 1998). Fluck's argument supports the claim that shareholders can influence business activities but debtholders cannot (Becker et al., 2011). On the other hand, Myers (2001) strongly suggests that shareholders and debtholders have a conflict only when there is a risk of non-payment. Debtholders otherwise do not interfere in a firm's operating activities (Myers, 2001).

A firm's capital structure may change in response to an economic behavior. A research on Gulf Cooperation Council (GCC) countries have concluded that global recession decreased liquidity of firms and affected their capital structure due to increased cost of borrowing and stringent bank policies during the crisis (Sbeiti, 2010). This view has been supported by a study

on the impact of financial crisis on capital structure decisions of firms in Sub-Saharan countries (Danso & Adomako, 2010).

It is evident that every theory or individual study has proposed a unique set of concepts and relationships to explain determinants of capital structure. Each work was conducted within a unique empirical situation. Hence, generalizations cannot be made.

2.4 Research Based on Canadian Data

Davis (1987) presented a study to test the relationship between corporate tax rate and firm leverage. The analysis was performed at individual firm level using panel data. The study was inconclusive and could not find statistically significant relationship between corporate tax rate and firm leverage. The author concluded that although Canadian economy as a whole shows stability in the corporate tax and firm leverage over time, only few individual firms were found stable (Davis, 1987).

Aivazian et al. (2003) studied the impact of firm leverage on the investment decisions of Canadian publicly traded companies. The study found that leverage is negatively related to firm investment and the negative relationship was significantly stronger for firms with lower growth opportunities compared to those with higher growth opportunities (Aivazian, Ge, & Qiu, 2003).

Mittoo and Zhang (2008) examined the capital structure of Canadian multinational corporations (MNCs) to understand the influence of country-specific factors on firm leverage. They found that Canadian MNCs have higher long-term debt ratio compared to the domestic corporations (DCs), which was opposite of their findings based on the U.S. evidence. They stated that higher leverage was associated with MNCs' expansions into the U.S. market because expansion into non-U.S. markets demonstrated insignificant impact on their leverage. Their

findings support the idea that the key benefits for Canadian MNCs do not come from the diversification of cash flows as discussed in the traditional theories of capital structure. Instead, Canadian MNCs seem to benefit from close economic linkage with the U.S. market that provides them an easier access to the world's largest capital and product markets. They concluded that Canadian firms with access to international bond market have higher firm leverage than firms without such access (Mittoo & Zhang, 2008).

Mittoo and Zhang (2010) further studied the impact of bond market access on firm leverage for Canadian firms. They classified the firms into two categories: high credit quality (HQ) and low credit quality (LQ). The impact on leverage was more evident for LQ firms. Their results were confirmed when they controlled individual firm's credit quality, assessed the change in firm leverage around rating initiation, and accounted for effect of firm size. The study suggested that Canada-U.S. bond market integration improves the financial flexibility and leverage for Canadian LQ firms (Mittoo & Zhang, 2010).

Nunkoo & Boetang (2010) studied the empirical determinants of target capital structure based on panel data from 1996 to 2004. Their results demonstrated that profitability and asset tangibility significantly affect Canadian non-financial firms' leverage with positive correlations, whereas growth opportunities and firm size significantly but negatively influence the leverage of Canadian firms. The study also projected that Canadian firms have long-term target leverage ratios, but their speed of adjustment to the target leverage ratios is slower compared to other countries (Nunkoo & Boateng, 2010).

Gill and Mathur (2011) proposed that financial leverage of Canadian firms is driven by collateralized assets, profitability, effective tax rate, firm size, growth opportunities, number of subsidiaries, and industry in which the firms operate (Gill & Mathur, 2011).

Rakhmayil and Yuce (2012) examined the long-term effect of North American Free Trade Agreement (NAFTA) on company performances across Canada, Mexico, and the U.S. The study focused on the impact of trade liberalization process on profitability, operating efficiency, capital investment, output (real sales), number of employees, firm leverage, and firm valuation. The authors discovered that output, profitability, and operating efficiency increased in all three countries after trade liberalization, and other effects varied by country. Lastly, the study suggested that NAFTA affected companies in all three countries positively, and the increment in profitability and operating efficiency of firms increased their firm value (Rakhmayil & Yuce, 2012).

Hossain and Nguyen (2016) stated that leverage has a negative impact on financial performance of firms. According to them, the resilient financial system in Canada and stability in crude oil prices lowered the performance gap during the crisis period (2007-2009). It is possible that the plummeting crude oil prices increased the gap in the post-crisis period (Hossain & Nguyen, 2016a). In another study, they found a strong evidence to prove that the performance gap between firms with high and low leverage was insignificant in context of Canada, during the financial crisis of 2007-2009 (Hossain & Nguyen, 2016b).

2.5 Trade-off Theory and Pecking Order Theory of Capital Structure

Matemilola, Bany-Ariffin &McGowan Jr. (2012) stated that Trade-off Theory and Pecking Order Theory are two rival theories that explain how finance managers make capital

structure decisions (Matemilola, Bany-Ariffin, & McGowan Jr., 2012). This study has reviewed both theories, along with prior studies on capital structure, and formulated explanatory variables to find the firm-specific determinants of capital structure across Canadian non-financial firms.

2.5.1 Trade-off Theory:

Minimizing cost of capital and maximizing firm value is justifiable under optimal capital structure perspective proposed by Modigliani and Miller (1958). In the capital cost arguments, shareholders are expected to demand least return when a firm's debt level is low, since the firm will be considered less risky. However, the cost of debt is substantially lower than the cost of equity due to the availability of tax shields. Therefore, firms are likely to use more debt than equity (Modigliani & Miller, 1963). When a firm begins to add more debt to its capital structure, its WACC falls because it will be using more of a cheaper financing option. However, at a certain point, the WACC will begin to rise as both creditors and shareholders will start to believe that the firm is at a higher risk of bankruptcy and they are entitled to receive compensation for the increased level of risk in their investments (Ross et al., 2016). Hence, a firm's capital structure with an optimal debt-equity ratio maximizes its market value (Stretcher & Johnson, 2011).

Modigliani and Miller (1963), Kraus and Litzenberger (1973), and Miller (1977) added tax-effects into the original framework proposed by Modigliani and Miller in 1958. It can be explained by Figure 1 (please see below). The figure is a diagrammatic representation of optimal capital structure when debt is associated with tax shields. It demonstrates the trade-off between debt-related tax shields and the cost of financial distress related to debt (Chen & Strange, 2005).

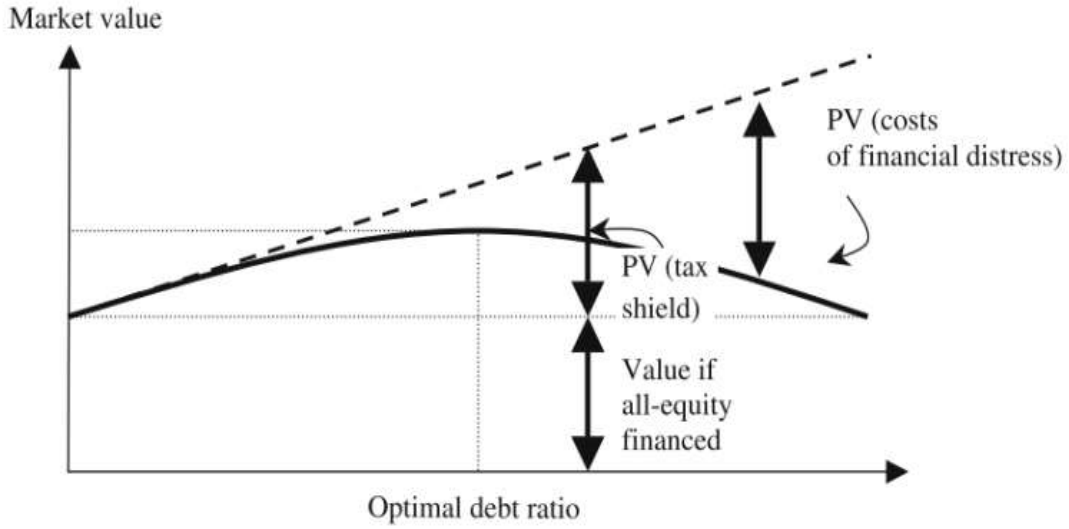


Figure 1: The Optimal Capital Structure when Debt is associated with Tax-Shield and Financial Distress Costs

The Trade-off Theory states that a firm borrows debt up until the tax-benefit from an additional dollar in debt is equivalent to the cost of financial distress as a result of the debt (Ross et al., 2016). Tax shields on debt can also be traded for the agency cost of debt, according to Jensen and Meckling (1976), who introduced Agency Theory.

2.5.2 Pecking Order Theory:

One of the most influential theories of corporate leverage is "Pecking Order Theory". Myers and Majluf (1984) elaborated and reintroduced the theory, which was originally developed by Donaldson in 1961. The theory states that asymmetric information affects capital structure of firms. It argues that if managers know more about their firm's value than outside parties, "the market penalizes the issuance of shares whose expected payoffs are significantly related to a firm's value per share" (Bharath, Pasquariello, & Wu, 2009, p. 3212). This means

that when a company issues more equity than debt, outside investors start to believe that price per share should be discounted.

Pecking Order Theory assumes that firms prefer to use internal cash instead of external funds (Myers, 2001). According to the theory, fund flow deficit at time (DEFt) can be interpreted as follows (Shyam-Sunder & Myers, 1999):

$$DEFt = DIVt + Xt + \Delta Wt + Rt - Ct$$

Where,

DIVt = dividend payments,

Xt = capital expenditures,

ΔWt = net increase in working capital,

Rt = current portion of long-term debt at start of period,

Ct = operating cash flows, after interest and taxes,

Pecking Order Theory also assumes that when the internal cash is inadequate for real investment and dividend commitments, firms choose debt over equity because of the lower issuance cost associated with debt. Equity is rarely issued and considered to be the last resort (Frank & Goyal, 2003).

2.6 Theoretical Propositions of Trade-off Theory and Pecking Order Theory

Debt ratio is the dependent variable in this research, which represents capital structure. The explanatory variables used in this research are: Age, Liquidity, Tangibility (Asset Tangibility), Size, Growth Opportunities, Profitability, and NDTS. Please refer to Table 1 for the

theoretical propositions of Trade-off Theory and Pecking Order Theory in relation to the explanatory variables (their relationship with debt ratio) explained in the following sections:

Variables	Definition	Theoretical Proposition	
		Trade-off Theory	Pecking Order Theory
Debt Ratio	Ratio of total debt to total assets	-	-
Age	Age of a company in each fiscal year	Positive	Negative
Liquidity	Ratio of current assets to current liabilities	Positive	Negative
Asset Tangibility	Ratio of net fixed assets to total assets	Positive	Positive
Size	Logarithm of total assets	Positive	Negative
Growth Opportunities	Percentage change in total assets	Negative	Positive
Profitability	Ratio of operating income to total assets	Positive	Negative
Non-Debt Tax Shields	Ratio of depreciation to total assets	-	-

Table 1: Theoretical propositions of Trade-off Theory and Pecking Order Theory

2.6.1 Age:

Trade-off Theory states that there is a positive relationship between a firm's age and its ability to obtain debt, which means that older firms are considered trustworthy to qualify for debt. In contrast, Pecking Order Theory assumes a negative relationship between age and debt, meaning that older firms have better ability to hold accrued income and use it instead of debt (as cited in Mukherjee & Mahakud, 2012).

2.6.2 Liquidity:

Trade-off Theory proposes that companies with higher liquidity ratios borrow more because they have short-term repayment obligations and they need to increase repaying capacity to meet the commitments. Therefore, Trade-off Theory predicts a positive relationship between

liquidity and leverage. Alternatively, Pecking Order Theory predicts a negative relationship between liquidity and leverage because a firm with higher liquidity ratio prefers internal financing over external financing, since liquid assets can be easily transformed into cash without altering its value (as cited in Sheikh & Wang, 2011).

2.6.3 Asset Tangibility:

Trade-off Theory suggests a positive relationship between asset tangibility and debt because firms' tangible assets can be used as collaterals in obtaining debt, to cover for bankruptcy. Therefore, firms with higher amount of tangible assets have a greater chance of being approved for debt. Agency Theory suggests that shareholders of highly leveraged firms have incentives to invest in their firms at sub-optimal level (there are projects that cannot be collateralized) and takeover companies' wealth from debtholders. However, debtholders would have understood the smart behavior of managers beforehand, and would have forced to keep tangible assets as collaterals against the debt (M. Jensen & Meckling, 1976; Myers, 1977; Myers, 2001; Titman & Wessels, 1988). In addition, Pecking Order Theory also proposes a positive relationship between asset tangibility and debt. There are costs associated with issuing shares, about which managers of firms have more information than outsiders. Therefore, firms find it more advantageous to borrow debt than issuing shares (Myers & Majluf, 1984). Asset tangibility increases the possibility of putting collaterals, which can also avoid information asymmetry cost because the values of tangible assets are known in advance (Michaelas, Chittenden, & Poutziouris, 1999). Since both theories suggest positive relationship between asset tangibility and debt, it will not provide a direction to conclude whether it is Trade-off Theory or Pecking Order Theory that applies to Canadian non-financial firms.

2.6.4 Size:

According to Trade-off Theory, larger firms have a higher chance of being approved for debt because of their better credit rating. Larger firms can access credit markets with ease and they have better negotiating power while borrowing, unlike smaller firms (Wiwattanakantang, 1999). In other words, diversified businesses imply less likelihood of bankruptcy because of their market reputation. However, Pecking Order Theory asserts that firm size and debt have a negative relationship. As per the theory, larger firms borrow less because they are more stable, less volatile in terms of cash flow, and able to take advantage of economies of scale. They can use internal funding for their operating activities (Titman & Wessels, 1988; Rajan & Zingales, 1995; Gaud, Jani, Hoesli, & Bender, 2005).

2.6.5 Growth Opportunities:

Trade-off Theory proposes a negative relationship between growth opportunities and debt. This is because growth opportunities are like intangible assets that cannot be collateralized to obtain debt (as cited in Sheikh & Wang, 2011). Conversely, Pecking Order Theory suggests a positive relationship between growth opportunities and debt. Internal funds decrease when firms expand, and then the firms choose debt over equity as a financing option. The preference of debt over equity to finance growth opportunities is because of information asymmetry cost associated with issuing shares (Viviani, 2008).

2.6.6 Profitability:

Trade-off Theory assumes a positive relationship between profitability and debt because profitable firms are more likely to be approved for debt due to market reputation. Profitable firms

borrow debt, primarily to take advantage of tax shields. On contrary, Pecking Order Theory conjectures a negative relationship between profitability and debt, meaning that profitable firms have higher retained earnings and they prefer internal financing over external financing (as cited in Sheikh & Wang, 2011).

Several empirical studies (Toy, Stonehill, Remmers, Wright, & Beekhuisen, 1974; Titman & Wessels, 1988; Rajan & Zingales, 1995; Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001; Viviani, 2008, etc.) have reported a negative relationship between profitability and debt.

2.6.7 Non-Debt Tax Shields (NDTS):

Non-Debt Tax Shields (NDTS) is a concept proposed by DeAngelo and Masulis (1980), which is an alternative and less risky means of reducing income taxes (Cloyd, Limberg, & Robinson, 1997). Trade-off Theory and Pecking Order Theory do not have propositions related to NDTS because these theories were introduced before the concept of NDTS. However, the relationship between NDTS and debt has been explained by empirical works. Viviani (2008) found a significant negative relationship between NDTS and debt ratio of a firm. On contrary, Bradley et al. (1984) found a strong positive relationship between NDTS and leverage. On the other hand, Titman and Wessels (1988) found no correlation between NDTS and leverage (debt ratio) of a firm.

CHAPTER 3: METHODOLOGY

3.1 Research Objective

The purpose of this study is to determine the significance of firm-specific variables, such as size, age, profitability, asset tangibility, liquidity, growth opportunities, and NDTS in determining capital structure (debt ratio) of Canadian non-financial firms. The study also examines whether there have been differences in Canadian non-financial firms' borrowing pattern before the global financial crisis (1999 to 2006), during the crisis (started in late 2007 and lasted until mid-2009), and after the crisis (2010 to 2016). Finally, the study attempts to see whether it is Trade-off Theory or Pecking Order Theory that is more applicable in the context of Canadian non-financial firms.

The research objective can be translated into three research questions:

1. What variables are statistically significant to Canadian non-financial firms' financial leverage?
2. Are there any differences in factors affecting capital structure decisions of Canadian non-financial firms before, during, and after the global financial crisis of 2007 - 2009?
3. Which theory of capital structure, i.e. Trade-off or Pecking Order is more applicable in the context of Canadian non-financial firms?

