US firms performance during recessions: a comparative case study

by

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Abstract

With the majority of economists predicting that the US economy will experience a recession by 2021, it has become increasingly important to explore how well firms do during recessions. Improving understanding of firm characteristics that sustain performance during recessions could provide some learning from the strategies pursued by these firms that maintain their performance during recessions. The study is a case analysis of six US firms, four in the agri-food sector, and two in the technology sector.

While numerous performance measures exist, the study intentionally uses return on sales as the performance measure of interest because of its unique characteristic of capturing firms' current situation over which they have current control. Return on sales, defined as the ratio of net income to sales revenue in the current period, limits performance assessment to current results, allowing for the direct impact of recessions to be measured. The study theorizes that certain firms fare better than others because of their product mix. It also hypothesizes that return on sales as a performance indicator during recessions is determined by how well firms do with their assets and other financial resources. These are tested using 30 years of financial data from Wharton Research Data Services (WRDS), hosted by the Wharton School of Business at the University of Pennsylvania.

The six companies investigated were ADM, Bunge, ConAgra and Tyson Foods Inc., IBM and Intel Corporation. The results, estimated using Ordinary Least Squares regression models, showed that the return on sales of Bunge and IBM were unaffected by recessions, while ADM was positively affected by recessions. Meanwhile Tyson Foods, Conagra and Intel were negatively affected by recessions. Additionally, the return on sales is positively affected by the current return

on assets for all six firms in the study. The other variables had different impacts on returns on sale.

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Dedication

I dedicate this thesis to God and my family.

Chapter 1 - Introduction

1.1 Background

The economy is said to have entered a recession when it experiences two or more consecutive quarters of negative growth in the Gross Domestic Product (GDP). The United States has experienced eight major recessions over the past six decades, each with different duration and triggers. For example, the most recent recession, which started in 2008, was triggered by the financial crisis in the real estate market that initiated a contagion effect globally, lasting 18 months in the US and longer in other places, such as Europe. On the other hand, the 1980-82 recession (which was actually two recessions) lasted 22 months. The first occurred in the first six months of 1980 and the second from July 1981 through November 1982. It was triggered by the Federal Reserve Board raising interest rates in an attempt to combat inflation, which caused a reduction in business spending, putting the economy into a recession. Then, the Iranian oil embargo exacerbated the situation because of a reduction in US oil supplies. Whatever the triggers and the duration, major characteristics of recessions are reductions in consumption and higher levels of unemployment.

Despite their economy-wide effects, there are variabilities in the effect of recessions on companies and industries in the economy. For example, the 2008 recession brought General Motors and Chrysler to the brink of bankruptcy, a situation averted only by the massive bailout program initiated by the Federal Government. Ford Motor Company, on the other hand, weathered that recession without any visible financial challenges apart from the general reduction in consumption that attended the recession. Likewise, Bank of America was virtually unscathed by the same recession while many financial institutions, including Lehman Brothers and Bear Stearns, collapsed and disappeared.

While recessions have broad economy-wide effects, from unemployment and consumption to monetary and trade policies, the focus of commentary and research on the agri-food sector's relationship with recessions has been weak. This may be a result of the relative size of the agri-food sector in the US economy compared to sectors such as automobile and finance. Yet, the sector's performance has potentially more far-reaching implications for the rest of the economy than some of these perceived more important sectors.

The performance of the agri-food sector during recessions has not been well researched mainly because of the broader economic challenges recessions bring to large employment segments of the economy. And since agri-food is not perceived to be a major employment sector, it is often overlooked in the analysis of the impacts of recessions.

Recessions are not a necessary condition for companies to explode or implode. Market forces, such as competition, and internal forces, such as incompetent management, contribute to the failure of businesses regularly. However, the ability of certain firms and industries to weather the shifts in the general economy presents interesting opportunities for understanding how other companies may learn from them or those companies may improve their performance in the future.

As external shocks go, recessions have been recognized as an integral part of the business cycle. The business cycle encompasses four stages: expansion; peak; contraction; and trough. The period between the trough and the peak is the expansion period, and the period between the peak and the trough is the contraction period. The critical metrics associated with recessions are unemployment rates and stock market performance. Each recession may have unique characteristics or patterns such as its triggers, the duration, and patterns of its effects on economic indicators. Past recessions have been engendered by; wage-price controls in the 1970s and the Federal reserve's contractionary monetary policies brought on by stock market crashes and oil

crisis etc. According to Labonte and Makinen (2002), a spike in oil prices has preceded nine of the ten post-war recessions before 2002.

Over the past six decades, the US has experienced eight recessions. Most of these recessions were short in duration, with some lasting eight months. However, it is within the periods between these recessions that the longest periods of growth or expansion have occurred. The longest expansion periods include 1961-1969, 1991-2001 and 2009 to date with durations of over a hundred months each. Even though economic contractions are typically short, recessions have long-term effects on the general economy of countries as well as the individual sectors of the economy (Agüero & Valdivia, 2010; Irons, 2009). Though these effects may vary from one sector to the other, there are some common effects, including a decrease in demand (Irons, 2009), a decline in output (Claessens, Kose, & Terrones, 2009a), decrease in performance and profitability (Youn & Gu, 2009), and an increase in unemployment levels (Caggiano, Castelnuovo, & Groshenny, 2014). Given that recessions are recurrent, and many predictions are being made for a recession in the US in the near future, it is necessary to examine how firms perform during recessions.

The agri-food sector is estimated to have contributed over a trillion dollars to the US economy in 2017. According to the United States Department of Agriculture - Economic Research Service (USDA-ERS) (2020) and the US Bureau of Labor Statistics (2018), 12.9 percent of American households' expenditures was attributed to food spending in 2018, while food and beverage manufacturing firms employed over 1.5 million people, that is about 14 percent of US manufacturing employees, in 2016 and over 1 percent of all nonfarm employment. The ability of the agri-food sector to sustain its performance during recessions is important for national security

both at home and in countries the depend on the US for its food and agricultural commodities through trade.

In recessions, firms are compelled to produce less which reduces their demand for workers. While some firms survive by downsizing, others go out of business. Characteristics of any firm, industry, and sector before and during a recession determines the rate and nature of its recovery and growth. The US agri-food sector, through its significant growth in farm income and demand for its agricultural products from developing countries among others, was conditioned to survive the effects of the recession between 2007 and 2009 much easier than most US industries (Sundell & Shane, 2012). According to Sundell and Shane (2012), during the 2008-09 recession, financial problems in the US and other developed countries like Canada and Australia resulted in lower real and financial asset prices worldwide. However, developing countries experienced resilient growth and buoyed countries like the US that partake in agricultural trade. As a result, US agricultural exports were not as affected as compared to nonagricultural exports. In addition, financial stress on nonagricultural sectors was relatively higher as loan default rates at the commercial banks reached historic peaks for most nonagricultural loans. The agricultural sector benefited from lower rates from the Farm Credit System. Furthermore, farmers were cautious with debt financing as compared to nonfarm borrowers. Given that the different sectors of the economy experience and recover from external shocks and downturns at different points in time (Jiang, Koller, & Williams, 2009), they may apply different strategies to recuperate.

Thus, it has become increasingly important to ascertain the measures that the agri-food sector may implement to ensure its recovery from the effects of a recession as investments within the sector continually rise. By 2007, global private sector investments in research and development associated with food manufacturing had increased from $6.02 billion in 1994 to $11.48 billion

(Fuglie, Keith et al., 2011). These investments are efforts to address food security and guarantee the sustainable development of the agri-food sector.

Recessions can be triggered by different factors and for different durations. Yet, there is little evidence to show that past recessions are significantly different (Labonte & Makinen, 2002). Consequently, past recessions can serve as reference points for assessing the performance of the agri-food sector and that of the other sectors of the US economy during shock periods as well as for ascertaining how the performance of the agri-food sector differs from that of the rest of the sectors of the US economy.

1.2. Statement of Problem

Recessions have macroeconomic implications: increased unemployment levels; decreased household consumption; reduced corporate investments; and decreased household incomes. According to Srinivasan, Lilien and Sridhar (2011, p. 49), recessions are reoccurring and could "entail a significant contraction in demand and services, lowering sales, cashflows and profits" depending on how long the last. Recessions can have permanent consequences for some sectors and have the potential to easily spread to other countries both advanced and emerging economies, quickly escalating into a global crisis (Claessens, Kose, & Terrones, 2009b; Srinivasan, Lilien, & Sridhar, 2011).

Different sectors respond differently to recessions and other macroeconomic shocks (Economics Division (Congressional Research Services), 1980; Sundell & Shane, 2012; Tasci & Lindner, 2010). While many studies have looked at different sectors in recessions, these studies have often looked at the contributory factors of these firms to the macroeconomic effects, such as employee layoffs (Goodman & Mance, 2011). As a result, sectors such as the automobile and financial services, which often layoff many of their employees during recessions, receive a lot of

researchers' attention. This extensive attention to these sectors has crowded out attention for agri-food firms. Yet, the very nature of the agri-food sector's products suggests that its firms should fare better in recessions. If this is true then the sector could become a recession haven for investors, helping to improve how agri-food firms are perceived and treated by investment analysts and, consequently, investors.

The agri-food sector, generally known as 'anti-cyclic', is susceptible to effects of economic contractions, yet, the reliance on the agri-food sector to create jobs, generate incomes as well as contribute to transformation continues to increase (Crescimanno, Galati, & Bal, 2014; FAO, 2017). Albeit, firms within the sector may fair differently by virtue of their unique characteristics as presented by Sundell and Shane (2012) on the 2008-09 recession. Consequently, it is critical to measure the performance of the agri-food sector with regards to surviving the effects of recessions. The question of whether all firms are "anti-cyclic" needs to be addressed. Also, the characteristics of firms that fit this "anti-cyclic nature would be very informative for those interested in strategies to manage recessions and their effects.

1.3. Research Question

The issue of the "anti-cyclic" nature of the agri-food sector has not been settled. If this is true then the sector would be immune to the effects of recessions – employment shedding, revenue declines, loss of sales, etc. Therefore, the research question to which this study seeks to answer is this: Are agri-food firms' performance affected by recessions and do they differ from the rest of the economy? If performance differences exist between recessionary and expansionary periods for agri-food firms, then what characteristics define their performance differences?

Answering these questions is important for two main reasons. First, if recessions have no effect on agri-food firms' performance, then they offer recession-proof investment opportunities

for investors. Identifying the firm characteristics that contribute to their performance stability and provides management with tools to manage performance during recessions. There might be lessons from other firms in other sectors to explore the identified characteristics and their effects on their performance.

1.4. Objectives

The overall objective of this research is to assess the performance differences between expansionary and recessionary periods for a select group of firms in both agri-food and non-agri-food sectors. The firms were selected to provide unique characteristics associated with their product strategy – narrow and differentiation focus, and cost leadership. The specific objectives for this thesis are:

1. Determine the effect of recessions on the performance of the selected case firms and explain the differences, if any, between the results based on the economic sector and their operational strategies.
2. Evaluate the extent to which firm characteristics influence its ability to sustain its performance during recessionary periods and evaluate if there are differences among the firms across sectors and operational strategies.
3. Use the results to draw insights for how agri-food managers may sustain and enhance performance by focusing on managing relevant characteristics during economic downturns if the results provide such direction.

1.5. Outline of the Thesis

The rest of the study is organized as follows: The literature review for this study is presented in the second chapter. Chapter 3 discusses in detail the method and data used for this study. The conceptual framework is also discussed in Chapter 2. The results and its interpretation will be discussed in chapter 4. Finally, in chapter 5, the results from the study are first summarized, and the conclusions emanating therefrom regarding the research questions are presented. Recommendations for future research and industry strategic thrusts are also presented.

Chapter 2 - Literature Review

2.1. Definition of Performance

Performance has been defined differently across disciplines and entities. The term 'performance' originated in the 15th century and was used to define the accomplishment of something, an activity. According to the third edition of the Oxford Dictionary, performance is "The quality of execution of such an action, operation, or process; the competence or effectiveness of a person or thing in performing an action; the capabilities, productivity, or success of a machine, product, or person when measured against a standard."

Pintea and Achim (2010) posit that performance will always pertain to individuals' ability to record progress due to efforts taken in achieving or surpassing set goals. They further suggest that performance, thereby, encompasses actions, result and success. Rolstadås (1998) suggests that the performance of an organizational system is a complex interrelationship between effectiveness, efficiency, quality, productivity, quality of 'work' life, innovation and profitability (budgetability). According to Rolstadås (1998), these criteria assist in achieving long-term success. Achieving effectiveness, efficiency and quality will most likely contribute to having a productive organization while attaining a high quality of work-life and innovation will engender short-term profitability for profit-oriented organizations and budgetability for non-profit organizations.

Despite being polysemantic, performance may encompass effectiveness and efficiency (Ghalem, Okar, Chroqui, & Semma, 2016). According to Neely, Gregory, and Platts (1995), the effectiveness of a firm depends on its ability to fulfill the requirements of its customers, while its efficiency measures its ability to meet these requirements with economical use of the firm's resources.

Generally, agents (individual, firm, industry, sector, etc.) strive to achieve the prior identified levels of performance presented by their principals. They employ available resources and capabilities in their attempts to achieve their specified performance targets. In some organizations, there are rewards and consequences for achieving or missing the specified targets. It has been argued that it is crucial for the right performance metrics to be set because these metrics do influence agents' behavior. According to Pires and Aravechia (2001), performance measurement facilitates an evaluation of an agent against past results or others.

The goals or objectives, as well as the indicators by which performance is measured, are fundamental in defining what performance is. Ion and Criveanu (2016, p.179) assert that "Currently, there is no performance independent of targeted objectives. Reaching the objectives translates with achieving the performance." Also, economic performance encompasses economic indicators, such as cost, revenue, gross margin, profitability, sustainability, and yield. Conclusively, "performance is the time test of any strategy" (Venkatraman & Ramanujam, 1986 p. 802).

2.2. Agri-Food Sector Performance

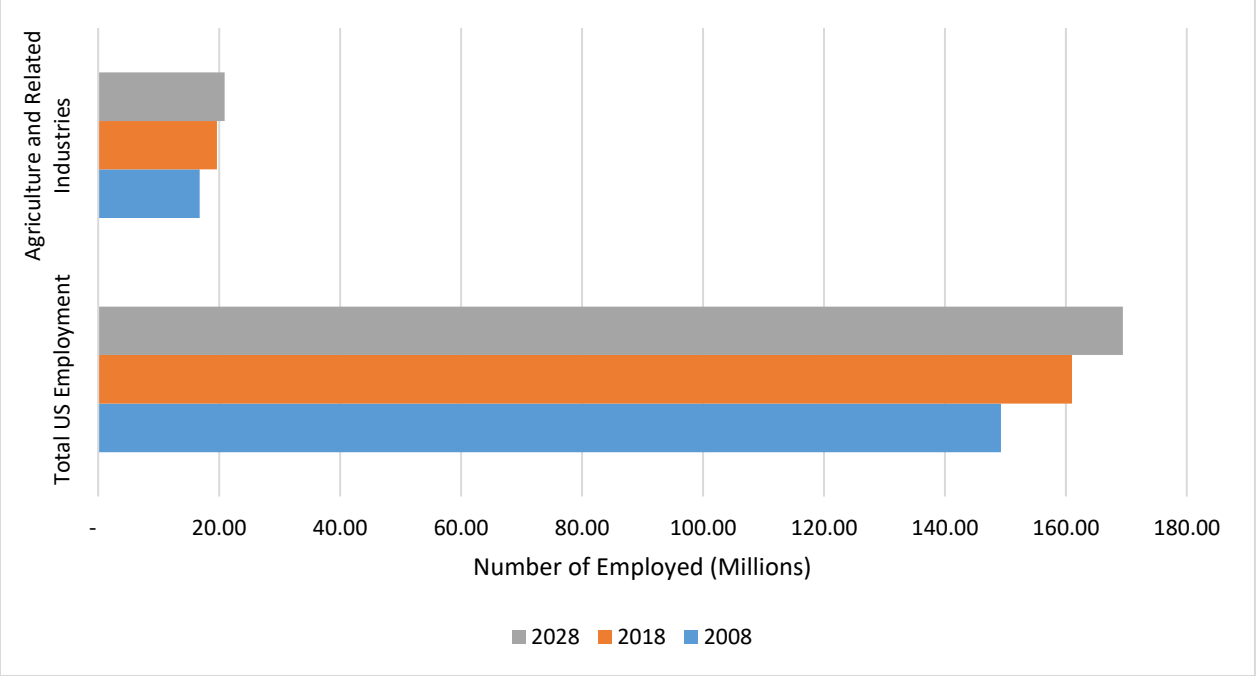
The US agri-food sector encompasses primary agriculture, food processing and manufacturing through to food and beverage retailing, as well as support services for the sector. The structure of the agri-food sector has changed over time. In the last several decades, the restaurant and foodservice, and manufacturing have become the largest and second-largest segments of the agri-food sector even as the farm production segment has shrunk.