3.2 Research Approach

This research focuses on debt ratio (proportion of total debt in firms' total assets) that Canadian non-financial firms use to maximize enterprise value, which is consistent with the idea of economic stability and control suggested by the functionalist paradigm. Functionalists'

approach to social science originated from the tradition of positivism (Bowring, 2000). Positivism states that "scientific theories can be assessed objectively by reference to empirical evidence" (Ardalan, 2003, p. 201).

Discovering a set of concepts and relationships from pre-existing theoretical models to explain the behavior of some phenomena of interest is logic of deductive strategy. "Deductive strategy can also be perceived as processing the premise information at the ratio level of exactness" (Verweij, Sijtsma, & Koops, 1999, p. 243). Since this study reviews prior works and theories, it is a deductive research that aligns with functionalist paradigm.

3.3 Data Collection

The sample consists of 208 firms listed on Toronto Stock Exchange (TSX) for the period of 1999 to 2016. The research period has been chosen to study the corporate borrowing pattern in Canadian non-financial firms; before, during, and after the financial crisis of 2007-2009. The Complete Financial Statements and Ratios of sample firms were retrieved from Compustat-Capital IQ (accessible via Wharton Research Data Services or WRDS) for fiscal year 1999 to 2016[1]. Companies that were delisted from TSX between 1999 and 2016 are excluded from the analysis, to ensure consistency. Moreover, companies with missing financial statements in one or more fiscal years from 1999 to 2016 and the companies with missing variables in their reporting are also excluded from this study. It has been verified that all the companies were listed under TSX during the period of observation, by mapping the company names against TSX Listed

[1] Conditional statements used to filter the companies: Foreign Incorporation Code = CAN (Data in native currency i.e. Canadian Dollars) and Stock Exchange Code = 7 (TSX)

Issuers - Market Intelligent Group (MIG) archives (https://www.tsx.com/listings/current-market-statistics/mig-archives). Please refer to Appendix A for the full list of sample firms.

The sample excluded financial firms, banks, and insurance companies because their capital structure and characteristics are different from other businesses. Additionally, real estate firms are also excluded from the study because of market unpredictability.

The industry classifications (based on TSX archives) of 208 firms used in this research are presented in Table 2.

Industry	No. of Companies	Percentage Coverage (%)
Clean Technology	11	5.29
Communication & Media	13	6.25
Diversified Industries	80	38.46
Forest Products & Paper	7	3.37
Life Sciences	17	8.17
Mining	35	16.83
Oil & Gas	19	9.13
Technology	16	7.69
Utilities & Pipelines	10	4.81

Table 2: Industry classifications of the companies in sample data

3.4 Firm-Specific Factors Affecting Capital Structure (Debt Ratio)

The existing literature has different explanations for capital structure. According to M&M theory, capital structure is the market value of debt over market value of equity. Since market value is difficult to measure, many researchers, such as Myers (1977), and Rajan and Zingales (1995) explained capital structure by the ratio of total liabilities to total assets. Gaud et

al. (2005) implemented the ratio of total liabilities over total equity as a representation of capital structure or leverage (Gaud et al., 2005). In this study, Debt Ratio (total debt divided by total assets) is used as a representation of capital structure. This is consistent with many empirical works done in capital structure, including the research by Sheikh and Wang (2011). In this study, total debt is calculated by subtracting deferred taxes from total liabilities for each firm and each year included in the sample set.

The firm-specific variables affecting Debt Ratio (DR) were selected through the review of available literature and theories in the area of capital structure. The variables affecting financial leverage (DR) of firms, as suggested by two contradictory theories (Trade-off and Pecking Order) and empirical studies in capital structure, are: Age (AGE), Liquidity (LIQ), Asset Tangibility (TANG), Size (SIZE), Growth Opportunities (GROW), Profitability (PROF), and Non-Debt Tax Shields (NDTS). The definitions of explanatory variables used in this research have also been guided by the capital structure literature. They are explained below:

3.4.1 Age (AGE):

Age (AGE) of a company in each fiscal year has been calculated by subtracting its date of incorporation from each fiscal year. For a company incorporated in 1995, its age in fiscal year 1999 would be 4 years (i.e. 1999 -1995 = 4). Incorporation dates of companies were obtained from Mergent Online (https://www.mergentonline.com).

3.4.2 Liquidity (LIQ):

Based on available theories and literatures in capital structure, liquidity (LIQ) is one of the important factors that determine capital structure of firms. Prior works and available theories have different views on the relationship between liquidity and debt (capital structure).

There are two types of liquidity ratios: current ratio and quick ratio (also known as acid-test ratio). Unlike current ratio, quick ratio does not include inventories from balance sheet. In this study, current ratio i.e., ratio of current assets to current liabilities is used as a measure of liquidity (LIQ).

3.4.3 Asset Tangibility (TANG):

Asset tangibility in this research refers to fixed assets of a firm that can be collateralized. Fixed assets cannot be easily converted into cash. In balance sheets, fixed assets are referred as "Property, Plant, and Equipment" or PPE. For this research, asset tangibility is measured as a ratio of net fixed assets (PPE after deducting depreciation) to total assets, as suggested by Sheikh and Wang (2011).

3.4.4 Size (SIZE):

Firm size (SIZE) is one of the most common determinants of capital structure. Firm size influences a firm's capability to obtain debt (Sayılgan, Karabacak, & Küçükkocaolu, 2006).

The capital structure literature most commonly uses two variables to represent the company size: logarithm of sales and logarithm of total assets. In this research, logarithm of total assets is used as a representation of company size because total assets fluctuate less compared to total sales.

3.4.5 Growth Opportunities (GROW):

Growth Opportunities (GROW) has been measured by different authors in different ways. For example, Rajan and Zingales (1995), Gaud et al. (2005) and Sbeiti (2010) have applied the market-to-book ratio as a representation of growth opportunities. Some other scholars have measured growth opportunities by taking percentage change in book value of total assets (Hsiao,

2003; Buferna, Bangassa, & Hodgkinson, 2005). Titman and Wessels (1988) also measured growth opportunities as a percentage change in total assets. In this study as well, percentage change in total assets is used as a measure of growth opportunities.

For the calculation of percentage change in total assets of sample firms in 1999, the data for 1998 was obtained from S&P Capital-IQ.

3.4.6 Profitability (PROF):

Profitability (PROF) is one of the key factors driving capital structure decisions. Scholars like Titman and Wessels (1988), Harris and Raviv (1991), and Rajan and Zingales (1995) have stated a significant negative relationship between profitability and debt ratio. This study defines profitability as a ratio of operating income (after depreciation) to total assets.

3.4.7 Non-Debt Tax Shields (NDTS):

There are some of expenses that can generate tax shields. Depreciation is a type of expense that can be considered tax deductible. Following López-Gracia, and José Sogorb-Mira, Francisco (2008), the ratio of depreciation to total assets has been used as a measure of NDTS (López-Gracia & Sogorb-Mira, 2008), in this study.

Based on majority of variables' relationships with debt ratio, it will be determined whether the theoretical propositions of Trade-off Theory or Pecking Order Theory apply in the context of Canadian non-financial firms. Please refer to second chapter for theoretical propositions of Trade-off Theory and Pecking Order Theory.

3.5 Panel Data Analysis

Panel data analysis has been used to examine the effect of firm-specific factors in determining capital structure of Canadian non-financial firms. Panel data analysis is preferred when the data has both cross-section dimension and time-series dimension. It is also known as longitudinal data and is formed when same samples are observed over two or more periods of time. Baltagi (2005) states that panel data analysis is "the pooling of observations on a cross-section of households, countries, firms, etc. over multiple time periods" (Baltagi, 2005, p. 1). According to Baltagi, time-series data alone are at high risk of creating multicollinearity but adding cross-section dimension to it generates "more variability, less collinearity, more degrees of freedom, and more efficiency in yielding reliable outcomes" (2005, p. 5). Baltagi further adds that panel data controls for individual heterogeneity, and therefore does not run the risk of obtaining bias results (2005, p. 4).

There are two types of panel data: balanced panel data and unbalanced panel data. Balanced panel data analyses two or more cross-sections with an equal number of time periods, whereas unbalanced panel data analyses two or more cross-sections with unequal number of time periods (Baltagi, 2005).

This research uses balanced panel data because all of 208 companies were observed from 1999 to 2016. The analysis was performed using a prominent statistical analytical tool i.e. SAS (version 9.4). The study analyses the significance of firm-specific factors in determining capital structure of Canadian non-financial firms from fiscal year 1999 to 2016 (overall period analysis), along with the analysis before the financial crisis period (1999 to 2006), during the financial crisis period (2007 to 2009), and after the crisis period (2010 to 2016).

3.5.1 One-Way Error Component Regression:

This study uses a one-way error component regression for the disturbances. The description of the two models; fixed effects and random effects (for one-way error component) are given below in equation (1) and (2), respectively:

$$DR_{jt} = \beta_{0j}+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\mu_{jt} \quad (1)$$

$$DR_{jt} = \beta_0+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\varepsilon_{jt}+\mu_{jt} \quad (2)$$

In the above equations:

- DR_{jt} is the measure of leverage (Debt Ratio) of firm j in year t
- β_{0j} is the y-intercept of firm j
- AGE_{jt}, LIQ_{jt}, $TANG_{jt}$, $SIZE_{jt}$, $GROW_{jt}$, $PROF_{jt}$, $NDTS_{jt}$ are the firm-specific factors determining leverage of firm j in year t
- β_1 to β_7 are coefficients of the explanatory variables
- β_0 is a common y-intercept
- ε_{jt} is the remainder stochastic disturbance term for firm j in year t
- μ_{jt} is the unobservable individual-specific effect of firm j in year t

Hausman test has been used to select the model that best explains the relationship between dependent variable and explanatory variables. It is further discussed in the following chapter.

3.5.2 Test Models for Two-Way Error Component Regression:

Following are the test models for two-way fixed effects and two-way random effects, respectively.

$$DR_{jt}=\beta_{0j}+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\mu_{jt}+\lambda_t \quad (3)$$

$$DR_{jt}=\beta_0+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\varepsilon_{jt}+\mu_{jt}+\lambda_t \quad (4)$$

In equations (3) and (4), λ_t denotes the unobservable time effect. Everything else remains the same as in equations (1) and (2).

3.5.3 Test Models for Fixed Effects Dummy Variable Regression:

Following are the fixed effects models with dummy variables. Equation (5) controls for heterogeneity (one-way fixed effects model). Equation (6) does not control for firm-specific effects but accounts for time effects only. It is known as fixed one-time model. Equation (7) is the two-way fixed effects model, which accounts for any time varying effects, while controlling for firm-specific aspects.

$$DR_{jt}=\beta_{0j}+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\mu_{jt}$$
$$+\beta_8 I1_t+\beta_9 I2_t+\beta_{10} I3_t+\beta_{11} I4_t+\beta_{12} I5_t+\beta_{13} I6_t+\beta_{14} I7_t+\beta_{15} I8_t \quad (5)$$

$$DR_{jt}=\beta_{0j}+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\lambda_t+\beta_8 I1_t+\beta_9 I2_t$$
$$+\beta_{10} I3_t+\beta_{11} I4_t+\beta_{12} I5_t+\beta_{13} I6_t+\beta_{14} I7_t+\beta_{15} I8_t \quad (6)$$

$$DR_{jt}=\beta_{0j}+\beta_1 AGE_{jt}+\beta_2 LIQ_{jt}+\beta_3 TANG_{jt}+\beta_4 SIZE_{jt}+\beta_5 GROW_{jt}+\beta_6 PROF_{jt}+\beta_7 NDTS_{jt}+\mu_{jt}+\lambda_t+\beta_8 I1_t$$
$$+\beta_9 I2_t+\beta_{10} I3_t+\beta_{11} I4_t+\beta_{12} I5_t+\beta_{13} I6_t+\beta_{14} I7_t+\beta_{15} I8_t \quad (7)$$

In the above equations:

- $I1_t$ to $I8_t$ represent Industry dummy variables (N-1; where N are number of unique values i.e. Technology, Diversified Industries, Oil & Gas, Life Sciences, Mining, Utilities & Pipelines, Clean Technology, Communication & Media, and Forest Products & Paper) in year t
- β_8 to β_{15} are coefficients of the dummy variables
- λ_t denotes the unobservable time effect
- μ_{jt} is the unobservable individual-specific effect of firm j in year t

CHAPTER 4: ANALYSIS OF RESULTS

This chapter summarizes the panel data estimation results. One-way fixed effects model was performed on the balanced panel data of 208 Canadian non-financial firms using SAS 9.4, followed by one-way random effects model using the same statistical tool. One-way error component regression models (one-way fixed effects model and one-way random effects model) were chosen because both models account for any firm-specific but time-invariant effects. Though, fixed effects model assumes the parameters to be fixed and random effects model assumes the parameters to be random. The unobservable firm-specific effects in year 't' is captured by $\mu_{jt.}$ "The remainder disturbance ε_{jt} varies with firms and time, which is a usual disturbance in the regression" (Baltagi, 2005, p. 11).

In order to decide between one-way fixed effects and one-way random effects for further analysis, Hausman test was conducted. The test helps select more efficient model against less efficient model. This study considers the significance level (alpha) of 5%. The null hypothesis of Hausman test states that random effects model is a more efficient model. If the p-value of Hausman test is less than 0.05 (5%), null hypothesis is rejected, and fixed effects model is considered a better fit.

Another test to examine whether fixed effects model is a better fit is known as "F test". The null hypothesis of the F test states that fixed effects of all observations are zero. If the p-value is less than 0.05 (5%), null hypothesis is rejected, and it is determined that fixed effects of the observations are not zero. This is when fixed effects model is considered a better fit. The outcomes of Hausman test and F test are presented in Table 3.

Data Set	Years	Probability (p-value)	
		F Test for No Fixed Effects	Hausman Test for Random Effects
Entire Period	1999 - 2016	<.0001	<.0001
Before financial crisis	1999 - 2006	<.0001	<.0001
Financial crisis	2007 - 2009	<.0001	0.0329
After financial crisis	2010 - 2016	<.0001	0.0002

Table 3: Probability tests for one-way fixed effects model and one-way random effects model

The results of both tests suggest that fixed effects model is a better fit, since the probability of causing Type I error is not greater than 0.05 in all cases. Since Hausman test and F test have supported fixed effects model, further analysis in this research is based on one-way fixed effects model only.

One-way fixed effects analysis was performed in four different sets: overall period (1999 - 2016), before crisis period (1999 - 2006), crisis period (2007 - 2009), and after crisis period (2010 - 2016).

First set of analysis examined the factors affecting capital structure decision of Canadian non-financial firms from 1999 to 2016. The R-squared is 0.3523, which means about 35% of data was captured (please refer to Figure 2, Appendix B). According to the results, Canadian non-financial firms with higher Liquidity (LIQ) ratio, higher Profitability (PROF) ratio, and larger Size (SIZE) borrowed lower debt during the period. They were possibly using their internal funds to finance their operations. Also, companies with higher Growth Opportunities (GROW) did not borrow additional debt to accommodate changes in their operations. Moreover, higher Asset Tangibility (TANG) of a firm did not lead to use of more debt (DR), which is inconsistent with capital structure theories. Furthermore, older (AGE) companies were able to borrow more debt to finance their operations. This could be because of market reputation and the

history of maintaining stability over the years. Non-Debt Tax Shields (NDTS) did not appear to have any effect on Canadian non-financial firms' decision to borrow debt to finance their operating activities from 1999 to 2016. Please refer to Table 4 for parameter estimates.

Parameter Estimates 1999- 2016			
Variable	**Estimate**[2]	**Standard Error**	**Pr > |t|**[3]
Intercept	0.542812	0.073800	<.0001
AGE	0.008876	0.001180	<.0001
LIQ	-0.012320	0.001210	<.0001
TANG	-0.303130	0.045100	<.0001
SIZE	-0.202740	0.016700	<.0001
GROW	-0.000080	0.000021	<.0001
PROF	-0.014860	0.004280	0.0005
NDTS	-0.116710	0.182000	0.5214

Table 4: Parameter estimates of one-way fixed effects model from 1999 to 2016

Second set of analysis examined the factors affecting capital structure decision of Canadian non-financial firms before the financial crisis (1999 - 2006). The R-squared is 0.4098, which means about 41% of data was captured (please refer to Figure 3, Appendix B). According to the results, higher Liquidity (LIQ) of a firm led to lower Debt Ratio (DR) during the period. It happens when firms prefer to use internal cash over external funds. Large sized companies (SIZE) also borrowed less, potentially because they had accumulated retained earnings and cash flow, which could substitute for debt. Moreover, companies with higher Growth Opportunities (GROW) could not borrow more debt. As firms grow, they are responsible to build trust to attract investors and they may not prefer higher debt that would show on their balance sheets.

[2] In SAS results, Coefficient Value is referred as "Estimate".

[3] In SAS, Pr > |t| is the p-value in the two-tailed probability of t distribution.

Furthermore, companies with higher net fixed assets or Asset Tangibility (TANG) had lesser DR, which is inconsistent with capital structure theories. Age (AGE), Profitability (PROF), and Non-Debt Tax Shields (NDTS) did not show any impact on Canadian non-financial firms' decision to borrow debt to finance their operating activities before the crisis period. Please refer to Table 5 for parameter estimates.

Parameter Estimates 1999 - 2006			
Variable	**Estimate**	**Standard Error**	**Pr > |t|**
Intercept	0.804993	0.142800	<.0001
AGE	0.003348	0.004480	0.4548
LIQ	-0.008520	0.002010	<.0001
TANG	-0.504450	0.096500	<.0001
SIZE	-0.279890	0.038600	<.0001
GROW	-0.000140	0.000028	<.0001
PROF	-0.005140	0.005500	0.3505
NDTS	-0.335410	0.315900	0.2885

Table 5: Parameter estimates of one-way fixed effects model from 1999 to 2006

Third set of analysis examined factors affecting debt borrowing decision of Canadian non-financial firms during the financial crisis period (2007 - 2009). The R-squared is 0.8933, which means about 89% of data was captured (please refer to Figure 4, Appendix B). According to the results, firms with higher Liquidity (LIQ) ratio and that are larger in Size (SIZE) preferred using internal financing over external financing during the crisis period. This is not unusual to happen during financial crisis because that is when bank policies are stringent and access to credit market is not easy. It is unlikely that those firms issued equity instead of debt during the period because firm shares devalue during crisis periods and no firm would issue undervalued shares. On the other hand, Age (AGE), Growth Opportunities (GROW), and Non-Debt Tax Shields (NDTS) showed positive relationship with leverage or Debt Ratio (DR). This means older firms were being better approved for debt during the financial crisis period. In addition,

firms seeking growth opportunities were borrowing more debt, possibly because their internal funds were decreasing due to expansion. NDTS showing positive relationship with DR is not consistent with the arguments by DeAngelo and Masulis (1980), who stated that NDTS should motivate corporate managers to borrow less debt in expectation of tax advantages. Moreover, Asset Tangibility (TANG) and Profitability (PROF) did not show any impact on Canadian non-financial firms' decision to borrow debt to finance their operating activities during the crisis period. Please refer to Table 6 for parameter estimates.

Parameter Estimates 2007 - 2009			
Variable	**Estimate**	**Standard Error**	**Pr > |t|**
Intercept	0.310360	0.141200	0.0285
AGE	0.015170	0.005110	0.0032
LIQ	-0.012910	0.002350	<.0001
TANG	-0.044830	0.089500	0.6169
SIZE	-0.208000	0.053900	0.0001
GROW	0.000280	0.000105	0.008
PROF	0.037093	0.030000	0.2164
NDTS	0.708282	0.356100	0.0474

Table 6: Parameter estimates of one-way fixed effects model from 2007 to 2009

Final set of analysis examined the factors affecting debt borrowing decision of Canadian non-financial firms after the financial crisis period (2010 - 2016). The R-squared is 0.6274, which means about 63% of data was captured (please refer to Figure 5, Appendix B). According to the results, firms with higher Liquidity (LIQ) ratio, larger Size (SIZE), and higher Profitability (PROF) ratio preferred using internal cash or accumulated earnings instead of debt during the period. Non-Debt Tax Shields (NDTS) showed positive relationship with leverage or DR, which is inconsistent with the arguments by DeAngelo and Masulis (1980), who stated that NDTS should substitute tax shields on debt and therefore would have negative relationship with firm

leverage. Age (AGE), Asset Tangibility (TANG), and Growth Opportunities (GROW) did not show any impact on Canadian non-financial firms' decision to borrow debt after the crisis period. Please refer to Table 7 for parameter estimates.

Parameter Estimates 2010 - 2016			
Variable	**Estimate**	**Standard Error**	**Pr > |t|**
Intercept	0.614458	0.113700	<.0001
AGE	0.000747	0.002770	0.7874
LIQ	-0.015950	0.002100	<.0001
TANG	-0.061110	0.069900	0.3820
SIZE	-0.166880	0.036700	<.0001
GROW	-0.000030	0.000060	0.6413
PROF	-0.126040	0.014300	<.0001
NDTS	0.868647	0.314500	0.0058

Table 7: Parameter estimates of one-way fixed effects model from 2010 to 2016

In this study, size (SIZE) turned out to be one of the dominant determinants of capital structure from 1999 to 2016, and the period before crisis (1999-2006). The coefficient value is -0.202740 for the overall period (1999 - 2016) and -0.279890 for before crisis period (1999 - 2006). The results show that the relationship between size (SIZE) and Debt Ratio (DR) has consistently been significant and negative. This is consistent with Pecking Order Theory, and consistent with the studies conducted by Titman and Wessels (1988), Harris and Raviv (1991), and Rajan and Zingales (1995).

Asset Tangibility (TANG) represented a leading determinant of capital structure of Canadian non-financial firms from 1999 to 2016 and the period before crisis (1999 - 2006), with coefficient values of -0.303130 and -0.504450, respectively.

NDTS represented another dominant factor affecting the capital structure decision of firms, during and after the financial crisis, with coefficient values of 0.708282 and 0.868647,

respectively. The results show a strong positive relationship between NDTS and DR during the periods. However, this is inconsistent with the study performed by renowned scholars Titman and Wessels (1988), and the arguments by DeAngelo and Masulis (1980).

Liquidity (LIQ) showed negative relationship with firm leverage (or DR) in overall period, before crisis period, during crisis period, and after crisis period. However, it did not appear as a leading or most dominant factor affecting capital structure decision of Canadian non-financial firms in all periods of analysis. The coefficient values ranged between -0.01 and -0.02 in all four sets of assessments.

To test the robustness of the results, the 208 companies were first sorted alphabetically according to their names and then distributed among 5 groups: Group 1, Group 2, Group 3, Group 4, and Group 5 (please refer to Appendix C). Then, companies that belonged to Group 2 (randomly selected) were omitted for analysis. One-way fixed effects model was employed to carry out analysis for the remaining 166 companies. Table 8 compares the results between the two analyses.

The results in Table 8 demonstrate that the relationship between the firm-specific variables and debt ratio did not change after dropping "Group 2" from the analysis. The differences in the coefficient values are insignificant. This shows that the results obtained are not driven by certain sample set or statistical artefacts.

Fixed One-Way Parameter Estimates 1999 - 2016								
No. of Companies	**208**			**166**			**Difference**	**Difference (%)**
R-squared	0.3523			0.3443				
F-test	<.0001			<.0001				
Variable	**Estimate**	**Standard Error**	**Pr > |t|**	**Estimate**	**Standard Error**	**Pr > |t|**		
Intercept	0.542812	0.073800	<.0001	0.561688	0.080300	<.0001	0.01888	3.48
AGE	0.008876	0.001180	<.0001	0.009596	0.001410	<.0001	0.00072	8.11
LIQ	-0.012320	0.001210	<.0001	-0.012140	0.001410	<.0001	0.00018	-1.46
TANG	-0.303130	0.045100	<.0001	-0.307520	0.053700	<.0001	-0.00439	1.45
SIZE	-0.202740	0.016700	<.0001	-0.221320	0.019500	<.0001	-0.01858	9.16
GROW	-0.000080	0.000021	<.0001	-0.000090	0.000024	0.0001	-0.00001	12.50
PROF	-0.014860	0.004280	0.0005	-0.013040	0.004690	0.0055	0.00182	-12.25
NDTS	-0.116710	0.182000	0.5214	-0.096610	0.215900	0.6545	0.02010	-17.22

Table 8: Robustness Analysis

If two-way error component models (two-way fixed effects and two-way random effects) were chosen for the analysis, the models would have accounted for any individual-invariant but time-specific effects that is not included in the regression (Baltagi, 2005), as reflected in equations (3) and (4). Two-way error component models are appropriate when economic variables, such as GDP, Interest Rate, Inflation etc., are included as explanatory variables.

Based on the test models for two-way error component regression (equation (3) and (4)), a major difference in results of one-way fixed effects model and two-way fixed effects model is that age (AGE) would be dropped in two-way fixed effects model because of multicollinearity. Please refer to Table 9 and Table 10.

Parameter Estimates 1999 - 2016				
Variable	**Fixed One-Way**		**Fixed Two-Way**	
	Estimate	**Pr > |t|**	**Estimate**	**Pr > |t|**
Intercept	0.542812	<.0001	0.787697	<.0001
AGE	0.008876	<.0001	0.000000	.
LIQ	-0.012320	<.0001	-0.012340	<.0001
TANG	-0.303130	<.0001	-0.311250	<.0001
SIZE	-0.202740	<.0001	-0.201170	<.0001
GROW	-0.000080	<.0001	-0.000090	<.0001
PROF	-0.014860	0.0005	-0.013780	0.0013
NDTS	-0.116710	0.5214	-0.081110	0.6563

Table 9: Difference in parameter estimates of fixed effects models (one-way and two-way) for 1999-2016

Parameter Estimates 2007 - 2009				
Variable	**Fixed One-Way**		**Fixed Two-Way**	
	Estimate	**Pr > |t|**	**Estimate**	**Pr > |t|**
Intercept	0.310360	0.0285	0.682214	<.0001
AGE	0.015170	0.0032	0.000000	.
LIQ	-0.012910	<.0001	-0.012480	<.0001
TANG	-0.044830	0.6169	-0.051920	0.5553
SIZE	-0.208000	0.0001	-0.232500	<.0001
GROW	0.000280	0.0080	0.000304	0.0035
PROF	0.037093	0.2164	0.048514	0.1015
NDTS	0.708282	0.0474	0.694899	0.0476

Table 10: Difference in parameter estimates of fixed effects models (one-way and two-way) for 2007-2009

Some additions were made to the data to accommodate industry dummy variables. Each industry dummy variable represented one category of the industry and was coded with 1 if the case fell in that industry, and with 0 otherwise. The Fixed Effects (FE) least squares or Least Squares Dummy Variables (LSDV) suffers from a large loss of degrees of freedom. While estimating $(N-1)$ extra parameters, too many dummy variables may aggravate the problem of multicollinearity among the regression components. In addition, “the FE estimator cannot

estimate the effect of any time-invariant variable like industry, gender, race, religion etc. These time-invariant variables are wiped out by within-estimator while calculating the deviations from means" (Baltagi, 2005, p. 13). Baltagi (2005) also states that time-invariant variables (industries in the case of this research) are spanned by the individual dummy variables, and therefore the fixed time regression model will fail, owing to perfect multicollinearity.

To validate, industry dummy variables were added to fixed effects models. The results of one-way fixed effects model (equation (5)) did not show any significance with industry dummy variables. However, when firm-specific effects were not controlled i.e. use of fixed one-time model (equation (6)), the industry effects were observed. Technology, Oil & Gas, and Clean Technology (renewable energy) showed significance with firm leverage. The results of two-way fixed effects model (equation (7)) also did not show any significance with industry dummy variables because it also accounts for heterogeneity, like one-way fixed effects model. Please refer to Table 11.

Parameter Estimates 1999 - 2016						
Variable	**Fixed One-Way**		**Fixed One-Time**		**Fixed Two-Way**	
	Estimate	**Pr > |t|**	**Estimate**	**Pr > |t|**	**Estimate**	**Pr > |t|**
Intercept	0.542812	<.0001	0.583871	<.0001	0.787697	.
AGE	0.008876	<.0001	0.001158	<.0001	0.000000	<.0001
LIQ	-0.012320	<.0001	-0.018800	<.0001	-0.012340	<.0001
TANG	-0.303130	<.0001	-0.299500	<.0001	-0.311250	<.0001
SIZE	-0.202740	<.0001	-0.008480	0.2336	-0.201170	<.0001
GROW	-0.000080	<.0001	-0.000040	0.0586	-0.000090	0.0013
PROF	-0.014860	0.0005	-0.020750	<.0001	-0.013780	0.6566
NDTS	-0.116710	0.5214	0.035779	0.8135	-0.081110	1.0000
Technology	0.000000	.	-0.121530	<.0001	31.054600	.
Diversified Industries	0.000000	.	0.000000	.	0.000000	1.0000
Oil & Gas	0.000000	.	0.109815	<.0001	-143.683000	1.0000
Life Sciences	0.000000	.	0.012282	0.6051	-29.596600	1.0000
Mining	0.000000	.	-0.027550	0.1301	-39.741200	1.0000
Utilities & Pipelines	0.000000	.	0.182314	<.0001	-34.118400	1.0000
Clean Technology	0.000000	.	0.074815	0.0029	-32.539100	.
Communication & Media	0.000000	.	0.038235	0.1093	0.000000	1.0000
Forest Products & Paper	0.000000	.	0.032035	0.2918	173.028000	1.0000

Table 11: Difference in parameter estimates of fixed effects models (one-way, one-time, and two-way) with Industry Dummy Variables for 1999 to 2016

In addition, when equations (5), (6), and (7) were applied to the crisis period, the results of one-way fixed effects model (equation (5)) did not show any significance with industry. The results of two-way fixed effects model (equation (7)) also demonstrated that industry effects were insignificant. However, the results of fixed one-time (equation (6)) showed that Mining, Utilities & Pipelines, and Technology were the industries having significant effect on firm leverage during the crisis period. This is different from the analysis of overall period as presented in Table 11. It means that the overall period did not only account for the crisis period, but also

considered any time-specific effects that may have affected the industry, before and after the crisis period. Please refer to Table 12.

Parameter Estimates 2007 - 2009						
Variable	**Fixed One-Way**		**Fixed One-Time**		**Fixed Two-Way**	
	Estimate	**Pr > |t|**	**Estimate**	**Pr > |t|**	**Estimate**	**Pr > |t|**
Intercept	0.310360	0.0285	0.427789	<.0001	0.682214	<.0001
AGE	0.015170	0.0032	0.000571	0.1536	0.000000	.
LIQ	-0.012910	<.0001	-0.013460	<.0001	-0.012480	<.0001
TANG	-0.044830	0.6169	-0.236980	<.0001	-0.051920	0.5588
SIZE	-0.208000	0.0001	0.037582	0.0019	-0.232500	<.0001
GROW	0.000280	0.0080	0.000083	0.6201	0.000304	0.0038
PROF	0.037093	0.2164	-0.168320	<.0001	0.048514	0.1045
NDTS	0.708282	0.0474	0.154756	0.5603	0.694899	0.0496
Technology	0.000000	.	-0.096580	0.007	14.203820	1.0000
Diversified Industries	0.000000	.	0.000000	.	0.000000	.
Oil & Gas	0.000000	.	0.010817	0.7683	-49.062600	1.0000
Life Sciences	0.000000	.	0.041240	0.3105	-18.088800	1.0000
Mining	0.000000	.	-0.114200	<.0001	-7.370010	1.0000
Utilities & Pipelines	0.000000	.	0.210648	<.0001	-13.848300	1.0000
Clean Technology	0.000000	.	0.027672	0.4717	-22.799100	1.0000
Communication & Media	0.000000	.	0.025640	0.4819	0.000000	.
Forest Products & Paper	0.000000	.	-0.034640	0.4562	79.402550	1.0000

Table 12: Difference in parameter estimates of fixed effects models (one-way, one-time, and two-way) with Industry Dummy Variables for 2007 to 2009

CHAPTER 5: FINDINGS AND CONCLUSIONS

This research investigates firm-specific determinants of capital structure of 208 Canadian non-financial firms listed on TSX from 1999 to 2016. This study also examines the phenomenon before, during and after the financial crisis. The analysis has been performed using a panel data technique i.e. one-way fixed effects model.

The study uses Debt Ratio (DR) as a dependent variable. Age (AGE), Liquidity (LIQ), Asset Tangibility (TANG), Size (SIZE), Growth Opportunities (GROW), Profitability (PROF), and Non-Debt Tax Shields (NDTS) are the explanatory variables. Based on the overall analysis from 1999 to 2016, Liquidity (LIQ), Size (SIZE), and Profitability (PROF) negatively affected Debt Ratio (DR). These correlations can be translated into a fact that firms preferred internal financing over debt during those years. Firms having higher Growth Opportunities (GROW) borrowed less debt, possibly because they wanted to maintain financial statements with lesser debt to attract new investors. Firms with older Age (AGE) borrowed more debt during the period, whereas Non-Debt Tax Shields (NDTS) did not show any significance with Debt Ratio (DR). Asset Tangibility (TANG) showed negative relationship with DR, which is not consistent with capital structure theories and prior studies.