The US agri-food sector accounts for roughly five percent of the gross domestic product (GDP), with the sector estimated to contributed about $1.053 trillion to GDP in 2017 (Okrent, Elitzak, Park, & Rehkamp, 2018). According to United States Department of Agriculture -

Economic Research Service (USDA-ERS) (2020), while output from the US farms contributed about $132.8 billion, the larger portion of the sector's contribution to GDP is attributed to related sectors that depend on agricultural products inputs for further production such as the food and beverage sector. The sector also accounts for about ten percent of US consumers' disposable personal income (Okrent et al., 2018; Unnevehr, 2017).

The Agri-food sector is credited with about 22 million full and part jobs in 2018, with direct on-farm employment accounting for about 2.6 million and the downstream segments accounting for almost 20 million jobs (USDA-ERS, 2020). The Agri-food industry experienced a 16.9 percent increase in its employment from 2008 to 2018 while the total US employment increased by roughly 7.9 percent from 2008 to 2018.

Figure 2.1: Employment Trend in US Agri-Food Sector



Source: US Bureau of Labor Statistics, data as of September 4, 2019.

With increasing innovations like freezing, canning, and refrigerated transport, food manufacturing grew as the sector became more efficient in both the production, processing and

delivery of food (Unnevehr, 2017). The food and beverage segment's rapid growth paralleled that of the manufacturing. Fresh or partially processed products from farmers serve as inputs for the segment to create final goods for consumers. The segment, along with tobacco manufacturing, has employed a large number of workers with roughly 1.5 million in 2015, 1.6 million in 2016, and 1.9 million in 2018 (US Census Bureau, 2017). According to the United States Department of Agriculture - Economic Research Service (USDA-ERS) (2020), 14 percent of all US manufacturing employees were into food manufacturing.

US agri-food trade has been a consistent contributor to the US international trade performance over the years. Exports were valued at about $140 billion in 2018, according to the Economic Research Service of the USDA (https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/agricultural-trade/). Imports of agricultural commodities and food have also been increasing over the years, reaching about $128 billion in 2018. This implies the sector posted a net trade balance of about $11 billion when the whole economy posted a negative trade balance of about $617 billion in 2018.

2.3 Recession

2.3.1. Recession and Its Effects

Economic contraction generally leads to a reduction in the demand for goods and services, which lowers sales, increases unemployment, decreases cash flows, investments, marketing and profits for some firms in certain industries. According to (Economics Division (Congressional Research Services), 1980), interest rates in the US rose to high levels in 1969. In 1975, total output fell at an annual rate of 9.1 while a rise in unemployment from 6% to 7.7% of the labor force in 1980 was observed (Economics Division (Congressional Research Services), 1980). As a result of

the effects that recessions have had on both the economy as a whole and the individual sectors of the economy, firms, industries, and sectors are therefore led to make the necessary decisions and implement the appropriate strategies to adapt and consequently thrive. Consequently, researchers have proposed strategies that could either prevent or mitigate these effects.

Consumer behavior is significantly affected during recessions. In anticipation of some crisis or shock, consumers are compelled to make bulk purchases of necessities in preparation for the crisis. Also, during recessions, when there is a decrease in cashflows, consumers are incentivized to prioritize their purchases due to limited resources. Furthermore, the behavior of 'panic buying' is heightened as people become skeptical about borrowing during these periods and the speculations of price levels increases.

Reed & Crawford (2014) argued that the relative importance of food in the US is indicated by its accounting for less than one-seventh of the average consumer's total expenditures. This acknowledges Engel's law that "as income rises, the proportion of income spent on food falls—even if absolute expenditure on food rises." However, Reed and Crawford hypothesize that these change during recessions. More income is expected to be spent on food while the relative importance of non-food products and services like motor vehicles, purchases of homes, durable goods, and travel are expected to pale in comparison. The relative importance of items in the Consumer Price Index (CPI) reflects consumers' purchasing behavior and reveals changes in consumer purchases over time. Table 2.1 presents the relative importance of the food component, vehicle component, travel, and housing.

Table 2.1. Relative Importance of Selected Components of the Consumer Price Index During Economic Boom, Recession and Recovery Periods (2007-2013).

Category	Relative Importance		
	December 2007 (Boom)	December 2011 (Recession)	December 2013 (Recovery)
Food	13.83	14.31	13.89
New Vehicles	4.63	3.20	3.56
Used Cars and Trucks	1.77	1.91	1.67
Hotels and Motels	N/A	0.59	0.63
Airfare Fare	0.72	0.77	0.74
Home (Rent)	5.77	6.49	6.98
Home (Owners' equivalent rent of primary residence)	23.94	22.54	22.51

Source: Reed & Crawford (2014)

2.3.2. Studies on The Effects of Recessions on The Agri-Food Sector

The causes, characteristics, effects and the sentiments about economic recessions have been extensively studied (Claessens, Kose, Laeven, & Valencia, 2014). Studies have included (A) investigating the effects on the sector (Fan, Pena, & Perloff, 2016; Youn & Gu, 2009); (B) ways of preventing and adapting to their effects (Pearce & Michael, 2006); and (C) maintaining or increasing firm performance during and after recession periods. These studies have revealed that the effectiveness of any adaptation strategy, however, depends on the industry and/or sector of the economy and the characteristics of that industry and/or sector. For instance, a firm in a cyclical industry, which produces durable goods is more likely to be adversely affected by recessions while those in an anti-cyclical industry, producing mostly necessities and staples may experience little to no impact (Pearce & Michael, 2006). Cyclical industries include those that produce electronics, automobiles, and apparel, while the anti-cyclical industries are producers of food and alcoholic beverages and health care products as well as service providers insurance companies.

Sectors that serve multiple and diverse markets tend to perform relatively better in recessions. With regards to agriculture, Gardner (1976) noted that real farm income fell while agricultural employment declined by 5.1% during the 1974-75 recession and during the 2007-8 recession, the prices of agricultural products fell (Braun, 2008). The US agri-food sector performed better than other sectors during the 2008-2009 recession since the agri-food sector had developed markets in developing countries (Sundell & Shane, 2012). According to Sundell and Shane (2012), the resilient growth of developing countries during the 2008-2009 period stabilized the demand for agricultural products. However, because the demand for nonagricultural products was in markets that were not protected from the recession, they plummeted. The availability of government support policies such as the Supplemental Nutrition Assistance Program (SNAP) and unemployment compensation, also contributed to maintaining food consumption during recessions (Economics Division (Congressional Research Services), 1980; Rosenbaum, 2013).

Some studies, like Reed and Crawford (2014) examined the entities' performance before, during and after the shock in order to establish the extent to which the entity was affected. Performance was often measured in terms of productivity growth and capacity utilization which have been observed to serve as the basis for a large number of economic performance indicators (indexes) such as the growth in the gross national product (GNP) and investment growth (Morrison, 1993). A decline in any of the productivity growth and capacity utilization indexes is an indication of a depressed economic performance.

The results of the research led to the proposition of strategies for preventing or reducing the effects of recessions. Pearce and Michael (2006), the industry classification of a firm is important as it contributes to its ability to thrive during recessions. Pearce and Michael (2006, p. 204) further argued that for a firm to be in a position to thrive during recessions, it must be active

in multiple industries to reduce "the variation in cash flows caused by the cyclicality of one industry." Research also revealed that the characteristics of an entity or socio-ecological systems (SESs) are important in both their ability to adapt and benefit from a shock (Hoffman & Hancock, 2017; Luthar et al., 2000; Walker, Holling, Carpenter, & Kinzig, 2004). In other words, recessions can have positive effects on the sector. According to Halverson (2018), offsetting impacts from recessions may be both good and bad. While a recession may cause a decline in domestic demand, a weaker dollar may benefit agricultural exports and lower interest rates from credit institutions are advantageous for the agri-food sector (Halverson, 2018).

2.4. Contribution to Literature

This research is primarily to contribute to performance research in order to guide the agri-food sector leaders and policymakers in making the appropriate strategic decisions that would help build and strengthen the performance of the US agri-food sector. Many studies have not focused on the effects of economic shocks on the performance of the agri-food sector and hence, this study seeks to empirically examine these effects as well as how firm-specific characteristics enable it to cope with the adverse effects of recessions.

A key part of determining the effect(s) that a shock or stress has had on any entity is to examine its performance before, during and after the shock. The performance, either at a specific point in time or over a period of time, gives an indication of the effects that past shocks have had on that entity. It is, hence, also important to select key performance indicators. The majority of performance indicators are based on output, investments, and employments including productivity and cost-effective measures. This research studies the performance of firms over time in order to ascertain the effect that firm characteristics and recession had on the firms' performance.

Many different firm characteristics have been used to explain a firm's performance. Studies have measured a firm's performance using firm size (J. Lee, 2009), firm age (Coad, Holm, Krafft, & Quatraro, 2018; Loderer & Waelchli, 2010; Malik, 2011), liquidity (Doğan, 2013; Goddard, Tavakoli, & Wilson, 2005; Muinamia & Atheru, 2018), leverage (Kisavi Mule & Suleiman Mukras, 2015; Mehari & Aemiro, 2013), and sales growth (Charles, Ahmed, & Joshua, 2013).

Mehari and Aemiro (2013) assessed the effect of firm characteristics on the performance of Ethiopian insurance companies. The firm-level characteristics included size, leverage, asset tangibility, loss ratio, growth in writing premium, liquidity and age with the key performance indicator and dependent variable as Return on Assets (ROA). Using annual audited and publication reports, the studied the performance of nine insurance companies over the 2005-2010 period. The regression analysis results indicated that the insurers' size, the tangibility of assets and leverage was positively related to ROA while loss ratio was negatively related to ROA; these were all statistically significant.

Sumaira and Amjad (2013) used a panel data of 31 insurance firms in Pakistan from 2006-2011 to analyze firm factors that affect profitability. The study applied both panel data techniques (fixed effects and random effects) and the Hausman's Specification Test to determine the most effective model. The fixed-effect model, which was determined the most effective for their study, indicated that leverage, size, earning volatility and age of the firm have significant effects of firms' profitability while growth opportunities and liquidity were not significant determinants of profitability. Leverage, firm age and earning volatility had negative effects on performance at a five percent level of significance while firm size impacted performance positively at a ten percent level of significance.

Return on sales will serve as the dependent variable for this study while the rate of return on assets, capital intensity, gross margin, debt-equity ratio, and the recession variable will serve as the predictors of firm performance. This analysis will be applied to firms in the agri-food sector and firms in non-agri-food sectors.

Chapter 3 - Data and Methods

The data and methods used to address the research question and achieve the research objectives are presented and discussed in this chapter. The chapter is organized into three main sections. The first presents the nature, type, and sources of the data. The second describes the research domain and a justification for the companies that are included in the study. The final section presents the conceptual models underlying the empirical analyses. It first presents the analytical frameworks used to answer the research question and achieve the objectives. It develops a theoretical foundation for the selection of variables to conduct the empirical analyses and the empirical models employed. The research hypotheses are then presented and discussed in the final subsection of the conceptual section.

3.1. Data

3.1.1. Data Source and Structure

The overall objective of the study was to assess the performance differences between expansionary and recessionary periods for a number of firms in both agri-food and non-agri-food sectors. This is important because firms that are less affected by macroeconomic conditions will maintain their sales momentum and have less reason to make labor and other adverse adjustments. In order to evaluate the impact of recessions on the different sectors of the US economy, it is important to capture multiple recessions. To successfully evaluate the effect of recessions on performance, the data needed to be structured to cover a statistically credible number of recessions. At the same time, it had to cover a minimum number of periods with adequate information on the selected firms. Therefore, the period 1990 through 2019 was considered for the analysis. It

included three recessions and on a quarterly basis presented a maximum of 120 data points for each selected firm.

This research used secondary data obtained from multiple sources. A panel dataset on the firm-level financial information of six firms was constructed with data acquired from the Wharton Research Data Services (WRDS). The dataset was, however, modified to treat each firm as an independent entity as further explained in this chapter. The dataset comprises firm-level financials for Archer Daniels Midland Company (ADM), Bunge Limited, Conagra Brands, Inc, Intel Corporation, International Business Machines Corporation (IBM) and Tyson Foods. Information pertaining to the most recent three recession periods was obtained from the Federal Reserve Board and hence data from 1990 to 2019 was used in this study. Annual reports were also obtained from Tyson Foods, Inc. to fill in missing data from WRDS. Additionally, annual reports for all firms were used in the firms' assessment. All information acquired was on a quarterly basis, consequently resulting in 120 observations for this study.

The main dataset encompassed financial data for the selected firms. They included total assets, invested capital, goodwill, liabilities, revenue, cost of goods sold and net income. These data from WRDS are reported in billion dollars. Because of the significant in size differences across firms, total revenue was used to deflate all metrics, and in so doing provide an effective comparator across firms.

The performance variables selected for the study were Return on Sale and Gross Margin Percent. Return on Sales (ROS) measures the net income per dollar of revenue. It is the proportion of sales revenue that the firm can transfer to its balance sheet as a "bankable" result from operations. It may be expressed as follows:

$$\boldsymbol{ROS = \frac{NI}{TR}} \qquad \textbf{(3.1)}$$

where NI is net income and TR is total revenue. Net income is total revenue minus total expenses, which comprise the cost of goods sold (COGS), operating expenses, interest, and taxes. It may be expressed as a percent by multiplying it by 100:

$$\boldsymbol{ROS}\% = \frac{\boldsymbol{NI}}{\boldsymbol{TR}}\boldsymbol{x}\ \mathbf{100}\% \qquad \textbf{(3.2)}$$

The ROS%, therefore, recognizes all costs incurred by the firm in assessing its return on sales. This allows this performance indicator to be an effective comparator among firms within the same industry or sector or across industries and sectors. It allows an assessment of how firms, regardless of their industry or sector, are effectively producing surplus from their business activities.

Gross margin percent is the difference between TR and COGS divided by TR, i.e.:

$$\boldsymbol{GM}\% = \frac{(\boldsymbol{TR}-\boldsymbol{COGS})}{\boldsymbol{TR}}\boldsymbol{x}\ \mathbf{100}\% \qquad \textbf{(3.3)}$$

The numerator in Equation 3.3 is the gross margin (GM), which is the gross profit after accounting for variable costs associated with production. This encompasses the cost of materials, hourly wages and other costs directly related to the level of production within each production season (i.e., short-run). The GM%, therefore, is the gross profit or gross margin per dollar of sales. It allows a comparison among firms regarding how much gross profit they are able to generate from each dollar of sales. As a performance measure, the GM% will work in favor of firms that have low variable costs, even if they have high fixed costs – operating expenses. Hence, firms with high hourly labor and high cost of raw material may not fare as well using the GM% as firms that have a similar number of employees, but they are salaried, and they produce non-commodities, such as high technology firms. As a result, GM% does not provide a good comparative performance indicator when firms from different sectors are being considered.