As the analysis was split into three different periods; before, during and after the crisis, some consistencies and some pattern changes were observed. Liquidity (LIQ) showed negative relationship with Debt Ratio (DR) in all periods. It means that cash convertible assets can substitute for debt at any time. Size (SIZE) of the firm reflected significant negative relationship with DR in all periods. Large sized companies (SIZE) borrowed less debt, probably because of their preference to use internal funds instead of debt. Growth Opportunities (GROW) appeared to

be the most volatile factor affecting borrowing decision of Canadian non-financial firms. The relationship between Growth Opportunities (GROW) and leverage (or DR) appeared to be negative and extremely weak for overall period (1999 - 2016) and before crisis period (1999 - 2006), with coefficient value less than -0.0002 in each period. The relationship was positive but negligible during the crisis period (2007 - 2009), with the coefficient value less than 0.0003. The variable (GROW) did not show any significance with DR after the crisis period (2010 - 2016).

During the crisis period, older (AGE) firms were obtaining debt more easily, and this is likely because of their stability and market reputation. Moreover, firms seeking Growth Opportunities (GROW) were borrowing more debt during the period, probably because their internal funds were becoming insufficient for expansion. NDTS showed positive relationship with DR, which is inconsistent with the arguments by DeAngelo and Masulis (1980). Furthermore, Asset Tangibility (TANG), and Profitability (PROF) did not show any impact on Canadian non-financial firms' decision to use leverage for financing their operating activities during the crisis period.

Firms with higher Liquidity (LIQ) ratio and that are larger in Size (SIZE) preferred using internal financing over external financing during the crisis period. This happens during financial crisis because bank policies are tighter during such times. It is extremely unlikely for firms to issue equity instead of debt during recession time because share prices devalue during recession and no firm would issue shares at discounted price.

Although, the results for different set of analysis performed (overall, before crisis, during crisis, and after crisis) are not similar, it can be concluded that age, liquidity, asset tangibility, size, growth opportunities, and profitability are significant determinants of capital structure in

Canadian non-financial firms. Even though NDTS showed significance in some periods of the analysis, its relationship being positive with debt ratio is not consistent with arguments by DeAngelo and Masulis (1980). Therefore, NDTS could not be considered as one of the determinants of capital structure in the context of Canadian non-financial firms.

The analyses performed for all four sets suggest that Pecking Order Theory is more applicable in the context of Canadian non-financial firms. However, Trade-off Theory cannot be ignored completely because some hypotheses of Trade-off Theory also seemed applicable. This is consistent with the findings of Fama and French (2002), who stated that both theories have abilities to explain some aspects of capital structure decisions. Therefore, one theory cannot be ignored in support of another theory (Fama & French, 2002).

This research contributes to the existing literature on capital structure in Canada, by analyzing the data into three different periods: before crisis, during crisis, and after crisis. This study may be helpful for finance managers, financial advisors, investors, and academicians who are interested to gather knowledge about how determinants of capital structure varied across Canadian non-financial firms in response to the global economic situation. There are certain limitations to the study, which are discussed in chapter 6.

CHAPTER 6: LIMITATIONS AND SCOPE OF FUTURE RESEARCH

Capital structure decisions depend on a complex mixture of theoretical frameworks and practical considerations. At managerial level, it is unrealistic to base decisions purely on a specific theory or propositions. Theories and literature provide a knowledge of capital structure; however, the decision is often driven by practical limitations (Stretcher & Johnson, 2011). This is a limitation of any capital structure research, and it applies to this study as well. Moreover, the potential impacts of managerial traits and personal preferences on capital structure (Hackbarth, 2008), and the impacts of CEO qualifications on capital structure choices (Rakhmayil & Yuce, 2008) are beyond the scope of this research.

Financial firms are excluded from this study because the structures of their financial statements differ significantly from that of non-financial firms. Nevertheless, the methodologies used in this research can be replicated by shifting the focus on Canadian financial firms. Future research can also examine difference in capital structure determinants across Canadian non-financial firms by industry.

APPENDICES

Appendix A: List of Companies from Research Data

S. No.	Company Name	Date of Incorporation
1	Absolute Software Corporation	1993
2	ADF Group Inc.	1956
3	Advantage Oil & Gas Ltd.	1979
4	Aecon Group Inc.	1957
5	AEterna Zentaris Inc.	1990
6	AgJunction Inc.	1990
7	Agnico Eagle Mines Limited	1972
8	Agrium Inc.	1992
9	AirBoss of America Corp.	1989
10	Akita Drilling Ltd.	1992
11	Alamos Gold Inc.	1994
12	Algoma Central Corporation	1899
13	Almaden Minerals Ltd.	1980
14	AltaGas Ltd.	1994
15	Aptose Biosciences Inc.	1986
16	Aralez Pharmaceuticals Inc.	1996
17	ARC Resources Ltd.	1996
18	Atco Ltd.	1962
19	Aurinia Pharmaceuticals Inc.	1993
20	Badger Daylighting Ltd.	1992
21	Ballard Power Systems Inc.	1983
22	Barrick Gold Corporation	1984
23	Baytex Energy Corp.	1993
24	BCE Inc.	1970
25	BELLUS Health Inc.	1993
26	Big Rock Brewery Inc.	1985
27	Bird Construction Inc.	1930
28	BlackBerry Limited	1984
29	BMTC Group Inc.	1989
30	Bombardier Inc.	1902
31	Bonavista Energy Corporation	1987
32	Bonterra Energy Corp.	1981
33	Boralex Inc.	1982
34	Boyd Group Services Inc.	1997

S. No.	Company Name	Date of Incorporation
35	Brampton Brick Limited	1950
36	Brick Brewing Co. Limited	1984
37	Buhler Industries Inc.	1994
38	Caldwell Partners International Inc. (The)	1979
39	Calfrac Well Services Ltd.	1960
40	Calian Group Ltd.	1982
41	Cameco Corporation	1987
42	Canadian National Railway Company	1919
43	Canadian Natural Resources Limited	1973
44	Canadian Pacific Railway Limited	1881
45	Canadian Tire Corporation Limited	1927
46	Canam Group Inc.	1997
47	Canfor Corporation	1966
48	Cardiome Pharma Corp.	1986
49	Cascades Inc.	1964
50	Cathedral Energy Services Ltd.	1987
51	CCL Industries Inc.	1951
52	Celestica Inc.	1996
53	CGI Group Inc.	1981
54	Cogeco Communications Inc.	1957
55	Cogeco Inc.-SUB VTG	1957
56	Computer Modelling Group Ltd.	1996
57	Corby Spirit and Wine Limited	1924
58	Corus Entertainment Inc.	1998
59	Cott Corporation	1955
60	Descartes Systems Group Inc. (The)	1981
61	Dominion Diamond Corporation	1980
62	Dorel Industries Inc.	1962
63	Dundee Precious Metals Inc.	1983
64	Electrovaya Inc.	1996
65	Emera Incorporated	1919
66	Enbridge Inc.	1970
67	Encana Corporation	1947
68	Enghouse Systems Limited	1984
69	Ensign Energy Services Inc.	1987
70	Exco Technologies Limited	1986

S. No.	Company Name	Date of Incorporation
71	EXFO Inc.	1985
72	Fennec Pharmaceuticals Inc.	1998
73	Finning International Inc.	1933
74	Firan Technology Group Corporation	1983
75	First Quantum Minerals Ltd.	1983
76	Fortis Inc.	1977
77	Gabriel Resources Ltd.	1986
78	Weston (George) Limited	1928
79	Gildan Activewear Inc.	1984
80	Goldcorp Inc.	1994
81	Golden Queen Mining Co. Ltd.	1985
82	Golden Star Resources Ltd.	1992
83	Goodfellow Inc.	1972
84	Hammond Manufacturing Company Limited	1917
85	Helix BioPharma Corp.	1993
86	High Liner Foods Incorporated	1953
87	Husky Energy Inc.	1979
88	Hydrogenics Corporation	1995
89	IAMGold Corporation	1990
90	Imperial Metals Corporation	1981
91	Imperial Oil Limited	1880
92	Inter Pipeline Ltd.	1997
93	Interfor Corporation	1963
94	Intertape Polymer Group Inc.	1989
95	Intrinsyc Technologies Corporation	1992
96	Jean Coutu Group (PJC) Inc. (The)	1969
97	Kinross Gold Corporation	1993
98	Lassonde Industries Inc.	1981
99	Leon's Furniture Limited	1969
100	Linamar Corporation	1966
101	Loblaw Companies Limited	1956
102	Logistec Corporation	1952
103	MacDonald, Dettwiler and Associates Ltd.	1969
104	Magellan Aerospace Corporation	1996
105	Magna International Inc.	1961
106	Maple Leaf Foods Inc.	1927

S. No.	Company Name	Date of Incorporation
107	Marsulex Inc/Chemtrade Logistics Inc[4]	1989
108	Martinrea International Inc.	1987
109	McEwen Mining Inc.	1979
110	MDC Partners Inc.	1980
111	Methanex Corporation	1968
112	Metro Inc.	1982
113	Microbix Biosystems Inc.	1990
114	Mountain Province Diamonds Inc.	1997
115	Mullen Group Ltd.	1993
116	Nevsun Resources Ltd.	1965
117	Newalta Corporation	1993
118	Newfoundland Capital Corporation Limited	1949
119	NGEx Resources Inc.	1983
120	Norbord Inc.	1987
121	Norsat International Inc.	1982
122	North American Palladium Ltd.	1968
123	North West Company Inc.	1997
124	Northland Power Inc.	1997
125	Novagold Resources Inc.	1984
126	Novelion Therapeutics Inc.	1981
127	Nuvo Pharmaceuticals Inc.	1983
128	NXT Energy Solutions Inc.	1994
129	Obsidian Energy Ltd.	1979
130	Oncolytics Biotech Inc.	1998
131	Open Text Corporation	1991
132	Orvana Minerals Corp.	1987
133	Pacific Insight Electronics Corp.	1979
134	Pan American Silver Corp.	1979
135	Paramount Resources Ltd.	1978
136	Parkland Fuel Corporation	1977
137	Pason Systems Inc.	1996
138	Pembina Pipeline Corporation	1997
139	Pengrowth Energy Corporation	1988

[4] Backfill filling was performed by Compustat - Capital IQ for Chemtrade Logistic Inc. Marsulex Inc launched Chemtrade's IPO in 2001; prior statements of Marsulex were used as backfilling for Chemtrade Logistic Inc.

S. No.	Company Name	Date of Incorporation
140	Peyto Exploration & Development Corp.	1997
141	Potash Corporation of Saskatchewan Inc.	1975
142	Precision Drilling Corporation	1969
143	Premium Brands Holdings Corporation	1917
144	ProMetic Life Sciences Inc.	1994
145	Pulse Seismic Inc.	1985
146	Quebecor Inc.	1965
147	Reitmans (Canada) Limited	1947
148	Richelieu Hardware Ltd.	1968
149	Richmont Mines Inc.	1981
150	Ritchie Bros. Auctioneers Incorporated	1958
151	RMP Energy Inc.	1987
152	Rogers Communications Inc.	1920
153	Rogers Sugar Inc.	1997
154	Russel Metals Inc.	1929
155	Saputo Inc.	1992
156	Shaw Communications Inc.	1966
157	ShawCor Ltd.	1968
158	Sherritt International Corporation	1995
159	Silver Standard Resources Inc.	1946
160	SNC-Lavalin Group Inc.	1967
161	Spectral Medical Inc.	1991
162	Stantec Inc.	1954
163	Strongco Corporation	1995
164	Stuart Olson Inc.	1981
165	Suncor Energy Inc.	1979
166	SunOpta Inc.	1973
167	Tanzanian Royalty Exploration Corporation	1990
168	Taseko Mines Limited	1966
169	Teck Resources Limited	1963
170	Telesta Therapeutics Inc.	1979
171	TELUS Corporation	1998
172	Tembec Inc.	1973
173	Tesco Corp.	1993
174	Theratechnologies Inc.	1993
175	Thomson Reuters Corporation	1977

S. No.	Company Name	Date of Incorporation
176	Toromont Industries Ltd.	1961
177	Torstar Corporation	1967
178	Total Energy Services Inc.	1996
179	Touchstone Exploration Inc.	1983
180	TransAlta Corporation	1985
181	Transat A.T. Inc.	1987
182	TransCanada Corporation	1951
183	Transcontinental Inc.	1978
184	TransGlobe Energy Corporation	1968
185	Trican Well Service Ltd.	1979
186	Trinidad Drilling Ltd.	1996
187	Turbo Power System Inc.	1987
188	Turquoise Hill Resources Ltd.	1994
189	TVA Group Inc.	1960
190	TWC Enterprises Limited	1997
191	Uni-Select Inc.	1968
192	Uranium One Inc.	1997
193	Valeant Pharmaceuticals International Inc.	1987
194	Valener Inc.	1987
195	Velan Inc.	1952
196	Veresen Inc.	1997
197	Vermilion Energy Inc.	1994
198	Vista Gold Corp.	1983
199	Wajax Corporation	1910
200	Waste Connections, Inc.	1997
201	West Fraser Timber Co. Ltd.	1966
202	Western Forest Products Inc.	1955
203	WestJet Airlines Ltd.	1994
204	Westport Fuel Systems Inc.	1995
205	Winpak Ltd.	1975
206	Yorbeau Resources Inc.	1984
207	Zargon Oil & Gas Ltd.	1987
208	ZCL Composites Inc.	1987

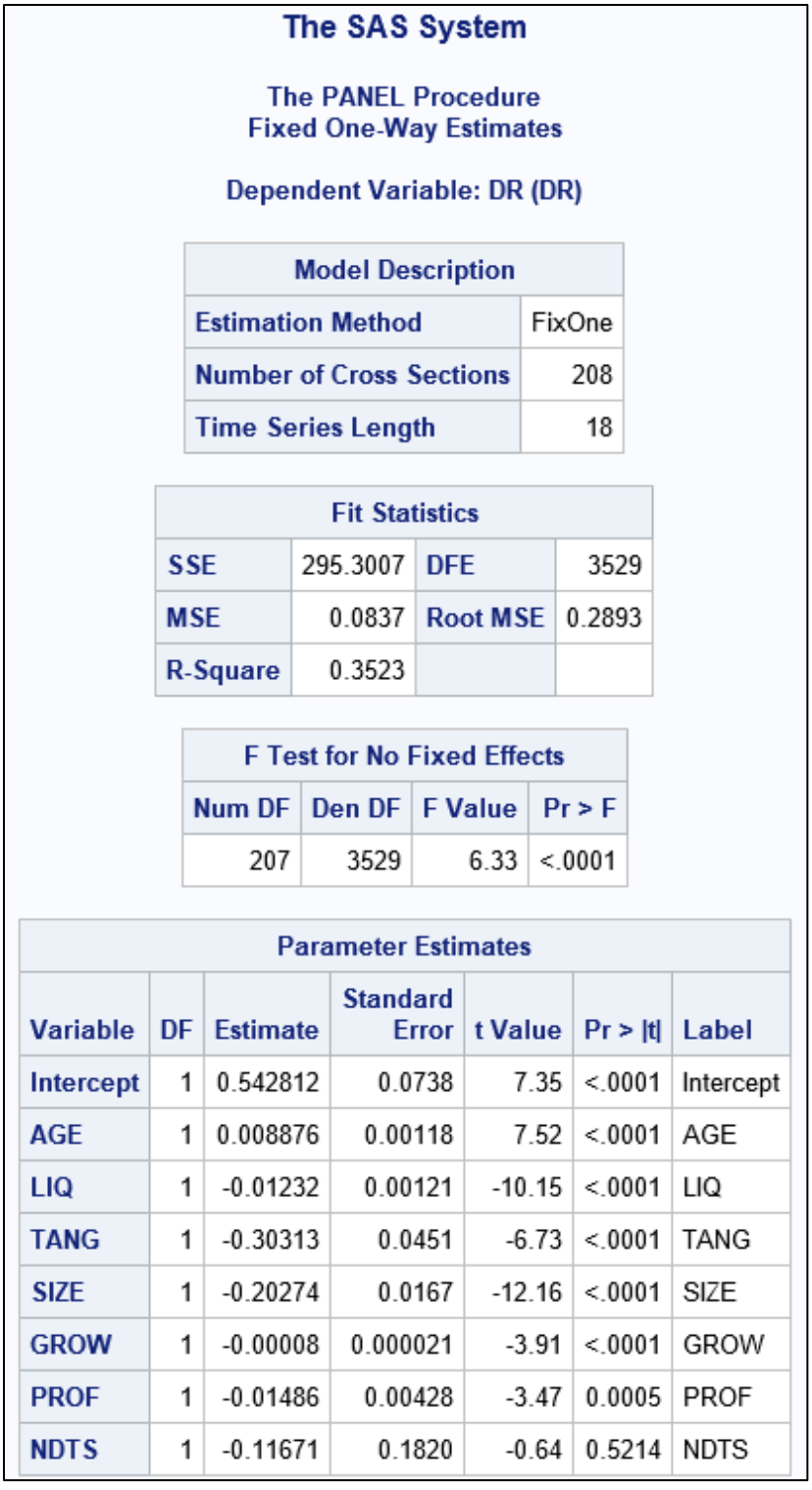
Appendix B: SAS Codes and Results

Panel data analysis was carried out using SAS 9.4 Virtual Application, licensed to Ryerson University. Below are the SAS statements that were used to perform various fixed effects models and random effects models analyses, followed by SAS results.

```
/*Read data from file*/
PROC IMPORT OUT= WORK.ALL
    /*path of file to be uploaded */
    DATAFILE= "\\Client\D$\Krisha\SAS\SASUniversityEdition\myfolders\test\SAS_Load_Final.xlsx"
    DBMS=EXCEL REPLACE;
    /*Worksheet of excel file to be loaded to SAS */
    RANGE="For_SAS$";
    GETNAMES=YES;
    MIXED=NO;
    SCANTEXT=YES;
    USEDATE=YES;
    SCANTIME=YES;
RUN;
/*Sort data by company name and fiscal year*/
PROC SORT DATA= WORK.ALL;
     BY COMPANY FY;
RUN;
/*Split data into 3 period-> Before: 1999-2006, During: 2007-2009, After: 2010-2016*/
PROC SORT DATA = WORK.ALL (WHERE=(FY <2007)) OUT= WORK.BEFORE;
BY COMPANY FY;
RUN;
PROC SORT DATA = WORK.ALL (WHERE =(FY >2009)) OUT= WORK.AFTER;
BY COMPANY FY;
RUN;
PROC SORT DATA = WORK.ALL (WHERE =(FY  between 2007 and 2009)) OUT= WORK.DURING;
BY COMPANY FY;
RUN;
/*Panel data analysis with fixed effects models for 1999-2016*/
PROC PANEL DATA= WORK.ALL;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONETIME;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXTWO;
COMPARE / PSTAT(ESTIMATE PROBT T);
RUN;
/*Hausman test for 1999-2016*/
PROC PANEL DATA= WORK.ALL;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANONE VCOMP=NL;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANTWO;
RUN;
/*Panel data analysis with Industry Dummy Variables, fixed effects models, for 1999-2016 */
PROC PANEL DATA= WORK.ALL;
ID COMPANY FY;
CLASS Industry;
```

```
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXONETIME;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXTWO;
COMPARE / PSTAT(ESTIMATE PROBT T );
RUN;
/*Hausman test with Industry Dummy Variables for 1999-2016, */
PROC PANEL DATA= WORK.ALL;
ID COMPANY FY;
CLASS Industry;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / RANONE VCOMP=NL;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / RANTWO;
RUN;
/* Panel data analysis using one-way fixed effects model+ Hausman test for 1999-2006*/
PROC PANEL DATA= WORK.BEFORE;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANONE VCOMP=NL;
RUN;
/* Panel data analysis using fixed effects models for 2007-2009*/
PROC PANEL DATA= WORK.DURING;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS  / FIXONETIME;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXTWO;
COMPARE / PSTAT(ESTIMATE PROBT T );
RUN;
/* Hausman test for 2007-2009*/
PROC PANEL DATA= WORK.DURING;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANONE VCOMP=NL;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANTWO;
RUN;
/* Panel data analysis with Industry Dummy Variables, fixed effects models, for 2007-2009*/
PROC PANEL DATA= WORK.DURING;
ID COMPANY FY;
CLASS Industry;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXONETIME;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry / FIXTWO;
COMPARE / PSTAT(ESTIMATE PROBT T);
RUN;
/* Hausman test with Industry Dummy Variables for 2007-2009*/
PROC PANEL DATA= WORK.DURING;
ID COMPANY FY;
CLASS Industry;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry/ RANONE VCOMP=NL;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS Industry/ RANTWO;
RUN;
/* Panel data analysis using one-way fixed effects model+ Hausman test for 2010-2016*/
PROC PANEL DATA= WORK.AFTER;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANONE VCOMP=NL;
RUN;
/*Panel data analysis for Robustness Check*/
```

```
/*Remove companies in Group 2*/
PROC SORT DATA = WORK.ALL (WHERE=(ROBU<>2)) OUT= WORK.ALL_R2;
BY COMPANY FY;
RUN;
/*Panel data analysis with one-way fixed effects models for 1999-2016 after removing Group 2*/
PROC PANEL DATA= WORK.ALL_R2;
ID COMPANY FY;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / FIXONE;
MODEL DR = AGE LIQ TANG SIZE GROW PROF NDTS / RANONE VCOMP=NL;
COMPARE / PSTAT(ESTIMATE PROBT T);
RUN;
```



The SAS System

The PANEL Procedure
Fixed One-Way Estimates

Dependent Variable: DR (DR)

Model Description	
Estimation Method	FixOne
Number of Cross Sections	208
Time Series Length	18

Fit Statistics			
SSE	295.3007	DFE	3529
MSE	0.0837	Root MSE	0.2893
R-Square	0.3523		

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
207	3529	6.33	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.542812	0.0738	7.35	<.0001	Intercept
AGE	1	0.008876	0.00118	7.52	<.0001	AGE
LIQ	1	-0.01232	0.00121	-10.15	<.0001	LIQ
TANG	1	-0.30313	0.0451	-6.73	<.0001	TANG
SIZE	1	-0.20274	0.0167	-12.16	<.0001	SIZE
GROW	1	-0.00008	0.000021	-3.91	<.0001	GROW
PROF	1	-0.01486	0.00428	-3.47	0.0005	PROF
NDTS	1	-0.11671	0.1820	-0.64	0.5214	NDTS

Figure 2: Results of one-way fixed effects model for 1999 to 2016

The SAS System

The PANEL Procedure
Fixed One-Way Estimates

Dependent Variable: DR (DR)

Model Description	
Estimation Method	FixOne
Number of Cross Sections	208
Time Series Length	8

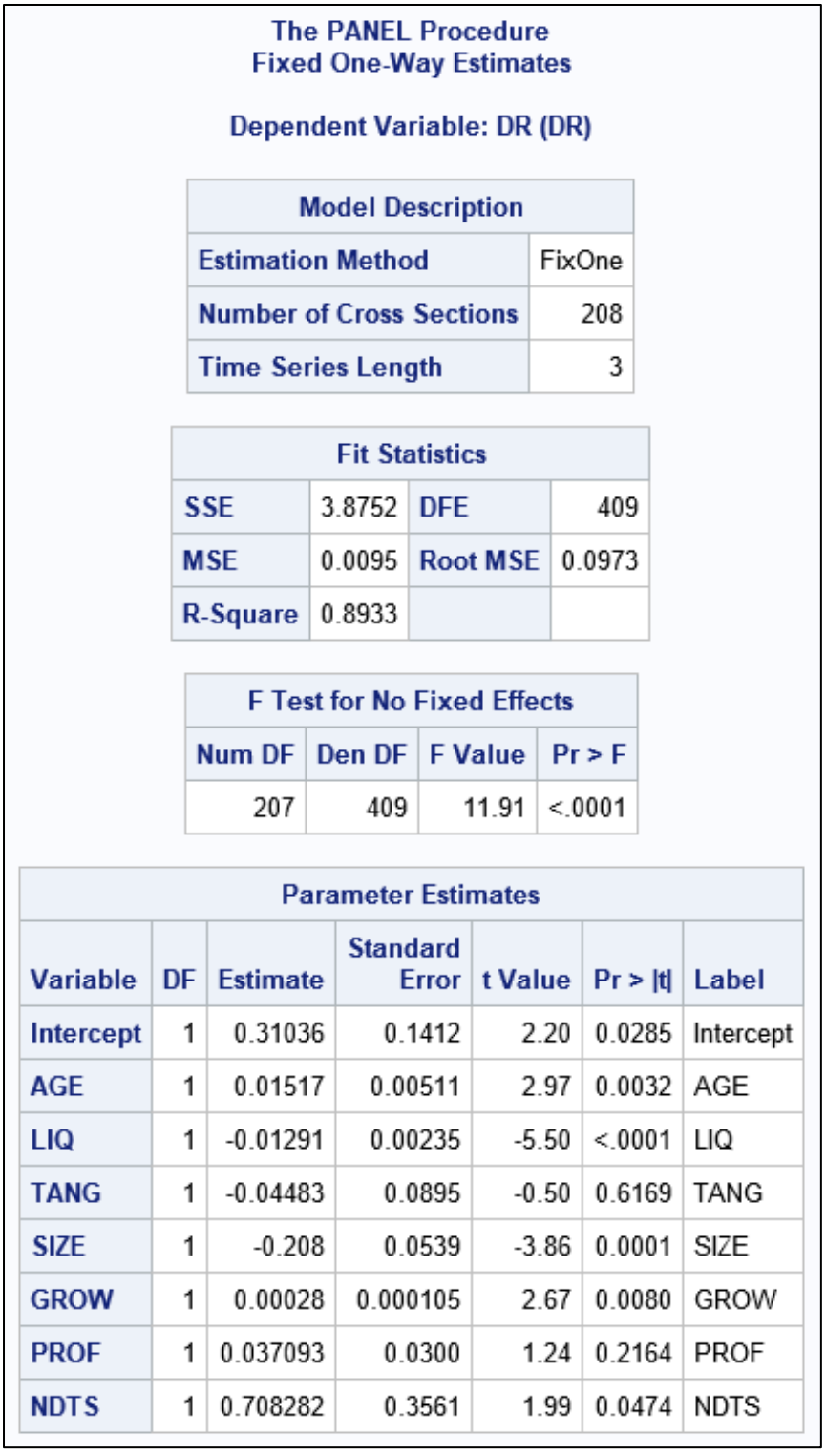
Fit Statistics			
SSE	172.1448	DFE	1449
MSE	0.1188	Root MSE	0.3447
R-Square	0.4098		

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
207	1449	3.86	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.804993	0.1428	5.64	<.0001	Intercept
AGE	1	0.003348	0.00448	0.75	0.4548	AGE
LIQ	1	-0.00852	0.00201	-4.24	<.0001	LIQ
TANG	1	-0.50445	0.0965	-5.23	<.0001	TANG
SIZE	1	-0.27989	0.0386	-7.24	<.0001	SIZE
GROW	1	-0.00014	0.000028	-4.87	<.0001	GROW
PROF	1	-0.00514	0.00550	-0.93	0.3505	PROF
NDTS	1	-0.33541	0.3159	-1.06	0.2885	NDTS

Figure 3: Results of one-way fixed effects model for 1999 to 2006



The PANEL Procedure
Fixed One-Way Estimates

Dependent Variable: DR (DR)

Model Description	
Estimation Method	FixOne
Number of Cross Sections	208
Time Series Length	3

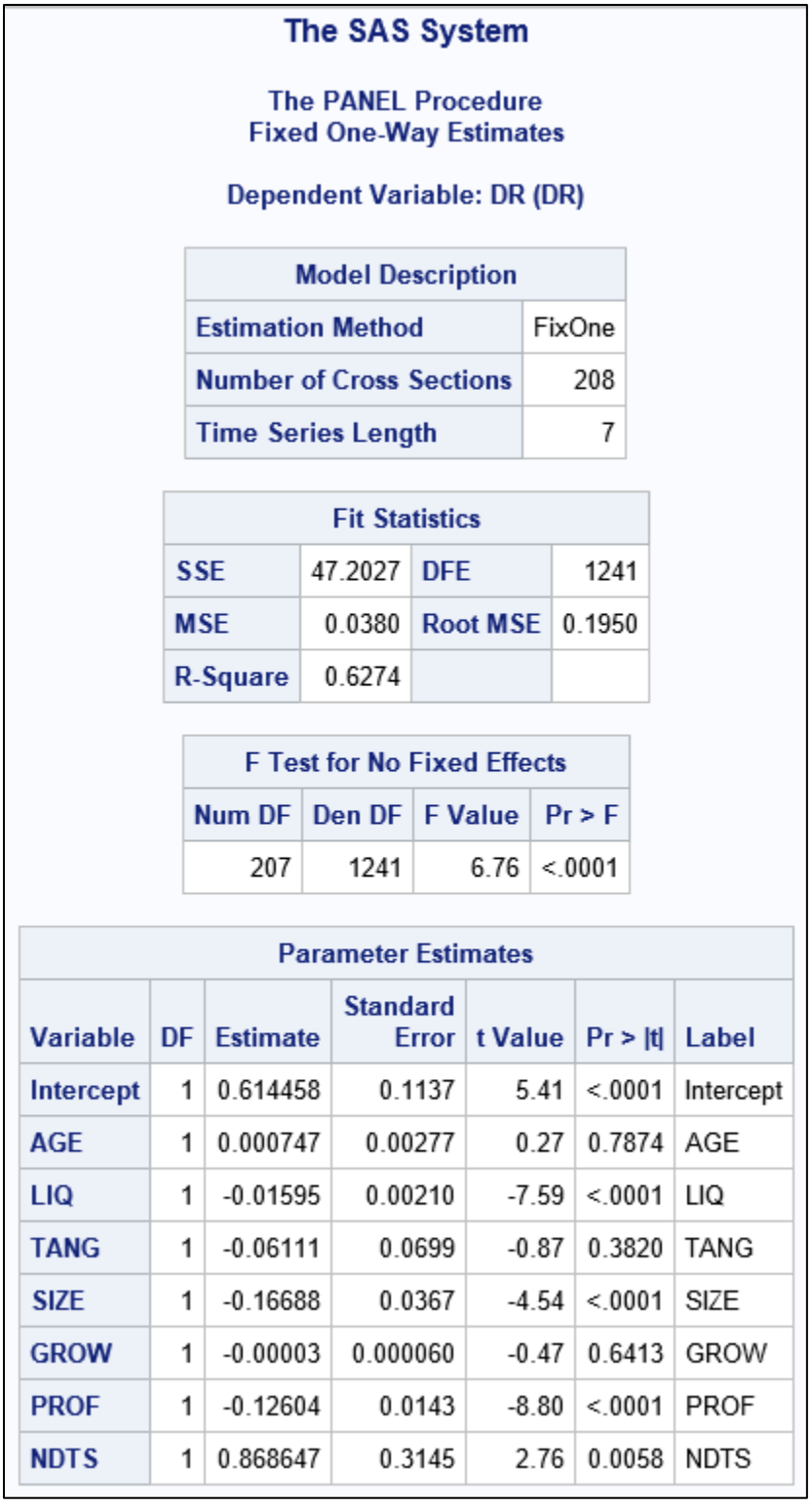
Fit Statistics			
SSE	3.8752	DFE	409
MSE	0.0095	Root MSE	0.0973
R-Square	0.8933		

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
207	409	11.91	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.31036	0.1412	2.20	0.0285	Intercept
AGE	1	0.01517	0.00511	2.97	0.0032	AGE
LIQ	1	-0.01291	0.00235	-5.50	<.0001	LIQ
TANG	1	-0.04483	0.0895	-0.50	0.6169	TANG
SIZE	1	-0.208	0.0539	-3.86	0.0001	SIZE
GROW	1	0.00028	0.000105	2.67	0.0080	GROW
PROF	1	0.037093	0.0300	1.24	0.2164	PROF
NDTS	1	0.708282	0.3561	1.99	0.0474	NDTS

Figure 4: Results of one-way fixed effects model for 2007 to 2009



The SAS System

The PANEL Procedure
Fixed One-Way Estimates

Dependent Variable: DR (DR)

Model Description	
Estimation Method	FixOne
Number of Cross Sections	208
Time Series Length	7

Fit Statistics			
SSE	47.2027	DFE	1241
MSE	0.0380	Root MSE	0.1950
R-Square	0.6274		

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
207	1241	6.76	<.0001

Parameter Estimates						
Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.614458	0.1137	5.41	<.0001	Intercept
AGE	1	0.000747	0.00277	0.27	0.7874	AGE
LIQ	1	-0.01595	0.00210	-7.59	<.0001	LIQ
TANG	1	-0.06111	0.0699	-0.87	0.3820	TANG
SIZE	1	-0.16688	0.0367	-4.54	<.0001	SIZE
GROW	1	-0.00003	0.000060	-0.47	0.6413	GROW
PROF	1	-0.12604	0.0143	-8.80	<.0001	PROF
NDTS	1	0.868647	0.3145	2.76	0.0058	NDTS