Recall that recessions are said to exist when there are two consecutive quarters of negative GDP growth. Because GDP growths are measured after the quarter has ended, this definition

implies that some recessions escape notice until they are over. An index measuring the probability that the US economy was in a recession a specified quarter was introduced by Chauvet & Hamilton (2005). The mechanical index is reported quarterly and is purely based on the currently available GDP data. Hamilton (2020) asserts that other indicators of recessions, such as the National Bureau of Economic Research (NBER) estimates, have their dates constantly revised. However, the quarterly GDP-based recession indicator index is never revised once calculated, using the data available at the time to obtain an objective assessment. He argues that while the NBER business cycle dates may be released several years after a recessionary event due to its reliance on a wide range of indicators, the GDP-Based Recession Indicator Index is calculated for the quarter prior to the most current GDP data available. An index value above 67% indicates that the economy has entered a recession. After the economy enters a recession period, a fall in the index below 33% suggests that the recession is over. Instead of using the estimated probability of the economy being in a recession as indicated by the author, the projected data were superimposed on other data sources from the Federal Reserve Bank of St. Louis to establish recession quarters, coded 1, and expansion quarters, coded 0.

3.2 Industry and Company Selection Methods

This section describes the industry and firms' selection method. The descriptions and characteristics of the firms used in this study are also presented in this section. This study applied the purposive sampling technique in the selection of firms. The two sectors represented in this study were the agri-food sector and the technology sector. The justification for the selection of particular firms is discussed in the subsections below.

3.2.1. Bunge Limited

Bunge Limited is an American agribusiness and food company established in 1818. This limited liability company was founded in Amsterdam by Johann P. G. Bunge. From its establishment the company grew, expanding into the grain trading market in Argentina in 1884, Brazil in 1905 and then to the United States in 1805. It later extended into the Asian and European markets. The company, formerly Bunge y Born, was listed on the New York Stock Exchange after going public in 2001. Bunge was headquartered in Buenos Aires in 1926 but the company's headquarters is currently in White Plains, New York.

The Bunge operations are segmented thus: Agribusiness; Edible Oil Products; Milling Products; Sugar and Bioenergy; and Fertilizer. Bunge sells the majority of its products in American, eastern European and Asian markets. The company is a leader in grains and oilseeds and is the largest producer and exporter of soy products globally. Commodities obtained from grains and oilseeds and sold include bottled oils, margarine, milled corn, premix for bread, rice, snacks, tomato sauces, and wheat products. The company's products are produced in more than 119 production facilities around the world in North and South America, Europe and Asia-Pacific. It operates 160 grain silos and 32 port terminals (Figure 3.1). Its brands include Chambal in India (vegetable oil), Delicia in Brazil (margarine), Espiga (wheat flour) and Nutra-Clear NT (cooking oil) in North America, Floriol and Bunge Pro in Europe (cooking oil), and Valderey in Argentina (sunflower oil). As Bunge expands, transportation and value-addition for its agricultural goods remain its main focus.

Figure 3.1: Bunge's Grain Infrastructure and Port Terminals

Source: ***https://www.bunge.com/our-businesses/grains***

The total revenue for Bunge in 2018 was $45.7 billion. Bunge's agribusiness unit produces the majority of its revenue with $32.21 billion in 2018. In the same year, edible oil products brought in approximately $9.1 billion while Milling products generated $1.7 billion. Sugar and Bioenergy accounted for approximately US$2.3 billion of Bunge's revenue. Fertilizer drew in the smallest revenue at $460 million. This, however, is no surprise as the inputs and outputs of the agribusiness segment are agricultural commodities and have a higher volume (146.31 billion tons) than the other segments. The closest in volume is Edible Oil Products, accounting for approximately 9 billion tons. In 2018, Bunge's agribusiness segment also accounted for the highest cost of goods sold. Yet, the segment brought in the highest gross profit of $1.43 billion, almost three times larger than the next segment. These comparisons are relatively similar to previous years with the agribusiness segment leading in Bunge's financials.

Bunge's total revenue in 2019 was about $ 41 billion, a decline of about 10% from the previous year. The firm generated $10.8 billion in the last quarter of the year. Bunge made a net income of roughly $0.260 billion in the first two quarters of 2019, however, in the last two quarters the company made a loss of about $1.5 billion. Also, Bunge's total assets were worth $18.3 billion in 2019, a 5.7% decline from the previous year. In addition, the company made a loss of $1.3 billion in 2019. The company employed roughly 31,000 workers in 2018 but reduced this by about 7,000 in 2019 as the firm experienced a reduction in its general performance.

The summary of Bunge's financials from 1999 to 2000 is presented in Table 3.1. The table shows that over the past three decades, Bunge Limited generated an average of $ 9.6 billion in net sales quarterly (Table 3.1) while its average cost of goods was almost $9.0 billion. This generated an average gross income of $0.62 billion over the duration under consideration. Its average total assets were about $18 billion while its average liabilities amount to almost $11 billion, producing an average total equity of about $600 million.

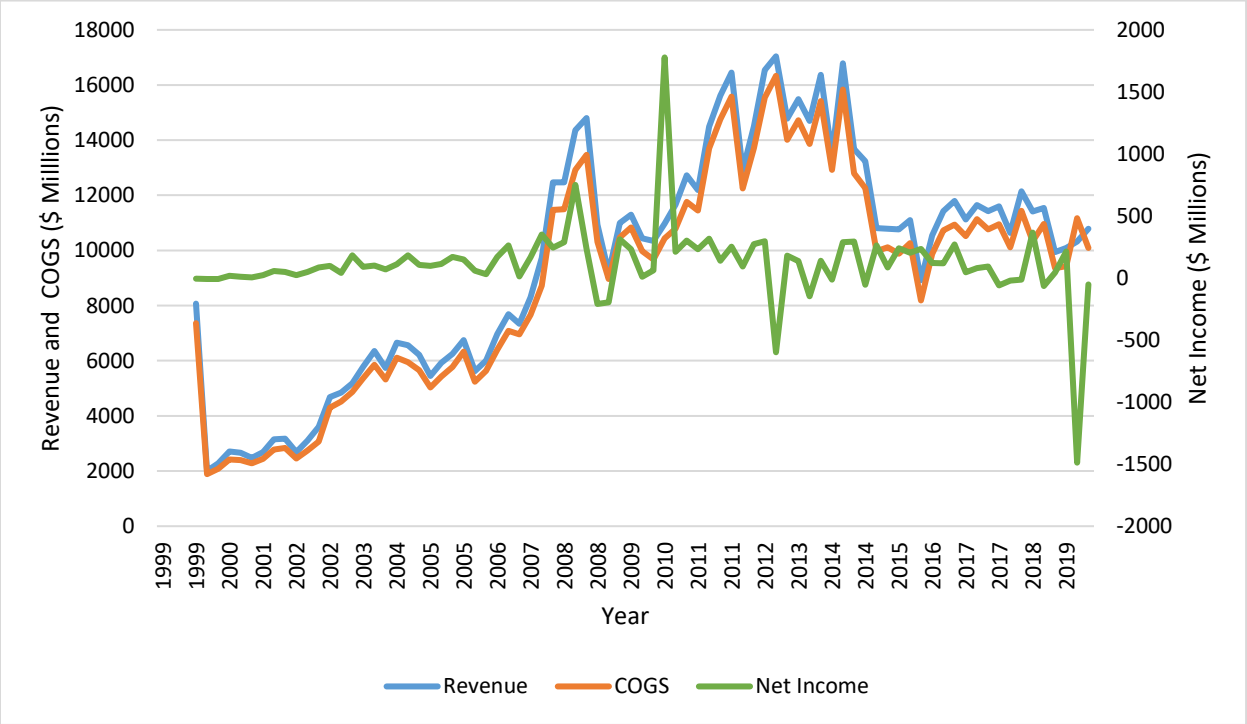
Table 3.1. Summary of Bunge's Financials (1999 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Total Revenue ($ billion)	81	9.59	4.13
Cost of Goods Sold ($ billion)	81	8.97	3.94
Net Income (Loss) ($ billion)	81	0.12	0.31
Total Assets ($ billion)	78	18.04	7.25
Total Liabilities ($ billion)	78	10.98	4.12
Total equity ($ billion)	78	7.06	3.48
Total Invested Capital ($ billion)	78	10.12	4.24

Figure 3.2 shows the trend in Bunge's revenue, cost of goods sold as well as its net income generated over the past three decades. The figure shows a spike in Bunge's net income in 2010. This spike coincided with Bunge's acquisition of the Moema Group which is a cluster of five

sugarcane mills in Brazil. The mills were strategically located on the border of the two largest domestic ethanol markets in Brazil; Sao Paulo and minas Gerais states. In the same year, Bunge sold its Brazilian fertilizer nutrients assets to Vale and acquired Petrobras' fertilizer operations in Argentina. The acquisition of Petrobras' fertilizer operations made Bunge one of the leading fertilizer firms in the Southern Cone region. In 2010, Bunge further entered the rice market by purchasing Pacific International Rice Mills (PIRMI) in the US. Bunge is appropriate for this study because it is a major company within the agri-food sector with over 200 years in existence.

Figure 3.2: Trends in Bunge's Revenue, Cost of Goods Sold (COGS) and Net Income (1999:1 – 2020:1)



3.2.2. ADM Company

The American company currently known as ADM was initially called Daniels Linseed Company. It was founded in Minneapolis by George A. Archer and John W. Daniels in 1902. The name-change to Archer Daniels Midland Company (ADM) came into effect in 1923 after acquiring

the Midland Linseed Products Company. ADM was listed on the New York Stock Exchange (NYSE) a year later in 1924. ADM originally focused on grain and ventured into soybean crushing by 1929. The company relocated its headquarters to Decatur, Chicago, Illinois.

ADM expanded its business by undertaking milling and processing as well as including specialty food ingredients and cocoa. It also took its business overseas and acquired its first soybean processing plants in both Europe and America. The company made some acquisitions over the years, a few of which are: Glencore's Brazilian grain operations in 1997, Eatem Foods and Eaststarch in 2015, Crosswind Industries, Inc. in 2017, Rodelle Inc. in 2018 and Neovia in 2019. ADM has over 270 plants and 496 crop procurement facilities worldwide, operating in more than 160 countries. Its products feed global beverage, food, and animal feed markets. ADM is involved in the global storage and the transportation of agricultural products.

Similar to Bunge's business operations, ADM's operations are segmented based on the nature of the products and services offered. According to ADM's 2017 Annual Report, the company's operations are composed of the agricultural services, Corn Processing, Oilseeds Processing and, Wild Flavors and Specialty Ingredients. Its agricultural services sector involves the purchase, storage, cleaning and transportation of agricultural commodities. The company's agricultural services are carried out worldwide through the use of its grain elevators, transportation networks, and port operations. ADM is a major competitor of Bunge in this regard. Commodities in this segment, such as barley, oilseeds, rice, and wheat, are sold to immediate and final customers. The company is also the leading producer of two biofuels: ethanol and biodiesel.

ADM' Corn Processing segment is involved in the milling of both wet and dry corn as well as other products including dextrose, starch, sweeteners and syrup. Alcohol and animal feed

ingredients produced from fermented dextrose, and ethanol are also attributed to this segment. ADM's global Oil Processing involves the acquisition, crushing and processing of oilseeds and marketing of its oil products. Oils are processed from canola, cottonseeds, flaxseed, soybean and sunflower. The supply of peanuts is also attributed to this segment. The company's Oilseed Processing segment previously included chocolate, cocoa butter and cocoa powder; this ended in 2015. The wild flavor and specialty ingredients unit manufactures, sells and distributes products like emulsifiers, natural colors, proteins and similar products.

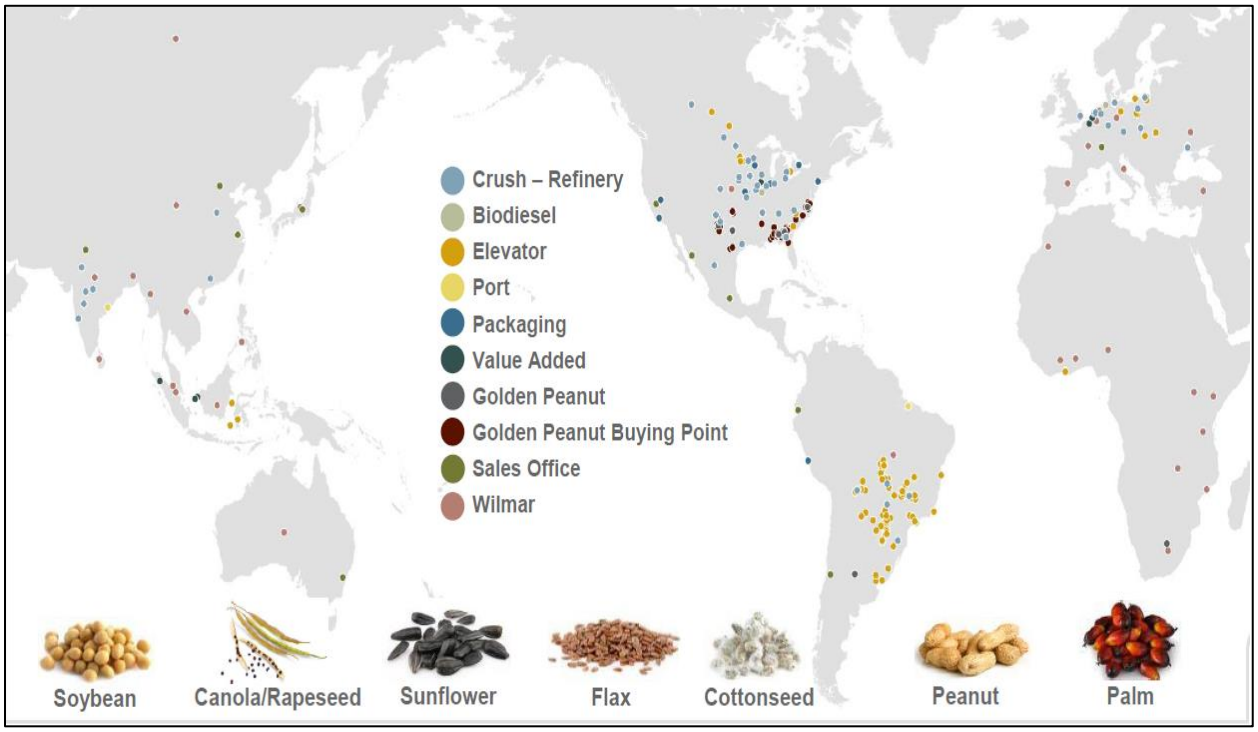
Soybeans, soybean meal and corn generated ten percent or more of the ADM's annual revenue (Table 3.2). Like Bunge, ADM receives most of its revenue from agricultural services accounting for approximately $26.2 billion of its $60.8 billion in 2017, about a $1.7 billion decrease from the previous year. In that same year, Corn processing generated $9.4 billion, Oilseeds proceeds drew in $22.5 billion while Wild Flavors and Specialty yielded a total of US$2.3 billion. Other activities generated approximately $0.4 billion for ADM.

Table 3.2. Distribution of Revenues by Product

PRODUCT	**% of Revenue**		
	Year Ended December 31		
	2017	**2016**	**2015**
Soybean	17%	17%	16%
Soybean Meal	13%	13%	13%
Corn	10%	10%	11%

Source: ADM 2017 Annual Report.

Figure 3.3: ADM's Oilseed Infrastructure and Port Terminals



Source: ADM (2018)

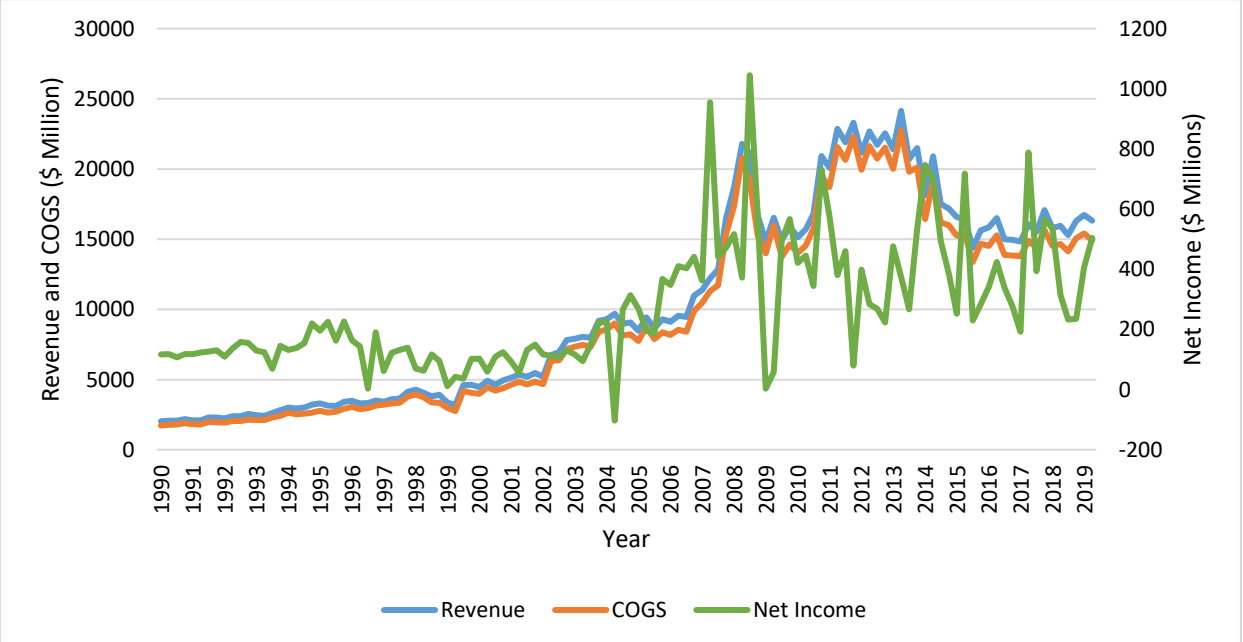
In 2019, ADM earned a net income of 1.4 billion on roughly US$ 64.7 billion in sales. ADM's cost of goods sold (COGS) was US$ 60.5 billion in the same year. The number of ADM employees at ADM was 38,100 in 2019. Table 3.3 presents ADM's financials over the study period. Its average quarterly revenue was $10.3 billion. The variation in sales, however, is the largest observed from the dataset (SD=6.95). It had the largest average net income (loss) of $0.3 billion and the highest average cost of goods sold of $9.5 billion among the agri-food firms selected. ADM is appropriate for this study as it is dominant in the agri-food sector with available financial information to account for the three recessions previously mentioned in section 3.1.

Table 3.3. Summary Statistics of ADM's Financials (1990 Q1-2019 Q4) (N = 118)

VARIABLES	MEAN	SD
Total Revenue ($ billion)	10.33	6.95
Cost of Goods Sold ($ billion)	9.53	6.58
Net Income (Loss) ($ billion)	0.27	.21
Total Assets ($ billion)	23.90	13.47
Total Liabilities ($ billion)	13.10	7.89
Total equity ($ billion)	10.80	5.72
Total Invested Capital ($ billion)	15.10	7.72

Figure 3.4 shows the trend in ADM's average quarterly revenue, cost of goods sold as well as its net income generated over the past three decades. According to ADM (2008), the 20 percent increase in the company's sales revenues was principally attributed to the strength of the commodity pricing as well as additional sales volumes. Droughts in grain-producing countries, and oil price spikes led to drastic increases in food prices and consequently grains like rice, wheat, corn and soybeans in 2007. Thus, ADM benefited from these price spikes in 2007.

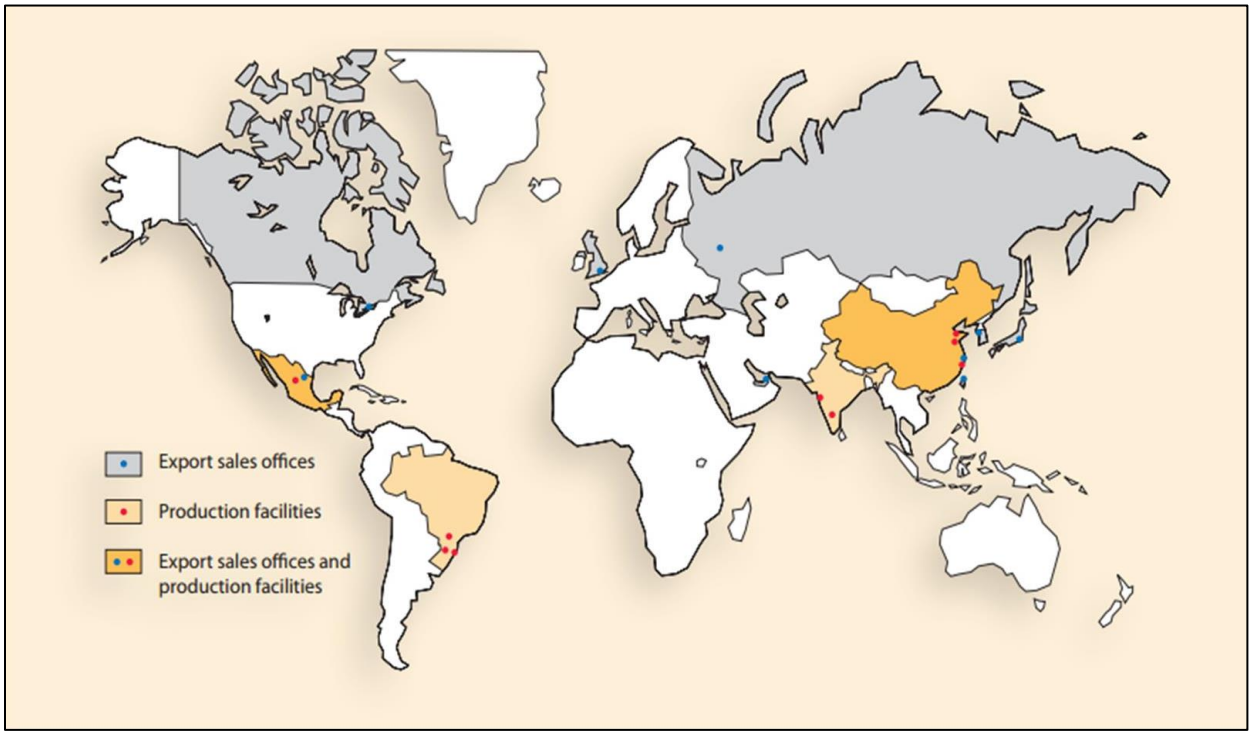
Figure 3.4: Trends in ADM's Revenue, Cost of Goods Sold (COGS) and Net Income (1990:1 – 2020:1)



3.2.3. Tyson Foods, Inc.

Tyson Foods, Inc. is an American multinational corporation and one of the largest food companies in the world. Based in Springdale, Arkansas, Tyson Foods was founded in 1935 by John W. Tyson to grow, process and market chicken and chicken products. The company has since grown through special production arrangements with chicken, cattle and swine farmers across the world, and the procurement of these livestock commodities for the processing and marketing of branded fresh and value-added meat and meat products. Tyson Foods operates 300 processing facilities globally.

Figure 3.5: Tyson Foods' Global Operations



Source: ***https://www.slideshare.net/finance9/tyson-foods-investor-fact-book***

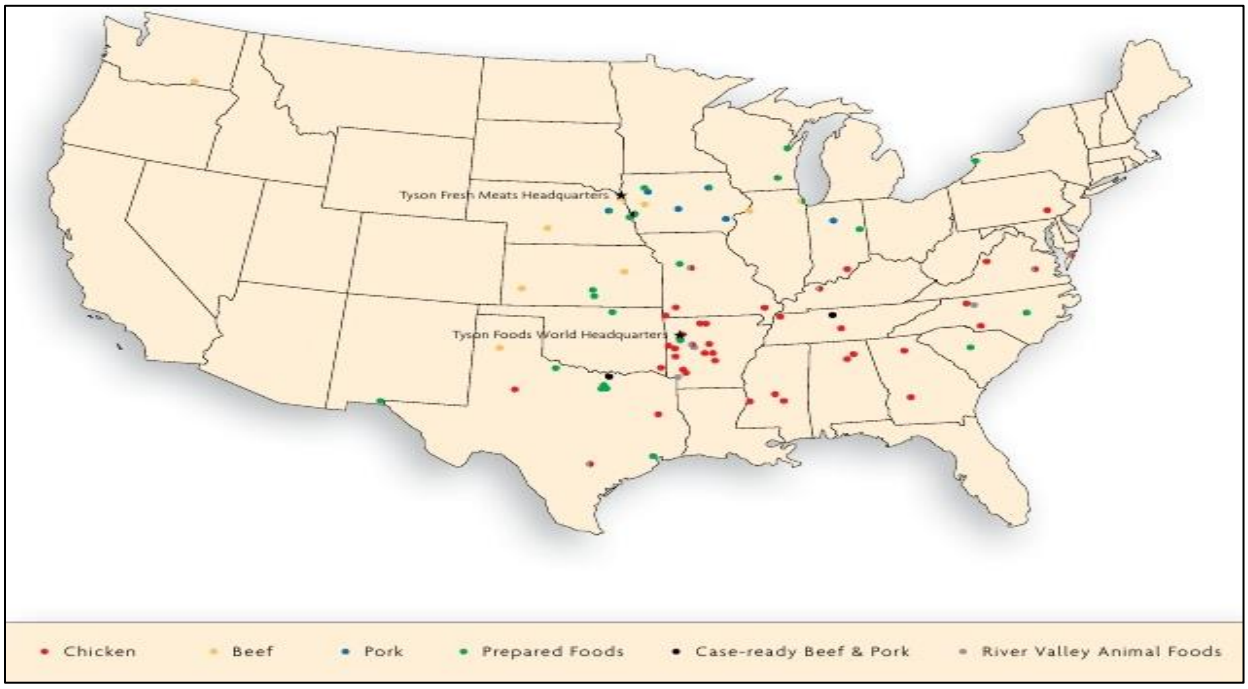
Tyson Foods provides meat products such as fresh and frozen beef and pork, frozen and fully cooked chicken, and ground beef to supermarkets, delis, fast-food, restaurants and other catering establishments. Its retail and foodservice customers include Wal-Mart, Kroger, Burger

King and McDonald's. The company also provides meat toppings for the pizza industry. Tyson's products fall under many brands including Ball Park, IBP, Inc., Hillshire snacking, Jimmy Dean, Open Prairie, State Fair, and True Chews.

Tyson Foods was known as the Tyson Feed and Hatchery, Inc., in 1947 and got its current name, Tyson Foods, Inc., in 1972. It built its first processing plant in 1958 and went public in 1963, growing by acquisitions. Some of the major companies Tyson Foods acquired are Mexican Original, Inc., a flour and corn tortilla processing plant in its hometown of Fayetteville, Arkansas, in 1983 and IBP, Inc., the Iowa beef processor in 2001. Also, in 2001, the company purchased Wright Brand Foods, Inc., a meatpacking company based in Vernon, TX. Tyson had previously bought Valmac Industries, Inc., a poultry processing company headquartered in Memphis, TN in 1984.

Tyson's Foods had a total operating margin of 6.7 % in 2019. However, the individual operating margins for each of its four product lines are Beef (7%), Pork (5.3%), Chicken (4.7%) and Prepared Foods (10.0%). Beef segment generally generates the most revenue with $15.83 billion in 2019 while chicken pulled in $13.3 billion in the same year. Revenue of $4.9 billion was attributed to pork and revenue from prepared food totaled $8.4 billion in 2019. International, intersegment sales and other sales accounted for a total of $2.7 billion.

Figure 3.6: Tyson Foods' US Location



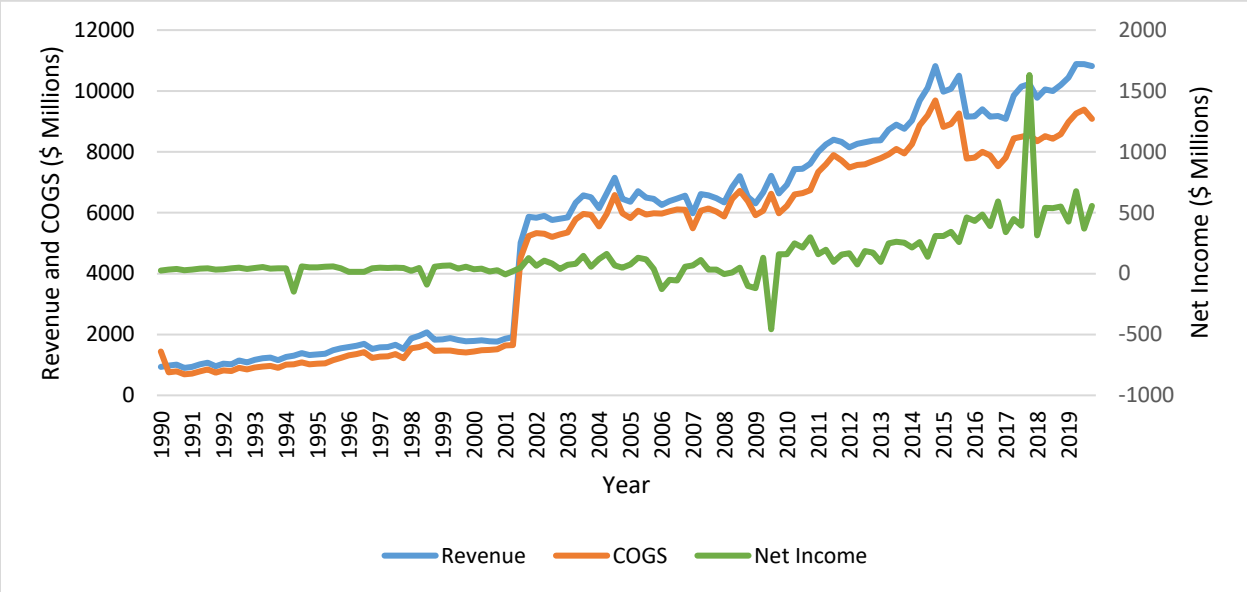
Source: ***https://www.slideshare.net/finance9/tyson-foods-investor-fact-book***

Tyson Foods has experienced an increasing trend in its revenues, cost of goods and net income over the period under review. For example, the company saw a significant shift in its revenue and cost of goods with its 2001 acquisition IBP, Inc., the largest suppliers of premium beef and pork products at the time. In 2018, the company saw experienced a fall in its net income. In the second and third quarters of that year, Tyson Foods had significant charges pertaining to the divestiture of non-protein businesses as well as pretax restructuring and related charges (Tyson Foods, 2019).

The company also observed an increase in its revenue, generating an annual revenue of $42.4 billion in 2019 as compared to its $26 billion in 2005. Similarly, the company's net income has generally increased over the years except for a decrease from US$3 billion in 2018 to US$2 billion in 2019. Tyson is estimated to have about 141,000 people in its employ, a 16.53 percent

increase from 2018 (121,000). Tyson is appropriate for this study because it represents firms within the agri-food sector that offer a single product (i.e. meat) that is not plant-based.

Figure 3.7: Trends in Tyson Foods' Revenue, Cost of Goods Sold (COGS) and Net Income (1990:2 – 2020:1)



Tyson Foods, Inc. has generated an average of US $5.4 billion in total revenue (Table 3.4) and has the least average capital invested with US$ 7.9 billion in comparison with the other agri-food firms.