Figure 5: Results of one-way fixed effects model for 2010 to 2016

The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	18

Fit Statistics			
SSE	306.3144	DFE	3736
MSE	0.0820	Root MSE	0.2863
R-Square	0.0810		

Variance Component Estimates	
Variance Component for Cross Sections	0.083454
Variance Component for Error	0.078873

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	75.34	<.0001

Figure 6: Hausman test results of one-way random effects model for 1999 to 2016

The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

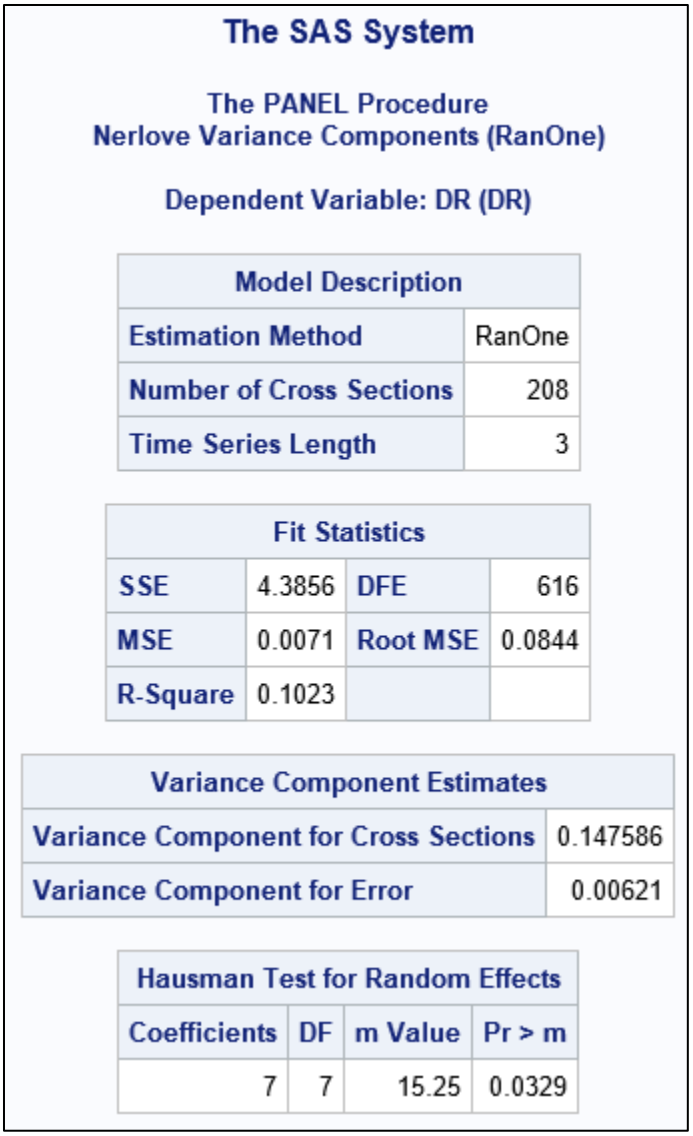
Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	8

Fit Statistics			
SSE	185.2594	DFE	1656
MSE	0.1119	Root MSE	0.3345
R-Square	0.0662		

Variance Component Estimates	
Variance Component for Cross Sections	0.145869
Variance Component for Error	0.103452

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	51.27	<.0001

Figure 7: Hausman test results of one-way random effects model for 1999 to 2006



The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	3

Fit Statistics			
SSE	4.3856	DFE	616
MSE	0.0071	Root MSE	0.0844
R-Square	0.1023		

Variance Component Estimates	
Variance Component for Cross Sections	0.147586
Variance Component for Error	0.00621

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	15.25	0.0329

Figure 8: Hausman test results of one-way random effects model for 2007 to 2009

The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

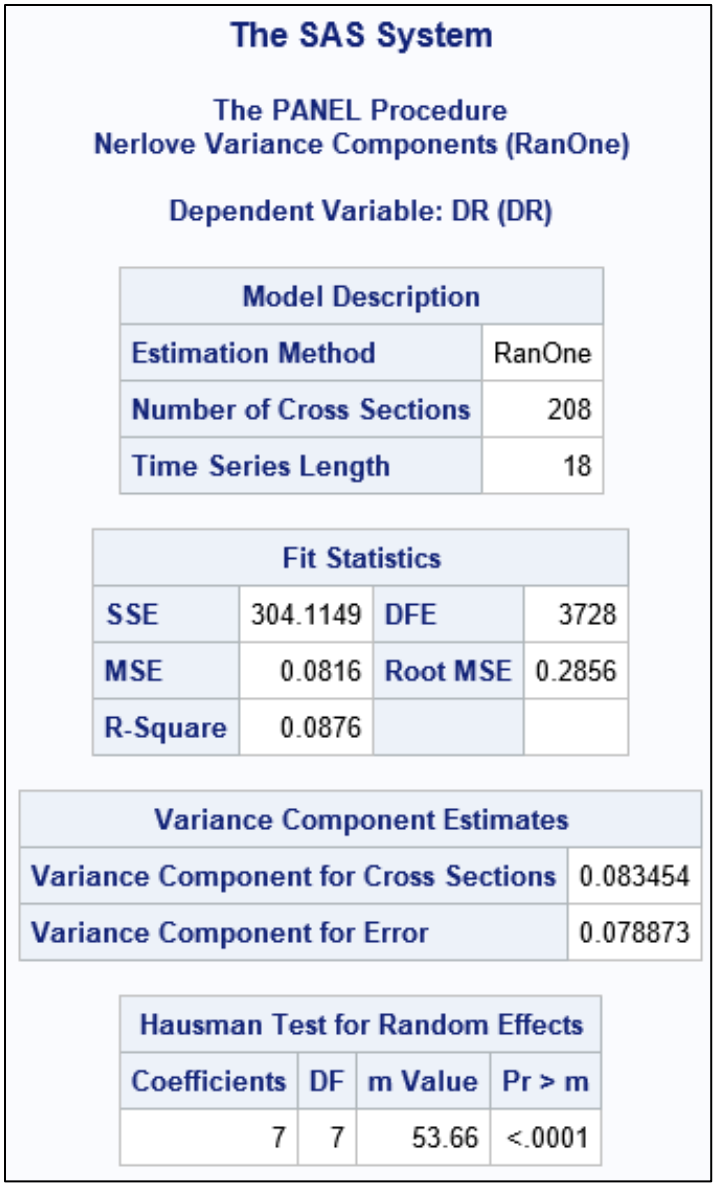
Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	7

Fit Statistics			
SSE	51.6085	DFE	1448
MSE	0.0356	Root MSE	0.1888
R-Square	0.1565		

Variance Component Estimates	
Variance Component for Cross Sections	0.068328
Variance Component for Error	0.032419

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	28.90	0.0002

Figure 9: Hausman test results of one-way random effects model for 2010 to 2016



The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

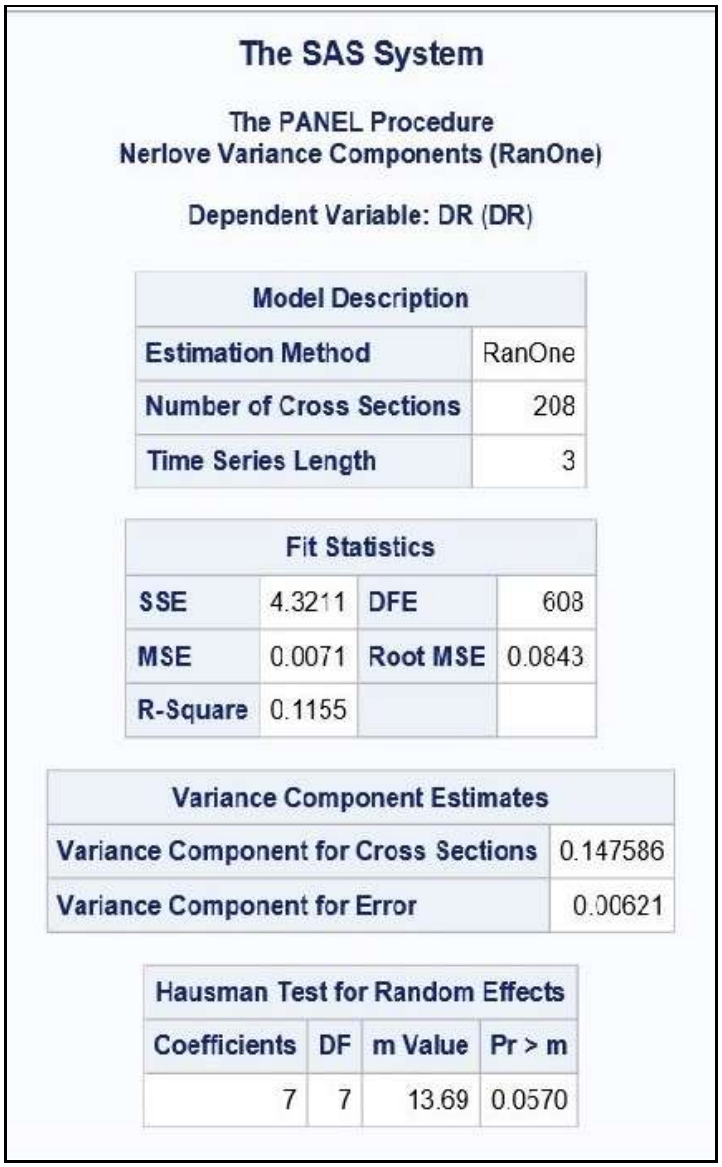
Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	18

Fit Statistics			
SSE	304.1149	DFE	3728
MSE	0.0816	Root MSE	0.2856
R-Square	0.0876		

Variance Component Estimates	
Variance Component for Cross Sections	0.083454
Variance Component for Error	0.078873

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	53.66	<.0001

Figure 10: Hausman test results (with Industry Dummy Variables) of one-way random effects model for 1999 to 2016



The SAS System

The PANEL Procedure
Nerlove Variance Components (RanOne)

Dependent Variable: DR (DR)

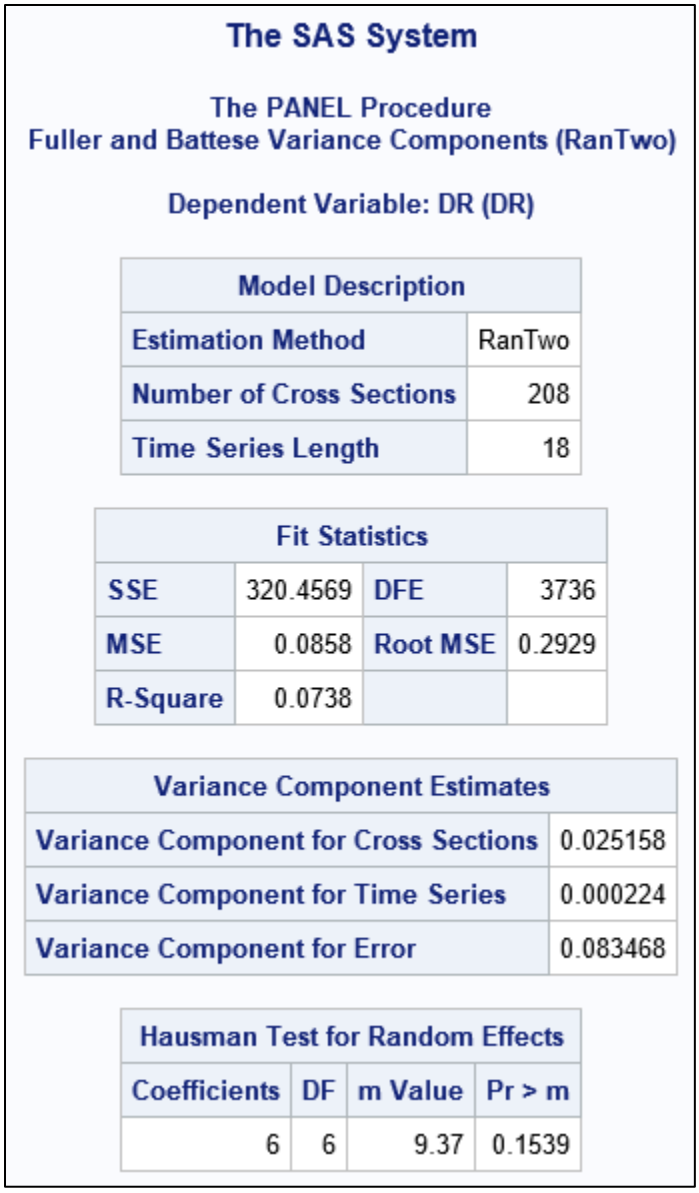
Model Description	
Estimation Method	RanOne
Number of Cross Sections	208
Time Series Length	3

Fit Statistics			
SSE	4.3211	DFE	608
MSE	0.0071	Root MSE	0.0843
R-Square	0.1155		

Variance Component Estimates	
Variance Component for Cross Sections	0.147586
Variance Component for Error	0.00621

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
7	7	13.69	0.0570

Figure 11: Hausman test results (with Industry Dummy Variables) of one-way random effects model for 2007 to 2009



The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: DR (DR)

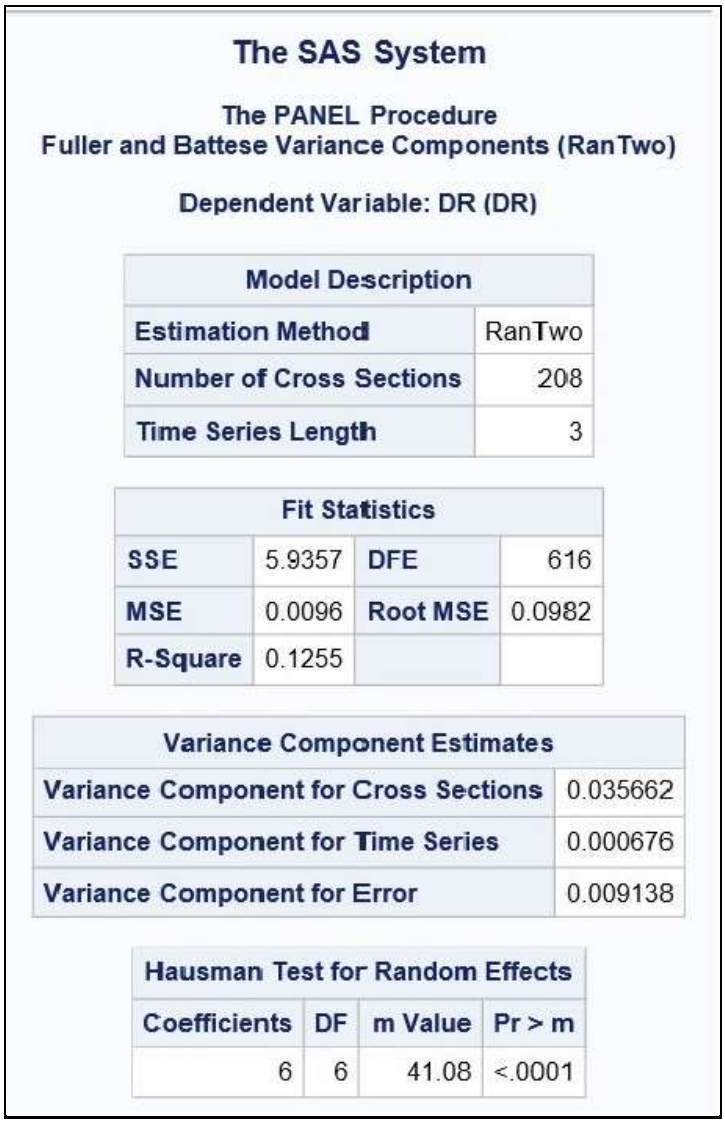
Model Description	
Estimation Method	RanTwo
Number of Cross Sections	208
Time Series Length	18

Fit Statistics			
SSE	320.4569	DFE	3736
MSE	0.0858	Root MSE	0.2929
R-Square	0.0738		

Variance Component Estimates	
Variance Component for Cross Sections	0.025158
Variance Component for Time Series	0.000224
Variance Component for Error	0.083468

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
6	6	9.37	0.1539

Figure 12: Hausman test results of two-way random effects model for 1999 to 2016



The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: DR (DR)