Table 3.4. Summary Statistics of Tyson Foods' Financials (1990 Q1-2019 Q4) (N = 120)

VARIABLES	MEAN	SD
Total Revenue ($ billion)	5.44	3.42
Cost of Goods Sold ($ billion)	4.82	3.07
Net Income (Loss) ($ billion)	0.14	0.22
Total Assets ($ billion)	1.11	8.28
Total Liabilities ($ billion)	6.43	4.79
Total equity ($ billion)	4.71	3.57
Total Invested Capital ($ billion)	7.88	5.91

3.2.4. Conagra Foods, Inc.

Conagra Foods, Inc. is an American company specializing in consumer packaged food products. Established in 1919, Conagra Foods is currently headquartered in Chicago, Illinois. The company was founded as Nebraska Consolidated Mills by Frank Little and Alva Kinney in 1919, by bringing together four grain mills. It was headquartered in Grand Island, Nebraska until 1922, when it moved to Omaha, NE. Nebraska Consolidated Mills produced flour and ventured into cake mixes to expand its flour sales through value addition in 1951. Its success in the value-added business did not lead to expansion of that business line, choosing instead to divest its Duncan Hines product line to Proctor and Gamble in 1956. Despite the increasing market for ready-to-use products, the company focused attention on other fields, such as meat and livestock feed.

Nebraska Consolidated Mills changed to its name in 1971 to Conagra – joining the first part of Consolidated with Agriculture, to reflect its history and focus. It took the company's near-bankruptcy in the 1970s with its livestock feed expansions to refocus its business model. Over20 years, Conagra acquired more than 100 companies in the prepared food space. The company acquired brands included Banquet Foods, known for its frozen meat pies, in 1980, and a selection of brands from RJR Nabisco and Beatrice Foods. Conagra focused on smaller companies that had resulted from divestitures and leveraged buyouts in the 1980s food industry, spending about $500 million in 1993 alone. In 1998, Conagra purchased another $480 million of RJR Nabisco brands. These acquisitions set ConAgra up as the branded company it is today. Conagra's acquisitions have continued: Bertolli in 2012, Ralcorp in 2013, Tai Mei potato Industry in 2014, Frontera Food, Inc. in 2016 and Pinnacle Foods in 2018. They also divested some of its earlier acquisitions over the years, including its Canadian Del monte and its Wesson edible oils business in 2018.

Conagra's brands include Aunt Jemima (breakfast foods, mainly pancake mixes and syrups), Birds Eye (frozen vegetables), Crunch 'n Munch, Orville Redenbacher's and Slim Jim (snacks), Hunt's (tomato products like ketchup and tomato sauces), PAM (non-stick cooking sprays), and Vlasic (known for pickles). The company consequently has a huge range of products including bagels, French fries, granolas, muffin, beans, cheese, meat, cocoa mixes, pudding and other snacks as well as pre-cooked frozen meals. These products are distributed to grocery stores, restaurants and other food services.

Conagra established five segments in which the business operates. According to Conagra's annual report (2019), the company comprises the Foodservice, Grocery and Snacks, International, Refrigerated and Frozen and Pinnacle Foods. The Foodservice division pertains to food products including meals and other branded, customized and packaged food products for restaurants and foodservice companies. The Grocery and snacks segment entails shelf-stable food products sold to retail stores within the US, while the international segment involves food products, at varied temperature states, sold to both retail and foodservice businesses outside of the US. Branded and temperature-controlled food products sold to retail stores with the US are attributed to the Refrigerated and Frozen division. Pinnacle Foods includes food products that are branded, privately labeled and at varied temperature states and sold to both retail and foodservice companies in the US and Canada.

Conagra's Grocery and Snacks segment generates the most revenue with roughly $3.3 billion in 2019. In the same year, the Refrigerated and Frozen segment had revenue of $2.8 billion while the International segment accounted for $0.8 billion of Conagra's net sales. Foodservice generated $0.93 billion and $1.7 billion was attributed to Pinnacle Foods in 2019. The Pinnacle Foods segment was introduced in October of 2018 after the acquisition of Pinnacle. This segment

accounts for certain "branded and private-labeled food products, in various temperature states, sold in various retail and foodservice channels in the United States and Canada" (Conagra Brands Inc, 2019, p.25).

Figure 3.8: Conagra Brands' Locations

Source: (Conagra Foods, 2014a)

Among Conagra's segments, the firm's Grocery and Snacks segment has the largest operating profit over the years. In 2019, $0.7 billion was attributed to the Grocery and Snacks segment. This was a five percent decrease from 2018. Primarily in the United States, Conagra currently employs more than 18, 000 people. The company is estimated to have generated $9.5 billion in sales in 2019, a twenty percent increase from 2018. With a net income of US$0.7 billion in 2019, Conagra Foods experienced a 16-percentage points decrease from the previous year. The company has total assets worth roughly US$22.2 billion in 2019, a 113.8 percent increase from 2018. Unlike Tyson, Conagra follows produces a large variety of diverse products. The company

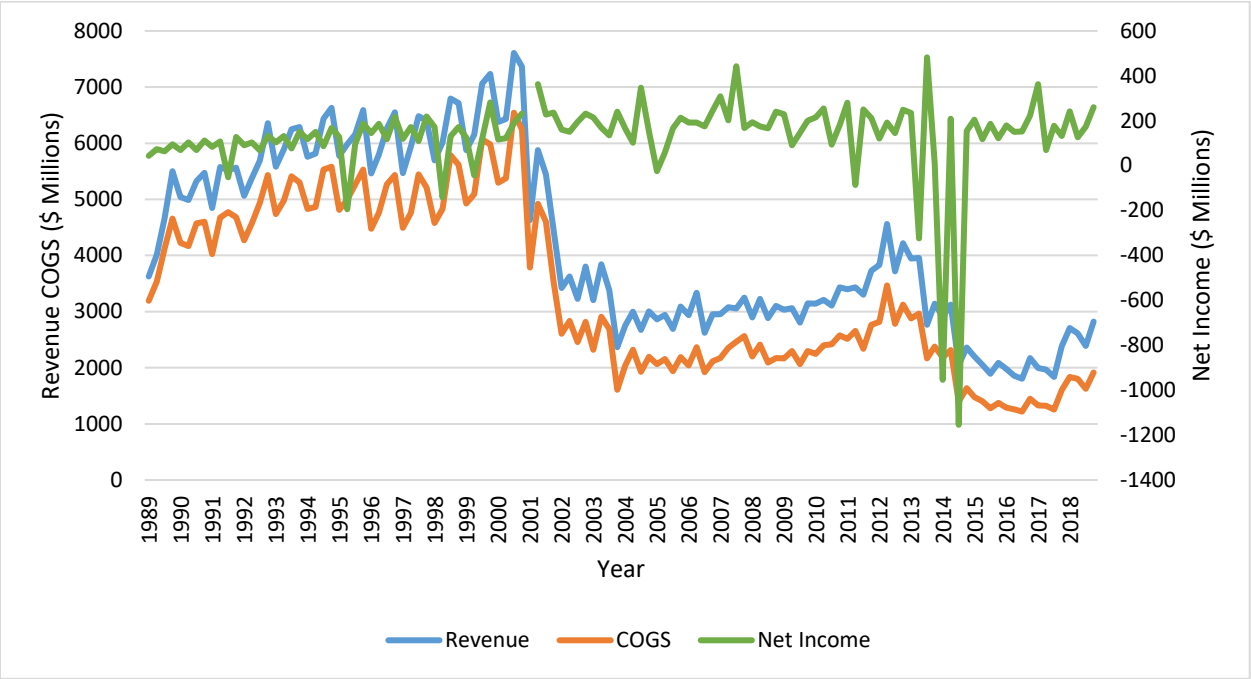
represents firms with a differentiation strategy. Table 3.5 presents Conagra's financials from 1990 to 2019. The company has the lowest variation in its total revenue in comparison to all selected firms, generating an average of US$4.2 billion.

Table 3.5. Summary Statistics of Conagra Company Financials (1990 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Total Revenue (US$ billion)	120	4.20	1.60
Cost of Goods Sold (US$ billion)	120	3.35	1.49
Net Income (Loss) (US$ billion)	119	0.13	0.19
Total Assets (US$ billion)	120	13.45	3.44
Total Liabilities (US$ billion)	120	9.31	2.66
Total equity (US$ billion)	120	4.14	1.25
Total Invested Capital (US$ billion)	120	8.13	3.36

Conagra experienced some significant falls in 2014 which the company attributed to weak volumes in their Consumer Foods business and profit pressures in their Private Brands operations (Conagra Foods, 2014b). In 2014, the company reported its operations in three segments; Consumer Foods, Commercial Foods, and Private brands. The Consumer foods, which included branded food sold primarily in North America to retail channels, had a three percent decrease in its net sales from approximately $7.6 billion in 2013 to about $7.3 billion in 2014. According to Conagra Foods (2014), the company's overall net sales increased by about $2.28 billion from $15.4 billion in 2013 to $17.7 billion in 2014 due to its acquisition of Ralcorp Holdings, Inc.

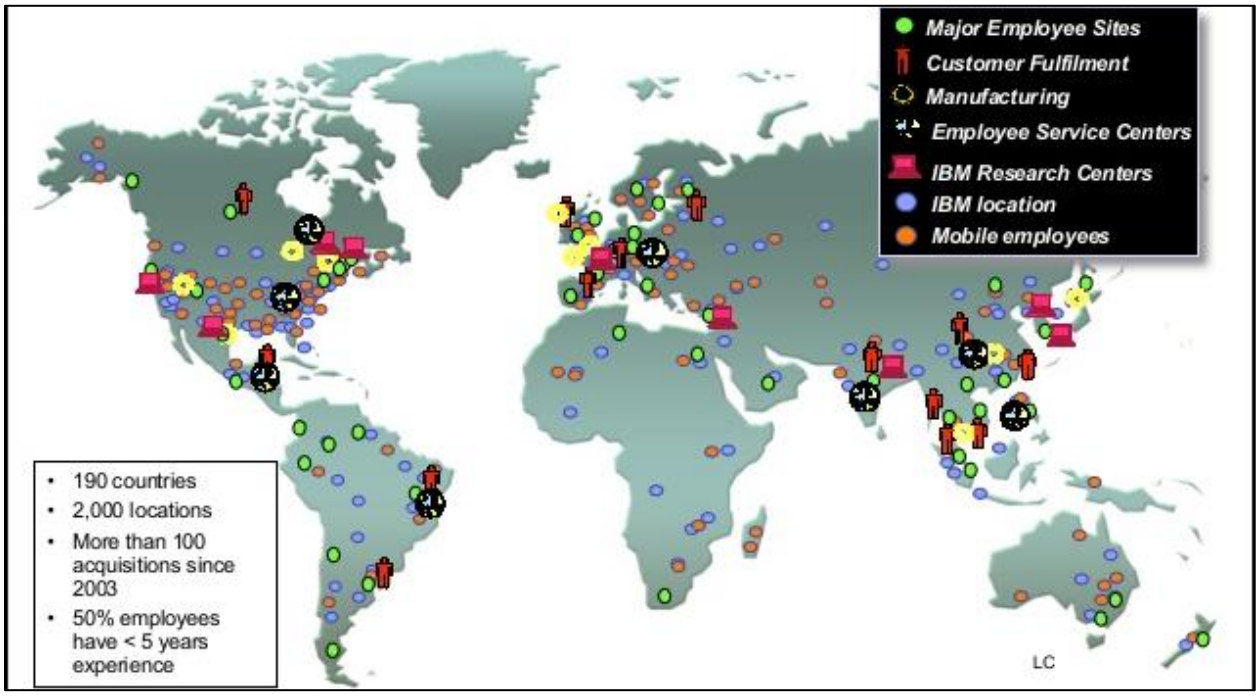
Figure 3.9: Trends in Conagra's Revenue, Cost of Goods Sold (COGS) and Net Income (1989:3 – 2019:2)



3.2.5. IBM

International Business Machines (IBM) is a global technology and consulting company founded in 1911 by Charles Ranlett Flint after merging four New York companies. Originally named Computing-Tabulating-Recording Company, IBM is headquartered in New York and currently operating in over 190 countries. Initial products by IBM included industrial time recorders, commercial scales and punched cards. Expanding its product range, IBM produces and sells hardware, middleware, and software while more recently providing cloud-based services and conducting research. Over the years, IBM products have included the Automated teller machine (ATM), floppy disks, hard disk drives, Dynamic random-access memory (DRAM), printers and personal computers.

Figure 3.10: IBM's Global Facilities



Source: ***https://www.slideshare.net/AndersQuitzauIbm/how-ibm-innovates-dec-2013-the-front-end-of-innovation-in-ibm***

In 1937, IBM's clients were able to process large amounts of data using IBM's tabulating equipment. This includes the US Government's use of the IBM 077 Collator to enhance the Social Security Program, which sought to keep large records on American workers and issue 26 million American workers with Social Security Numbers, and another 3.5 million with Employer Identification Numbers. IBM further developed the SABRE reservation system for American Airlines in 1961, which was adopted by many travel agencies and companies searching for, pricing booking and ticketing travel services offered by airlines, hotels, car rental companies, railways, and tour companies. The company has had a long partnership with NASA, working on some of its computing initiatives, including tracking the orbital flight of the Mercury astronauts in 1963.

IBM ventured into consultancy, serving the accounting firm PricewaterhouseCoopers (PwC), and collaborating with computer and internet-based companies, including Apple Inc.,

Cisco, Facebook, Macy's, Microsoft, Twitter, and UnderArmour. It also acquired Merge Healthcare in 2015 for $1billion, putting it into its health division, Watson Health. Watson Health is focused on increasing innovation in health services through personal health data analytics. Cleversafe and all digital assets from The Weather Company are also major acquisitions for IBM.

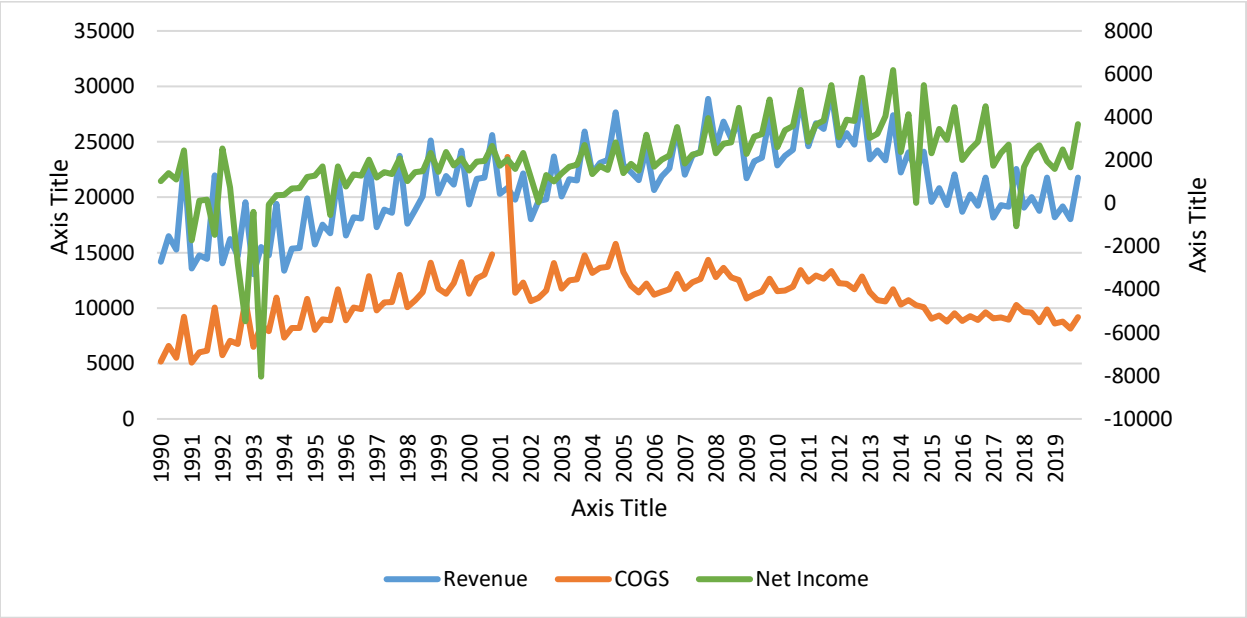
The company is estimated to earn $77.2 billion in sales with a net income of $9.4 billion in 2019. In the same year, IBM was estimated to have a market cap of approximately $152.2 billion and a price per share of $126.8. The company employs roughly 383,800 people with over 70 percent outside the US.

Table 3.6. Summary Statistics of IBM Company Financials (1990 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Total Revenue ($ billion)	120	21.16	3.77
Cost of Goods Sold ($ billion)	119	10.83	2.53
Net Income (Loss) ($ billion)	120	1.96	1.87
Total Assets ($ billion)	120	100.05	17.92
Total Liabilities ($ billion)	120	77.36	20.89
Total equity ($ billion)	120	23.11	6.69
Total Invested Capital ($ billion)	120	44.39	9.41

The technology firms generally have higher values for their firm characteristics as compared to the agri-food firms (Table 3.6). IBM total revenue averaged $ 21.2 billion with total assets worth $100.5 billion. The company has the highest cost of goods sold ($10.83 billion). IBM generates an average of $2 billion in net income. IBM, a dominant firm in the technology sector is appropriate for this study because it represents firms with a wide product range as well as having available public financial information.

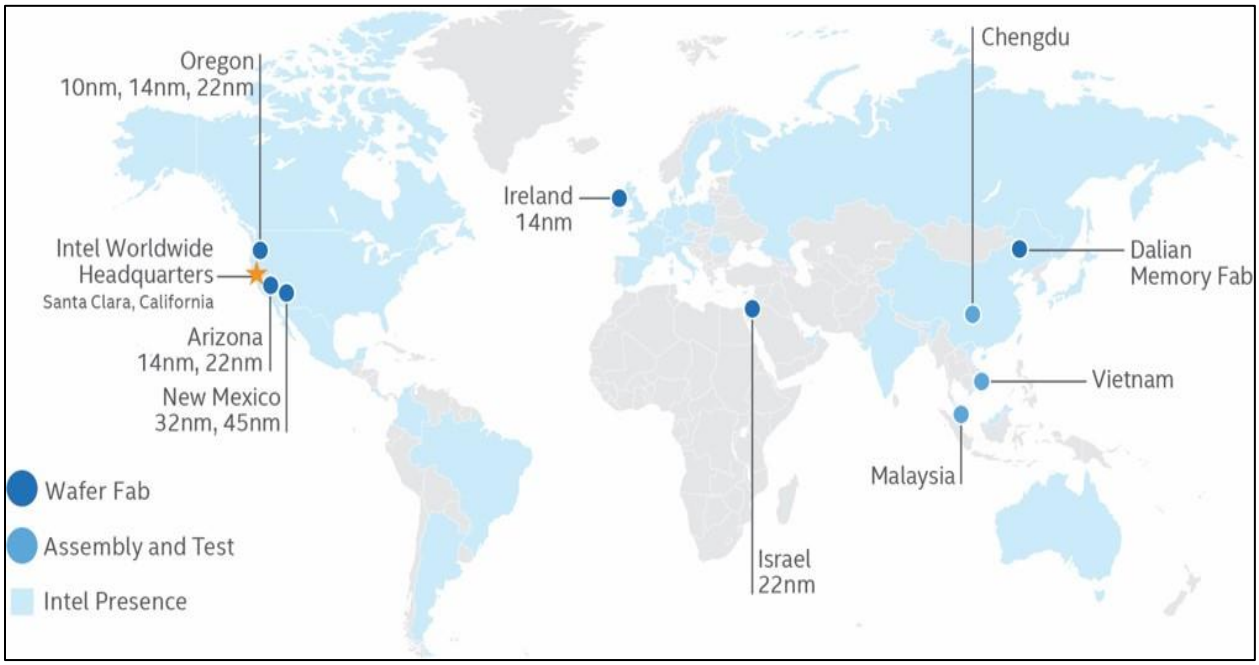
Figure 3.11: Trends in IBM's Revenue, Cost of Goods Sold (COGS) and Net Income (1990:1 – 2019:2)



3.2.6. Intel Corporation

Intel Corporation is a multinational technology company established by Gordon E. Moore and Robert Noyce in Mountain View, California in 1968, and is currently headquartered in Santa Clara, California. Intel, which was coined from Integrated Electronics, was initially called NM Electronics, after its founders. However, that name lasted only a month. The company started with an initial investment of $2.5 million which is equivalent to $18.5 million in 2020 dollars. Intel Corporation operates on five continents and about 46 countries worldwide.

Figure 3.12: Intel's Manufacturing Facilities and Presence



Source: Intel (2017)

Intel's first product was the 3101 Scottky TTL bipolar 64-bit Static Random-Access Memory (SRAM) in 1969. Intel created the first commercially available microprocessor (Intel® 4004), a central processing unit (CPU) in 1971, and the first microcomputers in 1973. Other products by Intel include the Dynamic random-access memory (DRAM) chips, the MOSFET[1] silicon gate SRAM chip (the 256-bit 1101), flash memory, integrated graphics processing units (iGPU), motherboard chipsets, connectivity products like Wi-Fi and Bluetooth chipsets, vehicle automation sensors and network interface controllers and integrated circuits. The company, however, focused on producing microprocessors, supplying processors to other companies like IBM, Apple, Lenovo, the Hewlett-Packard Company (HP) and Dell.

[1] Metal-oxide-semiconductor field-effect transistor.

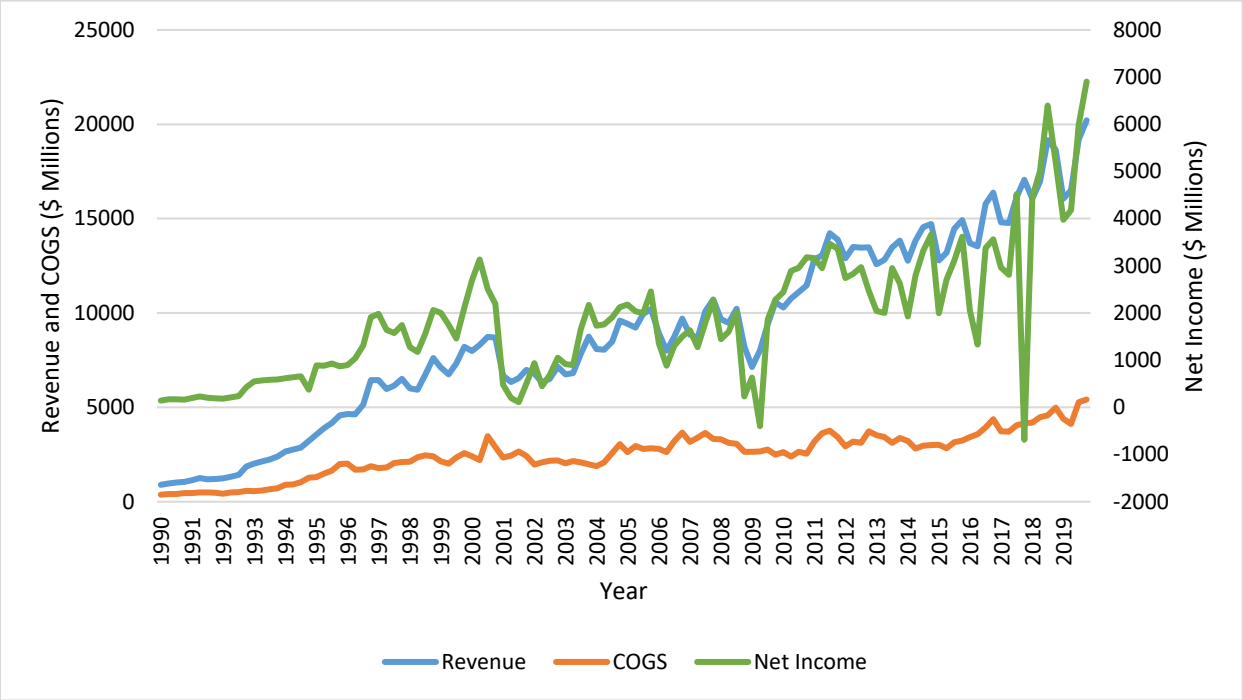
Intel Corporation generated revenue of approximately $72 billion in 2019 which served as a 1.58% increase from that of 2018 ($70.8 billion). The company's net income by the end of 2019 was approximately $21 billion with a net profit margin of 29.25% and a gross margin of 58.56%. Intel experienced an increase in its total assets by 6.69% from $128 billion in 2018 to $136.5 billion in 2019. In 2019, Intel Corporation is estimated to have about 110,800 employees by the year's end. Intel Corporation's focus on microprocessors (single product) has made it an appropriate firm for this study. Additionally, Intel is dominant in the technology sector with available financial information to account for the past three recessions periods.

Table 3.7. Summary Statistics of Intel Company Financials (1990 Q1-2019 Q4) (N = 120)

VARIABLES	MEAN	SD
Total Revenue ($ billion)	8.91	4.83
Cost of Goods Sold ($ billion)	2.52	1.15
Net Income (Loss) ($ billion)	1.87	1.41
Total Assets ($ billion)	54.07	36.53
Total Liabilities ($ billion)	17.52	16.82
Total equity ($ billion)	36.55	20.69
Total Invested Capital ($ billion)	42.30	28.09

Intel Corporation has generated an average of $8.9 billion in sales over the past three decades. It has total assets worth $54.1 billion, almost half that of IBM's. The company also has invested capital worth $42.3 billion in comparison with the other agri-food firms.

Figure 3.13: Trends in Intel's Revenue, Cost of Goods Sold (COGS) and Net Income (1990:1 – 2019:4)



3.2.7. Selected Company Summary Statistics for Financial Ratios

This section provides the financial ratios for each company over the 1990-2020 period, capturing three recession periods. Table 3.8 to 3.13 present these statistics. Bunge experiences a 0.01 percent return on both its sales and its assets on average. On a quarterly basis, Bunge operations utilize an average of $1.84 of assets to generate $1 of revenue as shown in Table 3.8. These results indicate that Bunge is using its assets more efficiently than the other five firms.

Table 3.8. Summary Statistics of Bunge Company Financial Ratios (1999 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Return on Sales (ROS) ($)	81	0.01	0.03
Return on Assets (ROA) ($)	78	0.01	0.01
Capital Intensity ($)	78	1.84	0.24
Liability per dollar of Revenue	78	1.15	0.19

ADM had a return on sales of 0.03 indicating that the firm converts three percent of its sales into profits. The firms' ROA indicates that for each dollar invested in assets, Conagra earned a cent. Also, for each dollar of revenue generated, the company uses an average of 2.6 dollars' worth of its assets.

Table 3.9. Summary Statistics of ADM's Financial Ratios (1990 Q1-2019 Q4) (N = 118)

VARIABLES	MEAN N=118	SD
Return on Sales (ROS) ($)	0.03	0.02
Return on Assets (ROA) ($)	0.01	0.01
Capital Intensity ($)	2.60	0.55
Liability per dollar of Revenue	1.34	0.26

Table 3.10 presents the financial ratios for Tyson Foods Inc. The return on sales of 0.02 shows that the firm generates two cents of profit per dollar of its sales. The firm's ROA is 0.01, indicating that for every dollar Conagra invested in assets, an average of one cent is generated. On average, $2.2 of assets earns Tyson a dollar in net sales.

Table 3.10. Summary Statistics of Tyson's Financial Ratios (1990 Q1-2019 Q4) (N = 120)

VARIABLES	MEAN N=120	SD
Return on Sales (ROS) ($)	0.02	0.03
Return on Assets (ROA) ($)	0.01	0.01
Capital Intensity ($)	2.22	0.61
Liability per dollar of Revenue	1.34	0.45

Conagra receives the highest returns on sales (ROS) at 0.04 but the highest variation in its ROS as compared to the agri-food firms. To generate a dollar in revenue the company must use on average assets worth $3.7, the highest for the agri-food firms. However, Conagra has the highest variation with its capital intensity. Like all the other agri-food firms, for every dollar Conagra invested in assets, an average of one cent was generated.

Table 3.11. Summary Statistics of Conagra Company Financial Ratios (1990 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Return on Sales (ROS) ($)	119	0.04	0.08
Return on Assets (ROA) ($)	119	0.01	0.01
Capital Intensity ($)	120	3.74	1.82
Liability per dollar of Revenue	120	2.54	1.22

IBM generates nine cents of profit per dollar of its net sales while generating two cents from every dollar the company invested in assets. IBM has a high capital intensity suggesting that the firm uses valued assets of $4.8 to generate a dollar of the firm's revenue.

Table 3.12. Summary Statistics of IBM Company Financial Ratios (1990 Q1-2019 Q4)

VARIABLES	N	MEAN	SD
Return on Sales (ROS) ($)	120	0.09	0.09
Return on Assets (ROA) ($)	120	0.02	0.02
Capital Intensity ($)	120	4.83	0.94
Liability per dollar of Revenue	120	3.69	0.95

Intel has the highest return on assets than all other firms in the study as shown in Table 3.13. This suggests that Intel is better at converting its investments into profit compared to all the other firms selected for this study. The firm also has the highest return on sales. Thus, Intel does a relatively better conversion of its sales into profits compared to the other selected firms (20%). Yet, for every dollar the firm generates in revenue, Intel must use $5.7 worth of assets.

Table 3.13. Summary Statistics of Intel's Financial Ratios (1990 Q1-2019 Q4) (N = 120)

VARIABLES	MEAN N=120	SD
Return on Sales (ROS) ($)	0.20	0.07
Return on Assets (ROA) ($)	0.04	0.02
Capital Intensity ($)	5.67	1.11
Liability per dollar of Revenue	1.68	0.74

The technology firms (non-agri-food firms) earn relatively more returns on both their assets and sales as compared to the agri-food firms. However, the technology firms utilize a higher value of assets to generate $1 in revenue.

The average return on sales for the agri-food companies averaged about 2.6%, compared to an average of about 14.4% for the technology companies. The variability between the averages within each group was also higher for agri-food than technology companies, with the coefficient of variation averaging about 1.5 for the former and 0.7 for the latter. This would suggest that the return on sales for agri-food companies have not only been lower, but it has been more variable.

However, within agri-food, the variability of the return on sales for ADM was the lowest (0.6) over the whole duration while Bunge had the highest (2.3). Indeed, ADM's coefficient of variation for its ROS was lower than IBM's. This is presented in Figure 3.14.