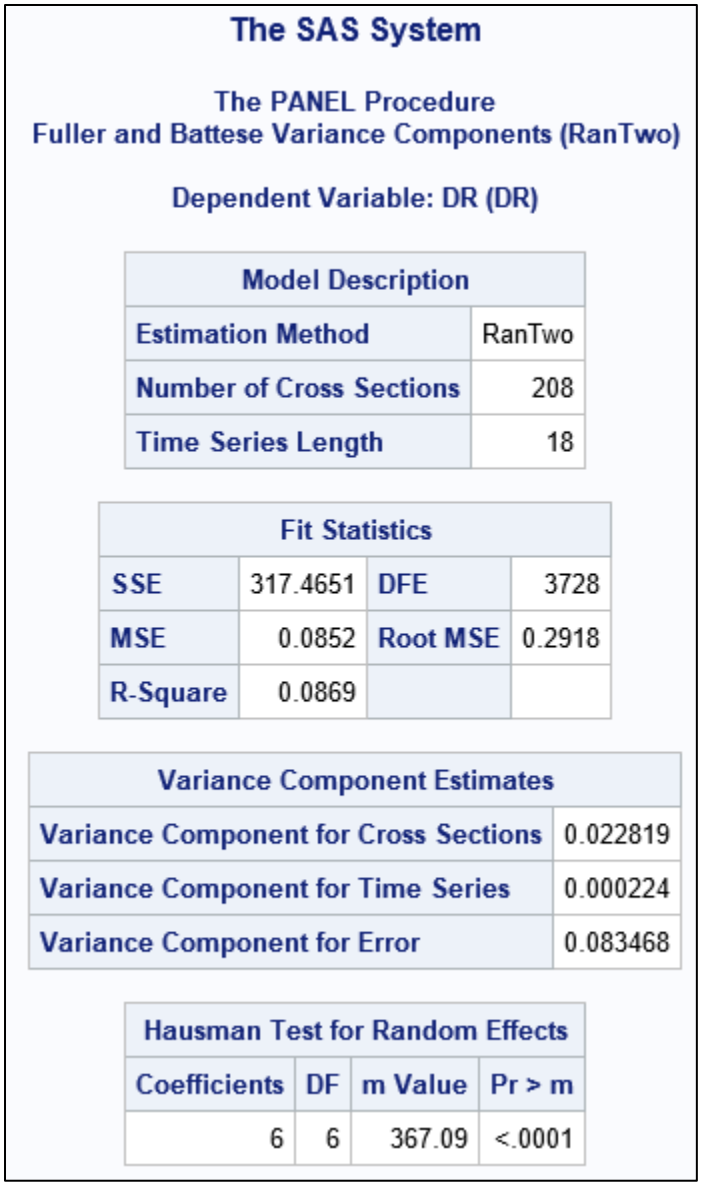
Model Description	
Estimation Method	RanTwo
Number of Cross Sections	208
Time Series Length	3

Fit Statistics			
SSE	5.9357	DFE	616
MSE	0.0096	Root MSE	0.0982
R-Square	0.1255		

Variance Component Estimates	
Variance Component for Cross Sections	0.035662
Variance Component for Time Series	0.000676
Variance Component for Error	0.009138

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
6	6	41.08	<.0001

Figure 13: Hausman test results of two-way random effects model for 2007 to 2009



The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: DR (DR)

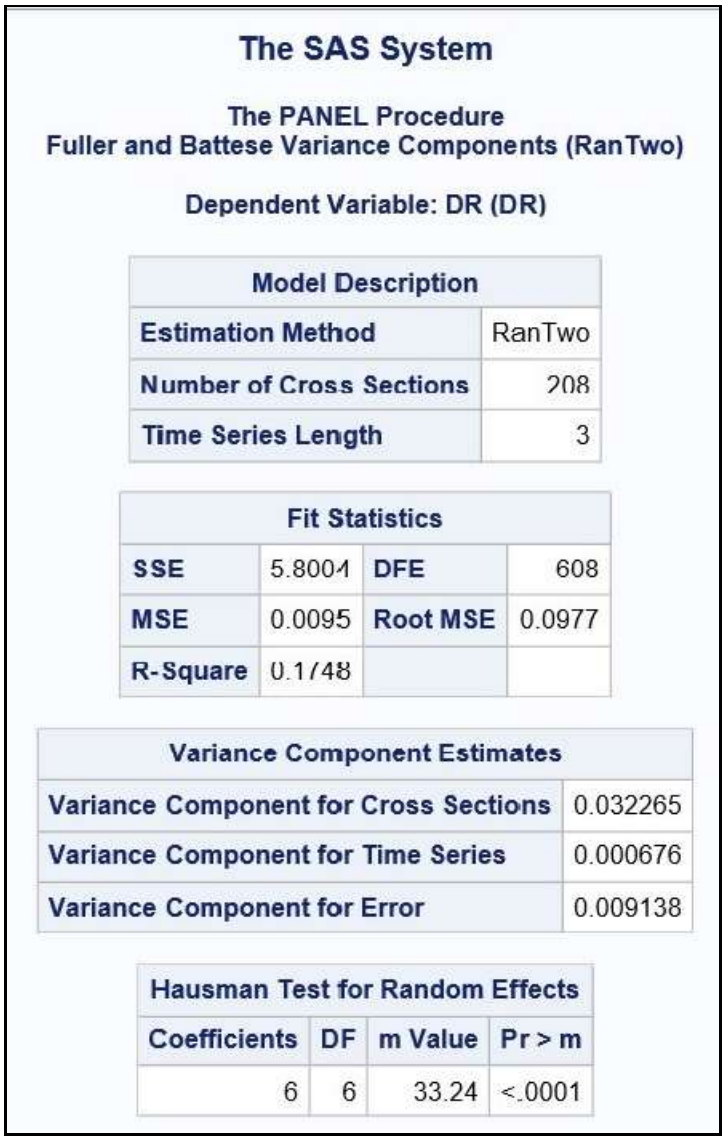
Model Description	
Estimation Method	RanTwo
Number of Cross Sections	208
Time Series Length	18

Fit Statistics			
SSE	317.4651	DFE	3728
MSE	0.0852	Root MSE	0.2918
R-Square	0.0869		

Variance Component Estimates	
Variance Component for Cross Sections	0.022819
Variance Component for Time Series	0.000224
Variance Component for Error	0.083468

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
6	6	367.09	<.0001

Figure 14: Hausman test results (with Industry Dummy Variables) of two-way random effects model for 1999 to 2016



The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: DR (DR)

Model Description	
Estimation Method	RanTwo
Number of Cross Sections	208
Time Series Length	3

Fit Statistics			
SSE	5.8004	DFE	608
MSE	0.0095	Root MSE	0.0977
R-Square	0.1748		

Variance Component Estimates	
Variance Component for Cross Sections	0.032265
Variance Component for Time Series	0.000676
Variance Component for Error	0.009138

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
6	6	33.24	<.0001

Figure 15: Hausman test results (with Industry Dummy Variables) of two-way random effects model for 2007 to 2009

The SAS System

The PANEL Procedure
Model Comparison

Dependent Variable: DR (DR)

Comparison of Model Statistics			
Statistic	Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Cross Sections	208	208	208
Time Series Length	18	18	18
MSE	0.0837	0.1082	0.0835
Root MSE	0.2893	0.3290	0.2889
R-Square	0.3523	0.1172	0.3568

Comparison of Model Parameter Estimates				
Variable		Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Intercept	Estimate	0.542812	0.518928	0.787697
	t Value	7.35	16.68	9.92
	Pr > |t|	<.0001	<.0001	<.0001
AGE	Estimate	0.008876	0.001172	0
	t Value	7.52	4.62	.
	Pr > |t|	<.0001	<.0001	.
LIQ	Estimate	-0.012316	-0.019249	-0.012339
	t Value	-10.15	-17.02	-10.15
	Pr > |t|	<.0001	<.0001	<.0001
TANG	Estimate	-0.303127	-0.224703	-0.311255
	t Value	-6.73	-10.94	-6.87
	Pr > |t|	<.0001	<.0001	<.0001
SIZE	Estimate	-0.202735	0.006226	-0.201166
	t Value	-12.16	0.94	-11.92
	Pr > |t|	<.0001	0.3471	<.0001
GROW	Estimate	-0.000083895	-0.000034722	-0.000089672
	t Value	-3.91	-1.47	-4.16
	Pr > |t|	<.0001	0.1409	<.0001
PROF	Estimate	-0.014862	-0.022577	-0.013781
	t Value	-3.47	-4.85	-3.21
	Pr > |t|	0.0005	<.0001	0.0013
NDTS	Estimate	-0.116712	0.093461	-0.081108
	t Value	-0.64	0.65	-0.45
	Pr > |t|	0.5214	0.5132	0.6563

Figure 16: Results of fixed effects models (one-way, one-time, and two-way) for 1999 to 2016

The SAS System

The PANEL Procedure
Model Comparison

Dependent Variable: DR (DR)

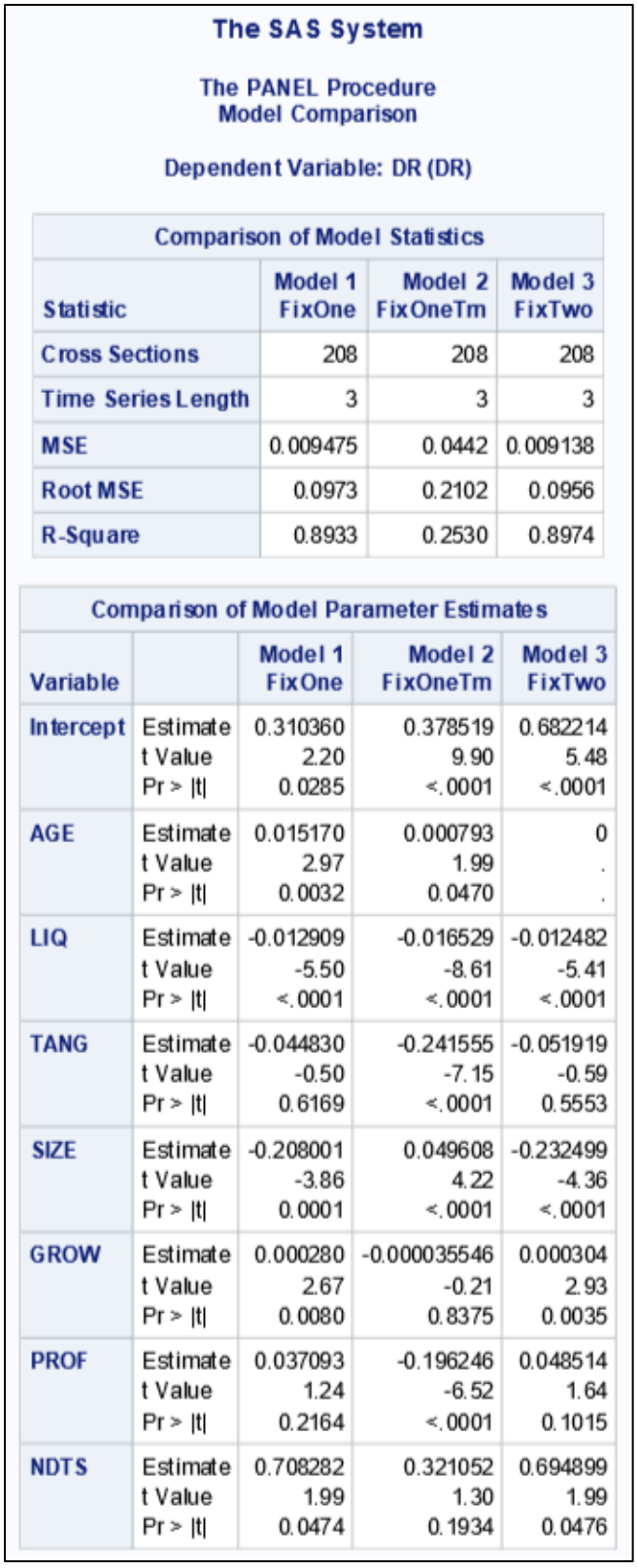
Comparison of Model Statistics

Statistic	Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Cross Sections	208	208	208
Time Series Length	18	18	18
MSE	0.0837	0.1051	0.0836
Root MSE	0.2893	0.3242	0.2892
R-Square	0.3523	0.1444	0.3568

Comparison of Model Parameter Estimates

Variable		Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Intercept	Estimate	0.542812	0.583871	0.787697
	t Value	7.35	16.86	9.91
	Pr > |t|	<.0001	<.0001	<.0001
AGE	Estimate	0.008876	0.001158	0
	t Value	7.52	4.40	.
	Pr > |t|	<.0001	<.0001	.
LIQ	Estimate	-0.012316	-0.018795	-0.012339
	t Value	-10.15	-16.05	-10.14
	Pr > |t|	<.0001	<.0001	<.0001
TANG	Estimate	-0.303127	-0.299499	-0.311255
	t Value	-6.73	-10.56	-6.88
	Pr > |t|	<.0001	<.0001	<.0001
SIZE	Estimate	-0.202735	-0.008477	-0.201166
	t Value	-12.16	-1.19	-11.91
	Pr > |t|	<.0001	0.2338	<.0001
GROW	Estimate	-0.000083895	-0.000044072	-0.000089672
	t Value	-3.91	-1.89	-4.16
	Pr > |t|	<.0001	0.0586	<.0001
PROF	Estimate	-0.014862	-0.020753	-0.013781
	t Value	-3.47	-4.50	-3.21
	Pr > |t|	0.0005	<.0001	0.0013
NDTS	Estimate	-0.116712	0.035779	-0.081108
	t Value	-0.64	0.24	-0.44
	Pr > |t|	0.5214	0.8135	0.6566
INDUSTRYTechnology	Estimate	0	-0.121532	31.054602
	t Value	.	-5.23	0.00
	Pr > |t|	.	<.0001	1.0000
INDUSTRYDiversified	Estimate	0	0	0
	t Value	.	.	.
	Pr > |t|	.	.	.
INDUSTRYOil	Estimate	0	0.109815	-143.682979
	t Value	.	4.72	-0.00
	Pr > |t|	.	<.0001	1.0000
INDUSTRYLife	Estimate	0	0.012282	-29.556629
	t Value	.	0.52	-0.00
	Pr > |t|	.	0.6051	1.0000
INDUSTRYMining	Estimate	0	-0.027549	-39.741207
	t Value	.	-1.51	-0.00
	Pr > |t|	.	0.1301	1.0000
INDUSTRYUtilities	Estimate	0	0.152314	-34.118443
	t Value	.	6.54	-0.00
	Pr > |t|	.	<.0001	1.0000
INDUSTRYClean	Estimate	0	0.074815	-32.539113
	t Value	.	2.98	-0.00
	Pr > |t|	.	0.0029	1.0000
INDUSTRYComm	Estimate	0	0.038235	0
	t Value	.	1.60	.
	Pr > |t|	.	0.1093	.
INDUSTRYForest	Estimate	0	0.032035	173.028040
	t Value	.	1.05	0.00
	Pr > |t|	.	0.2918	1.0000

Figure 17: Results of fixed effects models (one-way, one-time, and two-way) with Industry Dummy Variables for 1999 to 2016



The SAS System

The PANEL Procedure
Model Comparison

Dependent Variable: DR (DR)

Comparison of Model Statistics

Statistic	Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Cross Sections	208	208	208
Time Series Length	3	3	3
MSE	0.009475	0.0442	0.009138
Root MSE	0.0973	0.2102	0.0956
R-Square	0.8933	0.2530	0.8974

Comparison of Model Parameter Estimates

Variable		Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Intercept	Estimate	0.310360	0.378519	0.682214
	t Value	2.20	9.90	5.48
	Pr > |t|	0.0285	<.0001	<.0001
AGE	Estimate	0.015170	0.000793	0
	t Value	2.97	1.99	.
	Pr > |t|	0.0032	0.0470	.
LIQ	Estimate	-0.012909	-0.016529	-0.012482
	t Value	-5.50	-8.61	-5.41
	Pr > |t|	<.0001	<.0001	<.0001
TANG	Estimate	-0.044830	-0.241555	-0.051919
	t Value	-0.50	-7.15	-0.59
	Pr > |t|	0.6169	<.0001	0.5553
SIZE	Estimate	-0.208001	0.049608	-0.232499
	t Value	-3.86	4.22	-4.36
	Pr > |t|	0.0001	<.0001	<.0001
GROW	Estimate	0.000280	-0.000035546	0.000304
	t Value	2.67	-0.21	2.93
	Pr > |t|	0.0080	0.8375	0.0035
PROF	Estimate	0.037093	-0.196246	0.048514
	t Value	1.24	-6.52	1.64
	Pr > |t|	0.2164	<.0001	0.1015
NDTS	Estimate	0.708282	0.321052	0.694899
	t Value	1.99	1.30	1.99
	Pr > |t|	0.0474	0.1934	0.0476

Figure 18: Results of fixed effects models (one-way, one-time, and two-way) for 2007 to 2009

The SAS System

The PANEL Procedure
Model Comparison

Dependent Variable: DR (DR)