Figure 3.14: Average Return on Sales for Selected Company over Study Duration

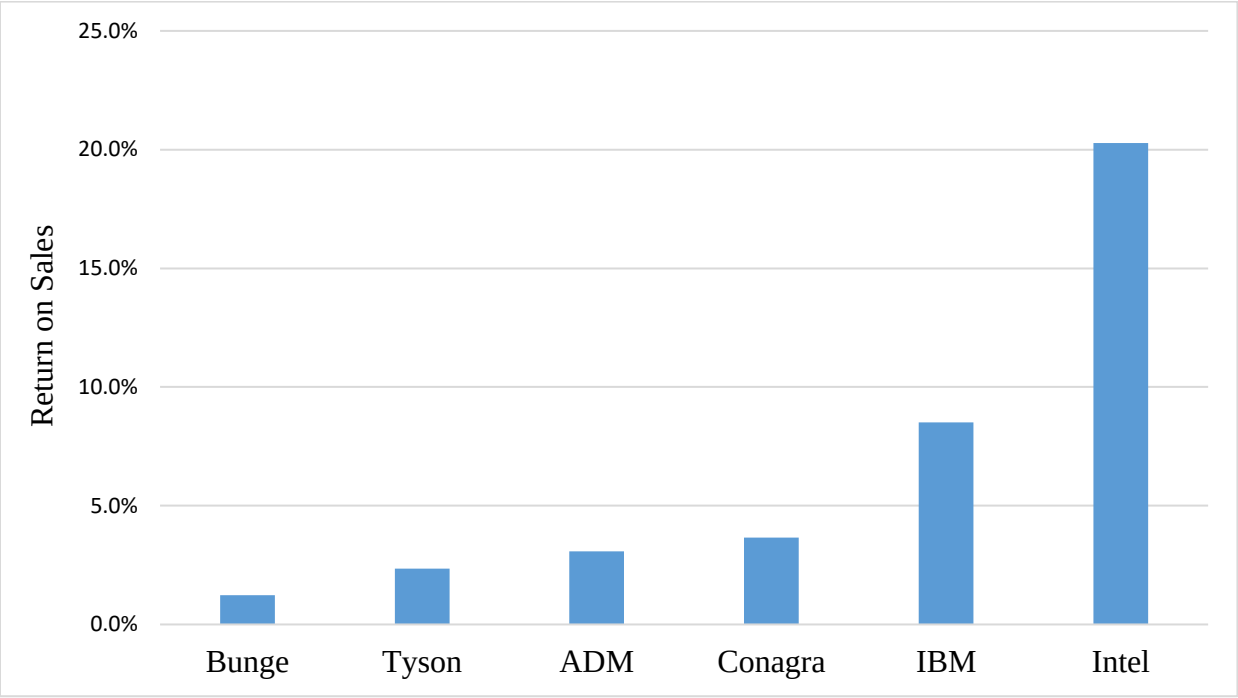


Figure 3.15. presents the average return on assets for the firms used in the case study over the past three decades. The average return on assets for the agri-food companies averaged about 0.01, as compared to an average of about 0.03 for the technology companies. The technology firms earn relatively more returns on their assets as compared to the agri-food firms. This suggests that technology firms are better at converting their investments into profit compared to the agri-food firms selected for this study.

Figure 3.15: Average Return on Assets for Selected Company over Study Duration

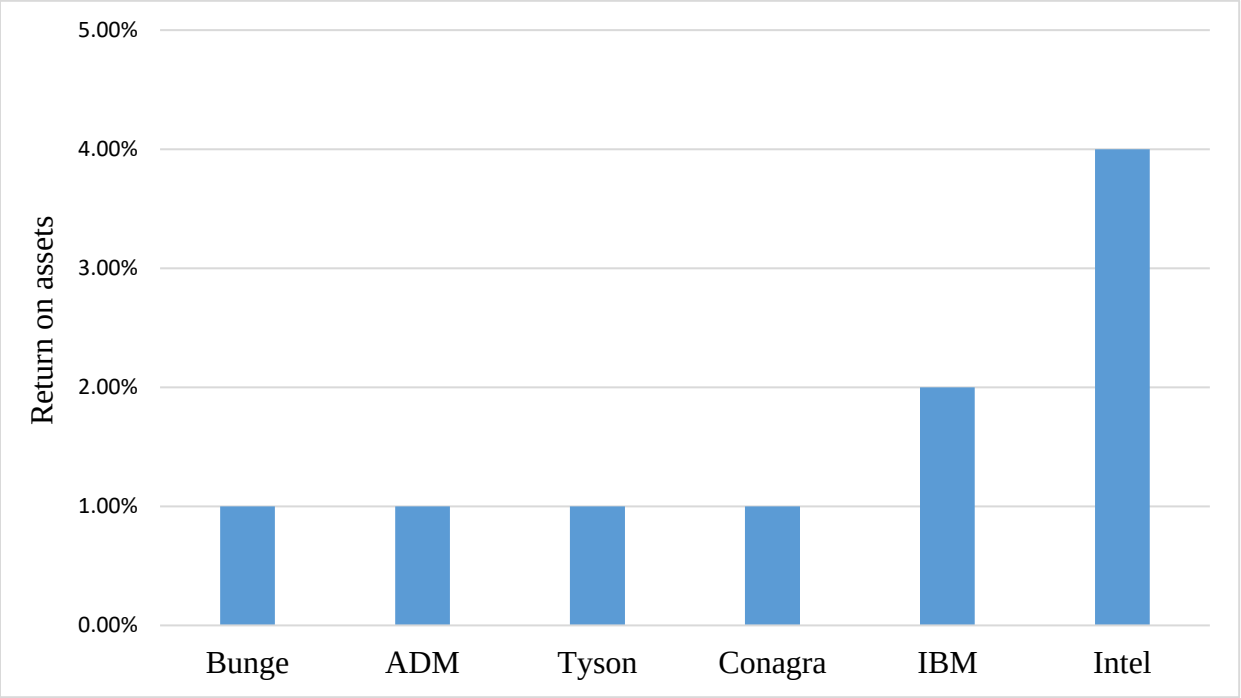
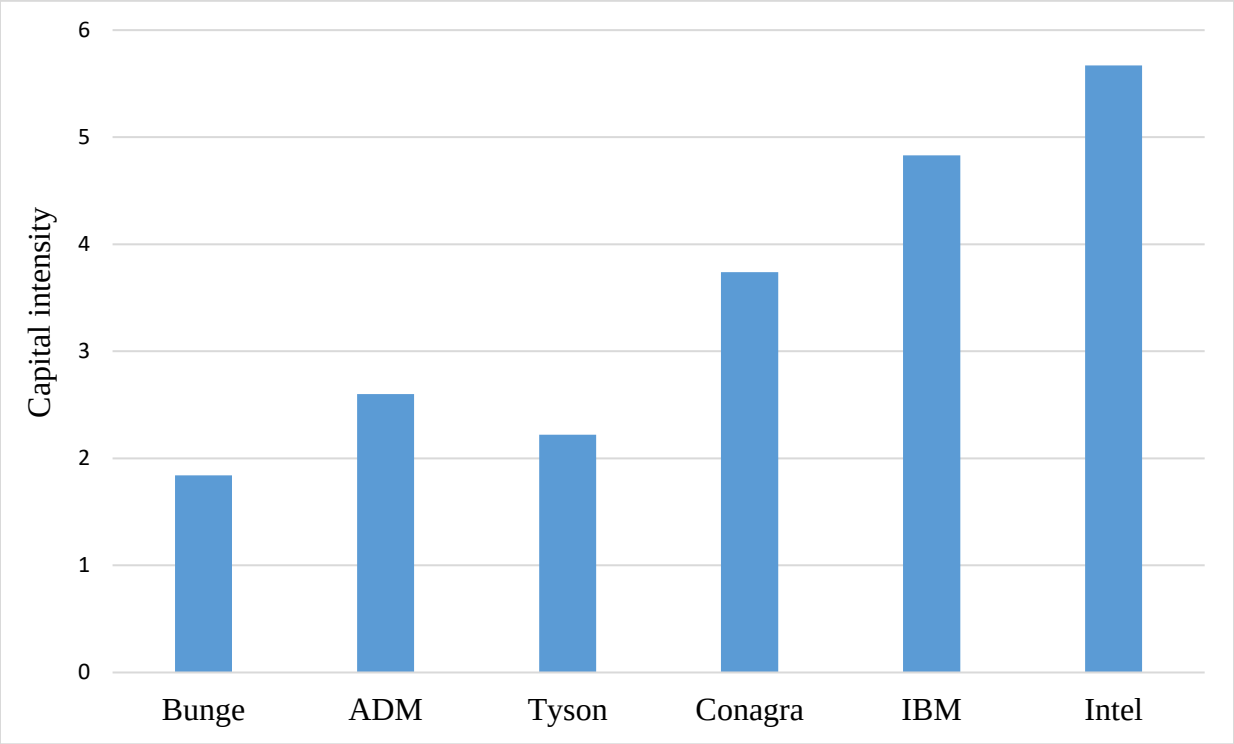


Figure 3.16 shows the companies' dollar return on their investment. The average capital intensity for the agri-food companies averaged about 2.6, compared to an average of about 5.25 for the technology companies. The figure indicates that technology firms utilize relatively more significant assets in order to produce a dollar of sales revenue than the agri-food companies. According to Tuzel (2010, cited in Koh, Rhou, Lee, & Singal, 2018), high levels of capital intensity may magnify the volatility of earnings since the large quantities of illiquid assets limit the firms' ability to adapt to any changes in economic conditions that could possibly arise.

Figure 3.16: Average Capital Intensity for Selected Company over Study Duration



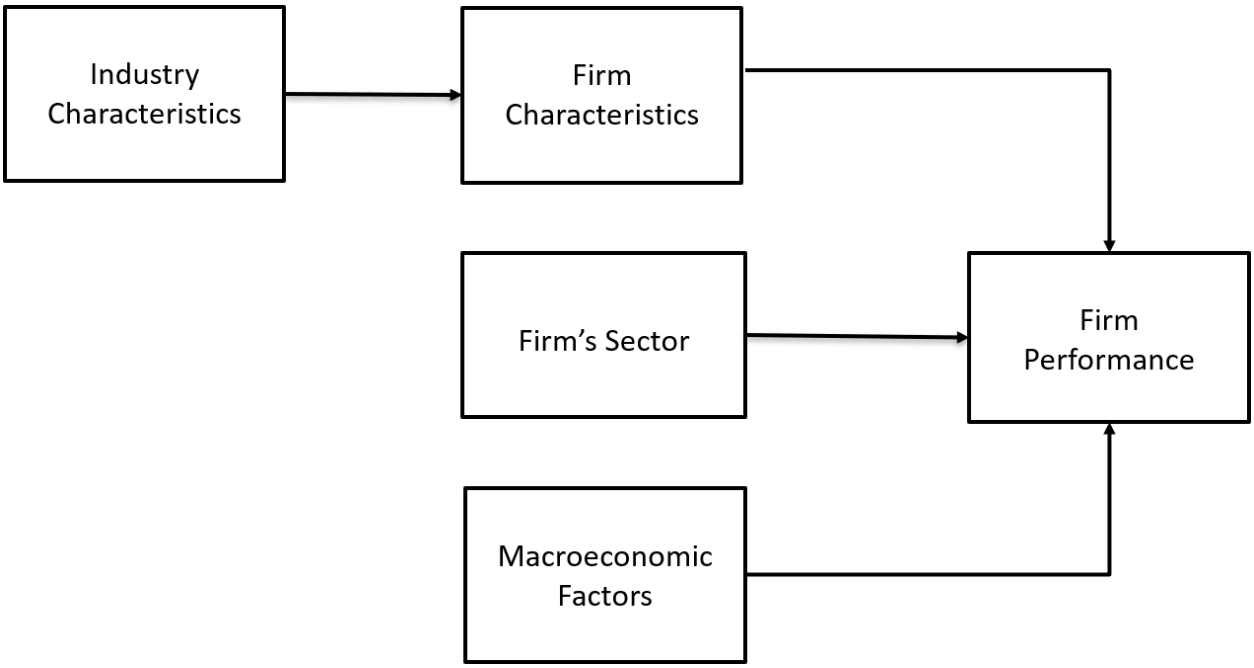
3.3. Conceptual Models

Conceptually, this study envisages firm performance as determined by its characteristics, its industry, and the macroeconomic environment at each point in time (Figure 3.2). The macroeconomic factor of interest in this study is a recession. It is hypothesized that recessions affect firms differently within industries and across industries. They may also affect them differently across time because of the capabilities that firms build over time to increase their ability to resist recessions. For example, a well-diversified firm may structure its product portfolio to make it recession-proof, with demand for certain products in the portfolio increasing during recessions, while others perform best when the economy is expanding.

As discussed in the literature review section, firm characteristics have been determined to have effects on their performance. For example, leverage may allow companies to expand the business through investments. Studies, depending on the characteristics observed, have suggested positive or negative relationships between firm characteristics and performance (Hendricks & Singhal, 2001; Kaguri, 2013; J. Lee, 2009). For example, according to Mehari and Aemiro (2013), firm size, asset tangibility, and leverage had a statistically significant positive effect on the firms' performance. However, Sumaira and Amjad (2013) observed leverage, firm age and earning volatility impacted performance negatively. Other studies have also determined that firm characteristics do not influence firm performance, rather firm performance was attributed to industry characteristics (Schmalensee, 1985).

The firm's industry can also determine its performance. As discussed in Chapter 2, the type of industry (i.e. anti-cyclical or cyclical) could determine how firms' performance may or may not be interrupted during economic downturns. Also, industries that may benefit from government support and policies are more likely to perform relatively better than firms without such support. This section further presents the conceptual framework of this study in Figure 3.2. below. The conceptual framework of this study indicates that the performance of firms is influenced by industry and firm characteristics as well as the firm's sector and macroeconomic factors. Additionally, the conceptual framework hypothesizes that the industry can affect firm performance either directly through the determination of firm characteristics.

Figure 3.17: Conceptual Framework



3.3.1 Analytical Framework

The analytical framework used is for this study presented and discussed in this section. The first objective of the study sought to determine if recessions affect performance. This is accomplished analytically by estimating the means of the performance indicator of interest with recession and without recession. The means are then tested for equality since the relevant hypothesis is that the two means are the same and the alternative hypothesis is that the mean of the performance indicator of interest in a recession is less than without recession. That is:

$$\bar{x}_{ir} = \frac{1}{T}\left(\sum_{t=1}^{T} x_{ir}\right) \text{"} r = \{0,1\}$$

$$H_0 : \bar{x}_{i0} = \bar{x}_{i1}$$

$$H_1 : \bar{x}_{i0} > \bar{x}_{i1}$$

Where $\bar{x}_{ir}$ is the performance indicator mean for the ith firm with recession (r = 1) and not with recession (r = 0).

The second objective sought to determine the firm and industry characteristics that determined performance, controlling for recessions. To achieve this objective, econometric models are employed. The chosen models are derived from the general Ordinary Least Squares regression (OLS) model. The underlying assumptions of this approach include BLUE (Best Linear Unbiased Estimate). The general OLS model may be represented as:

$$\boldsymbol{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon} \quad \textbf{(3.4)}$$

where Y is the dependent variable, $X_1, X_2, \ldots, X_n$ are the independent variables and the βs are coefficients estimated by the OLS model. The error term is represented by ε. The following assumptions are made: The conditional mean is zero; there is no multicollinearity or perfect collinearity between the independent variables; There is homoskedasticity; There is no autocorrelation and the error term is normally distributed.

Given the nature of the study, a panel dataset could be constructed with the six firms and with the time series of the data of interest selected from 1990 to 2019. Quarterly data are used in this study because recessions are usually measured in quarters. Panel datasets are more useful when the dataset is balanced, i.e., there is an equal number of observations across each panel member. When the panel dataset is unbalanced, as was the case in this research, the unbalanced panel data begins to exhibit problems with its error term if that error term exerts a significant effect on the system (Baltagi, 2005). The imbalance was due to Bunge becoming a publicly-traded company in 2001, several years after the other firms in the panel, and missing some of the recession events the dataset sought to capture. The OLS model for the analysis for a panel dataset may be presented as:

$$\boldsymbol{Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 X_{it} + \cdots + \beta_n X_{it} + \varepsilon_{it}} \quad \textbf{(3.5)}$$

All variables are as defined above and the subscripts i and t represent the individual firms and time. In this study, *t* is quarterly.

As earlier mentioned, the ordinary least squares model was used in this study. In the absence of the balanced dataset, the panel dataset was abandoned in favor of the analysis of the firms individually. In addition, there was no justification to envision that the selected firms have any direct and consistent relationship for them to be considered in a system or as a single model.