Comparison of Model Statistics

Statistic	Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Cross Sections	208	208	208
Time Series Length	3	3	3
MSE	0.009475	0.0400	0.009298
Root MSE	0.0973	0.2001	0.0964
R-Square	0.8933	0.3323	0.8974

Comparison of Model Parameter Estimates

Variable		Model 1 FixOne	Model 2 FixOneTm	Model 3 FixTwo
Intercept	Estimate	0.310350	0.427789	0.682214
	t Value	2.20	9.72	5.43
	Pr > |t|	0.0285	<.0001	<.0001
AGE	Estimate	0.015170	0.000571	0
	t Value	2.97	1.43	.
	Pr > |t|	0.0032	0.1536	.
LIQ	Estimate	-0.012909	-0.013464	-0.012482
	t Value	-5.50	-6.96	-5.36
	Pr > |t|	<.0001	<.0001	<.0001
TANG	Estimate	-0.044830	-0.236980	-0.051919
	t Value	-0.50	-5.29	-0.59
	Pr > |t|	0.6169	<.0001	0.5588
SIZE	Estimate	-0.208001	0.037582	-0.232499
	t Value	-3.86	3.13	-4.33
	Pr > |t|	0.0001	0.0019	<.0001
GROW	Estimate	0.000280	0.000082911	0.000304
	t Value	2.67	0.50	2.91
	Pr > |t|	0.0080	0.6201	0.0038
PROF	Estimate	0.037093	-0.168318	0.048514
	t Value	1.24	-5.06	1.63
	Pr > |t|	0.2164	<.0001	0.1045
NDTS	Estimate	0.706282	0.154756	0.694899
	t Value	1.99	0.58	1.97
	Pr > |t|	0.0474	0.5603	0.0496
INDUSTRYTechnology	Estimate	0	-0.096579	14.203820
	t Value	.	-2.71	0.00
	Pr > |t|	.	0.0070	1.0000
INDUSTRYDiversified	Estimate	0	0	0
	t Value	.	.	.
	Pr > |t|	.	.	.
INDUSTRYOil	Estimate	0	0.010817	-49.062564
	t Value	.	0.29	-0.00
	Pr > |t|	.	0.7683	1.0000
INDUSTRYLife	Estimate	0	0.041240	-18.088825
	t Value	.	1.02	-0.00
	Pr > |t|	.	0.3105	1.0000
INDUSTRYMining	Estimate	0	-0.114198	-7.370011
	t Value	.	-3.95	-0.00
	Pr > |t|	.	<.0001	1.0000
INDUSTRYUtilities	Estimate	0	0.210648	-13.848316
	t Value	.	4.90	-0.00
	Pr > |t|	.	<.0001	1.0000
INDUSTRYClean	Estimate	0	0.027672	-22.799140
	t Value	.	0.72	-0.00
	Pr > |t|	.	0.4717	1.0000
INDUSTRYComm	Estimate	0	0.025640	0
	t Value	.	0.70	.
	Pr > |t|	.	0.4819	.
INDUSTRYForest	Estimate	0	-0.034639	79.402550
	t Value	.	-0.75	0.00
	Pr > |t|	.	0.4582	1.0000

Figure 19: Results of fixed effects models (one-way, one-time, and two-way) with Industry Dummy Variables for 2007 to 2009

Appendix C: Robustness Test - Grouping of Companies and Results

S. No.	Company Name	Group
1	Absolute Software Corporation	1
2	ADF Group Inc.	2
3	Advantage Oil & Gas Ltd.	3
4	Aecon Group Inc.	4
5	AEterna Zentaris Inc.	5
6	AgJunction Inc.	1
7	Agnico Eagle Mines Limited	2
8	Agrium Inc.	3
9	AirBoss of America Corp.	4
10	Akita Drilling Ltd.	5
11	Alamos Gold Inc.	1
12	Algoma Central Corporation	2
13	Almaden Minerals Ltd.	3
14	AltaGas Ltd.	4
15	Aptose Biosciences Inc.	5
16	Aralez Pharmaceuticals Inc.	1
17	ARC Resources Ltd.	2
18	Atco Ltd.	3
19	Aurinia Pharmaceuticals Inc.	4
20	Badger Daylighting Ltd.	5
21	Ballard Power Systems Inc.	1
22	Barrick Gold Corporation	2
23	Baytex Energy Corp.	3
24	BCE Inc.	4
25	BELLUS Health Inc.	5
26	Big Rock Brewery Inc.	1
27	Bird Construction Inc.	2
28	BlackBerry Limited	3
29	BMTC Group Inc.	4
30	Bombardier Inc.	5
31	Bonavista Energy Corporation	1
32	Bonterra Energy Corp.	2
33	Boralex Inc.	3
34	Boyd Group Services Inc.	4
35	Brampton Brick Limited	5
36	Brick Brewing Co. Limited	1
37	Buhler Industries Inc.	2
38	Caldwell Partners International Inc. (The)	3

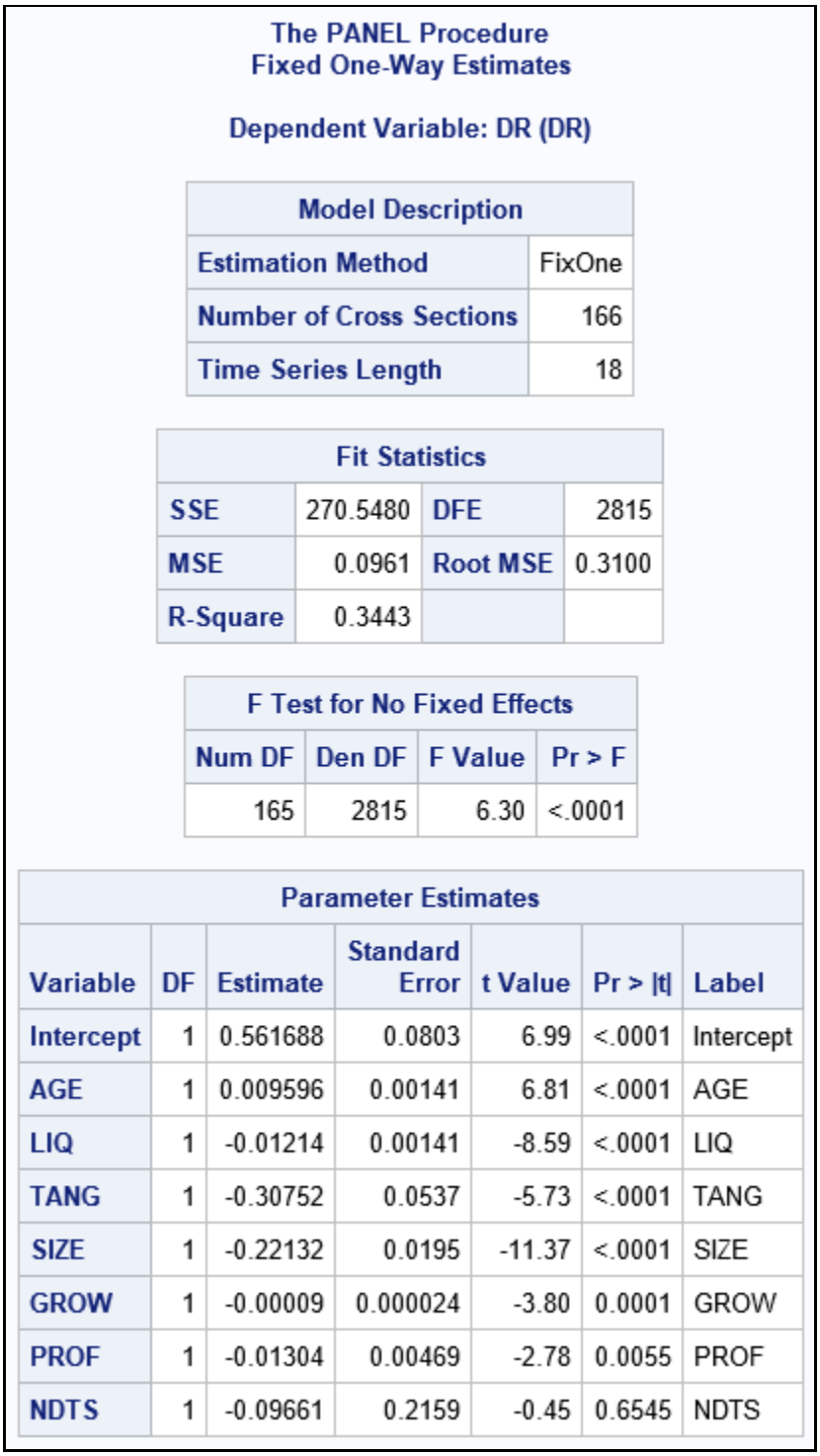
S. No.	Company Name	Group
39	Calfrac Well Services Ltd.	4
40	Calian Group Ltd.	5
41	Cameco Corporation	1
42	Canadian National Railway Company	2
43	Canadian Natural Resources Limited	3
44	Canadian Pacific Railway Limited	4
45	Canadian Tire Corporation Limited	5
46	Canam Group Inc.	1
47	Canfor Corporation	2
48	Cardiome Pharma Corp.	3
49	Cascades Inc.	4
50	Cathedral Energy Services Ltd.	5
51	CCL Industries Inc.	1
52	Celestica Inc.	2
53	CGI Group Inc.	3
54	Cogeco Communications Inc.	4
55	Cogeco Inc.-SUB VTG	5
56	Computer Modelling Group Ltd.	1
57	Corby Spirit and Wine Limited	2
58	Corus Entertainment Inc.	3
59	Cott Corporation	4
60	Descartes Systems Group Inc. (The)	5
61	Dominion Diamond Corporation	1
62	Dorel Industries Inc.	2
63	Dundee Precious Metals Inc.	3
64	Electrovaya Inc.	4
65	Emera Incorporated	5
66	Enbridge Inc.	1
67	Encana Corporation	2
68	Enghouse Systems Limited	3
69	Ensign Energy Services Inc.	4
70	Exco Technologies Limited	5
71	EXFO Inc.	1
72	Fennec Pharmaceuticals Inc.	2
73	Finning International Inc.	3
74	Firan Technology Group Corporation	4
75	First Quantum Minerals Ltd.	5
76	Fortis Inc.	1
77	Gabriel Resources Ltd.	2

S. No.	Company Name	Group
78	Gildan Activewear Inc.	3
79	Goldcorp Inc.	4
80	Golden Queen Mining Co. Ltd.	5
81	Golden Star Resources Ltd.	1
82	Goodfellow Inc.	2
83	Hammond Manufacturing Company Limited	3
84	Helix BioPharma Corp.	4
85	High Liner Foods Incorporated	5
86	Husky Energy Inc.	1
87	Hydrogenics Corporation	2
88	IAMGold Corporation	3
89	Imperial Metals Corporation	4
90	Imperial Oil Limited	5
91	Inter Pipeline Ltd.	1
92	Interfor Corporation	2
93	Intertape Polymer Group Inc.	3
94	Intrinsyc Technologies Corporation	4
95	Jean Coutu Group (PJC) Inc. (The)	5
96	Kinross Gold Corporation	1
97	Lassonde Industries Inc.	2
98	Leon's Furniture Limited	3
99	Linamar Corporation	4
100	Loblaw Companies Limited	5
101	Logistec Corporation	1
102	MacDonald, Dettwiler and Associates Ltd.	2
103	Magellan Aerospace Corporation	3
104	Magna International Inc.	4
105	Maple Leaf Foods Inc.	5
106	Marsulex Inc/Chemtrade Logistics Inc	1
107	Martinrea International Inc.	2
108	McEwen Mining Inc.	3
109	MDC Partners Inc.	4
110	Methanex Corporation	5
111	Metro Inc.	1
112	Microbix Biosystems Inc.	2
113	Mountain Province Diamonds Inc.	3
114	Mullen Group Ltd.	4
115	Nevsun Resources Ltd.	5
116	Newalta Corporation	1

S. No.	Company Name	Group
117	Newfoundland Capital Corporation Limited	2
118	NGEx Resources Inc.	3
119	Norbord Inc.	4
120	Norsat International Inc.	5
121	North American Palladium Ltd.	1
122	North West Company Inc.	2
123	Northland Power Inc.	3
124	Novagold Resources Inc.	4
125	Novelion Therapeutics Inc.	5
126	Nuvo Pharmaceuticals Inc.	1
127	NXT Energy Solutions Inc.	2
128	Obsidian Energy Ltd.	3
129	Oncolytics Biotech Inc.	4
130	Open Text Corporation	5
131	Orvana Minerals Corp.	1
132	Pacific Insight Electronics Corp.	2
133	Pan American Silver Corp.	3
134	Paramount Resources Ltd.	4
135	Parkland Fuel Corporation	5
136	Pason Systems Inc.	1
137	Pembina Pipeline Corporation	2
138	Pengrowth Energy Corporation	3
139	Peyto Exploration & Development Corp.	4
140	Potash Corporation of Saskatchewan Inc.	5
141	Precision Drilling Corporation	1
142	Premium Brands Holdings Corporation	2
143	ProMetic Life Sciences Inc.	3
144	Pulse Seismic Inc.	4
145	Quebecor Inc.	5
146	Reitmans (Canada) Limited	1
147	Richelieu Hardware Ltd.	2
148	Richmont Mines Inc.	3
149	Ritchie Bros. Auctioneers Incorporated	4
150	RMP Energy Inc.	5
151	Rogers Communications Inc.	1
152	Rogers Sugar Inc.	2
153	Russel Metals Inc.	3
154	Saputo Inc.	4
155	Shaw Communications Inc.	5

S. No.	Company Name	Group
156	ShawCor Ltd.	1
157	Sherritt International Corporation	2
158	Silver Standard Resources Inc.	3
159	SNC-Lavalin Group Inc.	4
160	Spectral Medical Inc.	5
161	Stantec Inc.	1
162	Strongco Corporation	2
163	Stuart Olson Inc.	3
164	Suncor Energy Inc.	4
165	SunOpta Inc.	5
166	Tanzanian Royalty Exploration Corporation	1
167	Taseko Mines Limited	2
168	Teck Resources Limited	3
169	Telesta Therapeutics Inc.	4
170	TELUS Corporation	5
171	Tembec Inc.	1
172	Tesco Corp.	2
173	Theratechnologies Inc.	3
174	Thomson Reuters Corporation	4
175	Toromont Industries Ltd.	5
176	Torstar Corporation	1
177	Total Energy Services Inc.	2
178	Touchstone Exploration Inc.	3
179	TransAlta Corporation	4
180	Transat A.T. Inc.	5
181	TransCanada Corporation	1
182	Transcontinental Inc.	2
183	TransGlobe Energy Corporation	3
184	Trican Well Service Ltd.	4
185	Trinidad Drilling Ltd.	5
186	Turbo Power Systems Inc.	1
187	Turquoise Hill Resources Ltd.	2
188	TVA Group Inc.	3
189	TWC Enterprises Limited	4
190	Uni-Select Inc.	5
191	Uranium One Inc.	1
192	Valeant Pharmaceuticals International Inc.	2
193	Valener Inc.	3
194	Velan Inc.	4

S. No.	Company Name	Group
195	Veresen Inc.	5
196	Vermilion Energy Inc.	1
197	Vista Gold Corp.	2
198	Wajax Corporation	3
199	Waste Connections, Inc.	4
200	West Fraser Timber Co. Ltd.	5
201	Western Forest Products Inc.	1
202	WestJet Airlines Ltd.	2
203	Weston (George) Limited	3
204	Westport Fuel Systems Inc.	4
205	Winpak Ltd.	5
206	Yorbeau Resources Inc.	1
207	Zargon Oil & Gas Ltd.	2
208	ZCL Composites Inc.	3



The PANEL Procedure
Fixed One-Way Estimates

Dependent Variable: DR (DR)

Model Description	
Estimation Method	FixOne
Number of Cross Sections	166
Time Series Length	18

Fit Statistics			
SSE	270.5480	DFE	2815
MSE	0.0961	Root MSE	0.3100
R-Square	0.3443		

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
165	2815	6.30	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.561688	0.0803	6.99	<.0001	Intercept
AGE	1	0.009596	0.00141	6.81	<.0001	AGE
LIQ	1	-0.01214	0.00141	-8.59	<.0001	LIQ
TANG	1	-0.30752	0.0537	-5.73	<.0001	TANG
SIZE	1	-0.22132	0.0195	-11.37	<.0001	SIZE
GROW	1	-0.00009	0.000024	-3.80	0.0001	GROW
PROF	1	-0.01304	0.00469	-2.78	0.0055	PROF
NDTS	1	-0.09661	0.2159	-0.45	0.6545	NDTS

Figure 20: Robustness test results after excluding Group 2 companies - one-way fixed effects model for 1999 to 2016

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