The estimated model was, therefore, presented as:

$$\boldsymbol{Y_t = \alpha + X_t\beta + \varepsilon_t} \quad \textbf{(3.6)}$$

where Y_t is the time series of the performance indicator of interest in time *t* for each firm, *i*, β is a vector of coefficients, X_{it} is a matrix of explanatory variables associated with firm *i*, and ε_t is the error term in time *t* for the i^{th} firm. The error term can be serially correlated over time, thereby violating one of the underlying assumptions of the OLS. This may be addressed with the Cochrane-Orcutt transformation, presented as:

$$\boldsymbol{y_t - \rho y_{t-1} = \alpha(1-\rho) + \beta(X_t - \rho X_{t-1}) + \varepsilon_t} \quad \textbf{(3.7)}$$

Where all variables are as defined and $0< \rho < 1$. The model suggests that t = 2, 3, …T, indicating a loss of the first observation, possibly introducing loss of efficiency. The Prais-Winsten procedure provides a useful transformation for t-1 to recover that lost first observation, thus:

$$\boldsymbol{\sqrt{1-\rho^2}y_1 = \sqrt{1-\rho^2} + \left(\sqrt{1-\rho^2}X_1\right)\beta + \left(\sqrt{1-\rho^2}y_1\right)\varepsilon_1} \quad \textbf{(3.8)}$$

Once this transformation is accomplished, the usual OLS may be applied. The Prais routine in Stata was used to estimate the regressions for each firm, selecting the appropriate firm variables for each firm. The Prais routine allows for addressing the potential risk of autocorrelation without any loss of efficiency.

3.3.2 Justification of variables

For this study, the quarterly percentage change in the return on sales (ROS) will serve as a proxy of firm performance. The Return on Sales (2) measures a firm's performance by analyzing how efficiently a firm derives profits from its sales or revenue (Equation 2). Many studies have used different proxies for firms' performance: returns on assets (ROA) and return on equity (ROE) (Cinca, Molinero, & Larraz, 2005; Delen, Kuzey, & Uyar, 2013; Ho & Wu, 2006; Saad M & Zhengge, 2016). Other studies have measured firm performance using the return on sales (Tallman & Li, 1996) while others have used return on sales with one or both of the measures previously mentioned (Chhibber & Majumdar, 1998; Hatem, 2014). Returns on Investment, however, has been used a few times in measuring firm performance (Bashir, Abbas, Manzoor, & Akram, 2013). Return on sales was used in this study because in measuring the firms' operational efficiency, it allows for comparison between different time periods and between firms regardless of the firm scale. Geringer et al. (1989 cited Tillman & Li 1996, p.187) asserted that sales-based measures prevent differential asset valuations that are engendered new investments and/or depreciation.

As observed in Chapter 2, the majority of studies have used firm size, age and, more recently, ownership as representations for firm characteristics that influence performance. These characteristics are what Mgeni and Nayak (2016) categorize as structural firm performance. Liquidity, sales growth, and risk have served as proxies for firm characteristics in other studies (Chhibber & Majumdar, 1998; Liu & Pang, 2006; Papadogonas, 2007; Wen, Chen, & Chen, 2008). This research uses the firms' return on assets (ROA), gross margin percent, capital intensity, debt-equity ratio, and the presence of a recession as the predictor variables. The return on assets, expressed as a percentage, indicates how profitable a company's assets are in generating revenue. A higher return on assets shows the company's ability to efficiently derive earnings from its assets

and hence indicates better firm performance. The gross margin percent indicates the contribution of sales revenue less cost of goods sold to sales revenue. A higher gross margin percent denotes relatively better gross profits which consequently implies better firm performance.

Previous studies have represented the number of employees and firm capital investment as the firm size. This study, however, uses capital investment (capital intensity) as a proxy for firm size. Capital intensity measures the firm's capital investment used to generate revenue. According to Lee (2010), businesses need physical buildings and equipment and hence capital intensity plays an important role in determining company performance. Similarly, Gamlath and Rathiranee (2013) posit that capital intensity and asset tangibility have a significant role in firms' financial performance. The tangibility of assets is used in determining the capital structure and thus, represented by Total Debt Ratio and Debt to Equity Ratio. Their study revealed a statistically significant relationship between capital intensity and asset tangibility and firm performance. Increasing the capital employed in the production of the same unit implies that the firm is becoming more capital intensive (Rathiranee & Gamlath, 2013). Some studies posit that capital intensity may increase firm risk as it obtains high levels of fixed costs that remain unchanged with the variation in sales levels (Shapiro and titman, 1986). Contrarily, others argue that initial investments in capital allow firms to experience cost savings in subsequent years which will be important especially in periods of economic downturns (S. Lee & Qu, 2011).

Additionally, recessions are hypothesized to impact firm performance negatively (Youn & Gu, 2009). A preliminary regression was run with the debt-equity ratio and the variance inflation factor (VIF) was used to assess multicollinearity within this model. The regression model exhibited high multicollinearity. The following regression equation was constructed:

$$\boldsymbol{ROS\%_{it} = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \beta_5 X_{5t} + \beta_6 X_{6t} + \varepsilon_{it} \quad \forall\, i = 1, 2, \ldots, 5} \quad \textbf{(3.9)}$$

where the explanatory variables are as follows:

$X_1 =$ ROA%

$X_2 =$ CI%

$X_3 =$ GM%

$X_4 =$ DER%

$X_5 =$ Recession (=1; 0 otherwise)

And *i* represent the six selected companies. Lags for each independent variable will be included in the model to assess the potential effects of characteristics in prior periods on the current performance indicator. Should the lagged variables present statistically significant coefficients, then it implies that they do influence current performance.

3.3.3 Hypotheses

In this analysis, five hypotheses were derived from the objectives of the study as well as reviewed literature. The first hypothesis is derived from the overall objective of this study; the performance of firms significantly decreases during recession periods. The null hypothesis (H_0), as shown below, states that recession does not influence the performance of a firm while the alternative hypothesis (H_1) states that recessions have negative effects on firms' performance. The first hypothesis is presented as:

$$H_0{:}\beta_{RCS} = 0$$

$$H_1{:}\ \beta_{RCS} < 0$$

As a result of the many effects that arise during recessions, firms are generally expected to perform poorly. If the null hypothesis is rejected, then it can be inferred that recessions have a

negative effect on the firm's performance. The next four hypotheses were tested to determine if the firm characteristics play a significant role in influencing the firms' ability to sustain the firms' performance. The hypotheses are presented below:

$$H_0{:}\beta_{ROA} = 0$$

$$H_1{:}\ \beta_{ROA} > 0$$

It is hypothesized that return on assets will have an impact on the firms' performance. The null hypothesis states that return on assets has no impact on firm performance while the alternative hypothesis asserts that the return on assets has a positive effect on its performance. If the null hypothesis is rejected, then it can be inferred that return on assets has a positive effect on the firm's performance.

$$H_0{:}\beta_{GM} = 0$$

$$H_1{:}\ \beta_{GM} > 0$$

Gross margin percent is presumed to have an impact on the firms' performance. The null hypothesis states that the gross margin percent has no effect on the performance of firms. The alternative hypothesis states that the gross margin percent positively influences firms' performance. If the null hypothesis is rejected, then it can be inferred that gross margin percent has a positive effect on the firm's performance.

$$H_0{:}\beta_{CI} = 0$$

$$H_1{:}\ \beta_{CI} > 0$$

It is hypothesized that capital intensity influences firms' performance. The null hypothesis states that capital intensity has no effect on the performance of firms. The alternative hypothesis

states that capital intensity has a positive effect on firms' performance. If the null hypothesis is rejected, then it can be inferred that capital intensity has a positive effect on the firm's performance.

$$H_0{:}\beta_{DER} = 0$$

$$H_1{:}\ \beta_{DER} \neq 0$$

Finally, the firms' debt-equity ratio is hypothesized to influence the performance of the firms. The null states that the debt-equity ratio affects firm performance. The alternative states that firm performance is not influenced by its debt-equity ratio. If the null hypothesis is rejected, then it can be inferred that the debt-equity ratio affects firm's performance.

Chapter 4 - Results and Discussion

The results of the models presented in Chapter 3 are discussed in this chapter. The chapter is divided into two sections, each one addressing one study objective. Therefore, the first section is devoted to discussing the results determining if recessions affect performance. Sub-sections of the second section, where applicable, present the results of the hypotheses associated with the objective and addresses them by firms.

4.1. Effect of Recessions on Firm's Performance

This section discusses the effects of recession on the performance of firms. The results are shown in Table 4.1 below. The results show that Tyson Foods and Intel, with a relatively narrow range of products, perform relatively poorly in recession periods as compared to growth or expansion periods. Thus, recession has a statistically significant negative effect on these two firms. The results further showed that Bunge, ADM, Conagra, and IBM, with a wider range of products, were observed to have increased in their return on sales during recession periods as compared to non-recession periods. These results, however, were statistically significant for only ADM and were not statistically significant for Bunge Conagra and IBM.

Recession was observed to cause a statistically significant negative effect on the gross margin percent of Tyson, Conagra, and Intel. The gross margin percent of Bunge, ADM, and IBM increased during the recession periods. These results were also not statistically significant.

Table 4.1. Comparison of Average Performance in Expansionary and Recessionary Periods

Sector	Firm	Product Focus		Firm Performance Indicators							
				ROS (%)				GM (%)			
		Narrow	Wide	Expansion	Recession	Test statistic	Pr(|T|>|t|)	Expansion	Recession	Test statistic	Pr(|T|>|t|)
Agri-Food	**Bunge**		x	1.23	1.28	t = -0.06	0.9531	6.75	7.66	t= -1.02	0.3092
	ADM		x	2.98*	3.87*	t = -1.73	0.0856	9.37	9.72	t= -0.37	0.7109
	Tyson	x		2.54**	0.97**	t = 2.15	0.0334	14.08***	6.80***	t=3.13	0.0022
	Conagra		x	3.56	4.27	t = -0.35	0.7286	23.19***	18.54***	t = 2.78	0.0063
Technology	**IBM**		x	8.46	8.84	t = -0.15	0.8791	48.82	49.37	t= -0.24	0.8128
	Intel	x		21.51***	11.68***	t = 5.49	0.0000	70.29***	63.22***	t = 4.66	0.0000

Testing the hypothesis that ROS is the same whether in a recession or not, it is found that this is true for Bunge, Conagra, and IBM. The ROS of ADM, Tyson, and Intel is different in recession and expansion. ADM's average ROS, in and out of recession, is different at a 10% significance level while Tyson's average ROS is significantly different at the 5% level whether in a recession or not. The mean ROS of Intel is significantly different at the 1% level. The average gross margin is not statistically different for Bunge, ADM, and IBM whether in a recession or not. The average gross margin for Tyson, Conagra, and Intel, however, are statistically different at the 1% significance level.

4.2. Effect of Firm Characteristics on Firms' Performance

4.2.1. Testing for Violations of OLS Assumptions

In Chapter 3, we hypothesized that the firms' characteristics influence the performance of the firms. This section presents and discusses the effects of firm characteristics on performance. This section, therefore, addresses Objective 2 of the study: Assessing the extent to which firm characteristics influenced performance, controlling for recession.

The method used to achieve this objective is the OLS regression model. The OLS is built on some very specific and stringent assumptions. They are summarized as the BLUE (Best, Linear, Unbiased Estimator) assumptions. The first assumption is that the model is linear in parameters alpha and beta; the dependent variable is a linear function of the independent variables and the error term. Violating this assumption may lead to either biased regression coefficients or increased variance of the estimates. The second assumption is that there is a random sampling of the

observations; both the error term and dependent are also assumed to be random. If the assumption is violated, the intercept may be biased.

Another assumption is the expected value of the mean of the error term should be zero. This further means that the error term and the independent variable have no correlation. There is a problem of endogeneity if the error term and the independent variables are correlated. Biased and inconsistent parameter estimates are produced if the third assumption is violated.

An OLS regression is BLUE when there is neither multicollinearity nor perfect collinearity within the regression model. In other words, there is no linear relationship between the independent variables. The presence of multicollinearity may cause an increase in the regression coefficient variance, making the coefficient estimates sensitive to minor changes within the model. Thus, the interpretation of our coefficients is made difficult. Additionally, the regression may not be estimated in the presence of perfect collinearity.

The fifth assumption is that there is homoskedasticity. Homoskedasticity implies that the variance of the error term is constant for all independent variables and across time. The uncertainty within the model is expected to be identical over all observations. A violation of this (heteroskedasticity) results in the inefficiency of the OLS estimators. The assumption of no autocorrelation implies that the error terms of the observations have no noticeable existing relationship. If the error terms are serially correlated, the OLS estimators are inefficient. The OLS assumption that error terms in the regression model are normally distributed suggests that the standard errors associated with the OLS estimates are reliable. This assumption, however, is not a requirement to achieve unbiased OLS regression estimators.

Multicollinearity within each regression was measured using the variance inflation factor (VIF). The VIF determines how much the variance of the estimated coefficients increased due to

correlation in the explanatory variables. In this sense, it quantifies the severity of multicollinearity in the OLS model. In general, VIF values exceeding 10 are considered to indicate serious multicollinearity. According to Gujarati (2003), variables with values above 10 should be dropped. In this analysis, values exceeding 10 were dropped. To tackle the issue of multicollinearity, the highly correlated independent variables were removed.

Heteroskedasticity was also tested for each regression using the and White test. The White test hypothesizes that the variance (σ^2) for the errors in a regression is constant. The hypotheses for the White test are presented below:

$$H_0 : {\sigma^2}_i = \sigma^2$$
$$H_1 : {\sigma^2}_i \neq \sigma^2$$

The rejection of the null hypothesis indicates that the variances for the errors are not constant. Allison (1999, p.128 cited in Williams, 2012) states "My own experience with heteroskedasticity is that it has to be pretty severe before it leads to serious bias in the standard errors. Although it is certainly worth checking, I wouldn't get overly anxious about it."

4.2.2. Bunge Company

In accessing the effect of firm characteristics on the ROS for Bunge, ROA, CIR, DER, and GM% were run on ROS% while controlling for recession. Also included in the model were the lags on each of the firm characteristics up to four quarters. Given the nature of the variables, a test of multicollinearity using the variance inflation factor (VIF). The VIF test results showed that DER and its lags were outside the VIF maximum cut-off of 10 for the existence of multicollinearity. It was therefore removed from the model and the model re-estimated without it. The results of the VIF test for Bunge Company are presented below in Table 4.2.

Table 4.2. VIF Test Results for Bunge Company

VARIABLE	VIF	1/VIF
ROA%	3.19	0.31
L1.	2.26	0.44
L2.	1.38	0.72
L3.	1.53	0.65
L4.	1.50	0.67
CIR%	1.74	0.58
L1.	1.70	0.59
L2.	1.90	0.53
L3.	1.71	0.59
L4.	1.96	0.51
DER%	9.12	0.11
L1.	14.43	0.07
L2.	18.79	0.05
L3.	16.83	0.06
L4.	7.35	0.14
GM%	3.29	0.30
L1.	3.55	0.28
L2.	3.16	0.32
L3.	3.30	0.30
L4.	2.95	0.34
Recession	3.12	0.32
1.recession	5.73	0.17
1.recession	6.42	0.16
1.recession	8.69	0.12
1.recession	4.79	0.21
Mean VIF	5.22	

The results of the re-estimation of the model without DER and its lags for Bunge Company are presented in Table 4.3. The results show that except for the capital intensity ratio, whose current and prior period affected ROS, none of the other lagged variables presented statistically significant effects on ROS. They showed that while a percentage point increase the current CIR leads to about 0.007 percentage point increase in ROS, a percentage point increase in the prior CIR increased ROS by 0.003 percentage point. The former is statistically significant at 1% level while the latter is statistically significant at the 10% level.

Bunge's return on assets has a positive statistically significant effect on its performance at a 1% level. A percentage increase in the return on assets results in a 1.9 percentage increase in the firm's return on sales. On the other hand, the gross margin percent had a statistically significant negative effect on Bunge's performance. A percentage increase in the firm's gross margin percent resulted in a decrease in Bunge's return on sales by approximately 0.04 percent.

Table 4.3. Effect of Firm Characteristics on Bunge's Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	1.9024***	0.02	83.43	0.00	1.86	1.95
L1.	-0.0142	0.02	-0.70	0.49	-0.05	0.03
L2.	0.0087	0.02	0.39	0.70	-0.04	0.05
L3.	0.0013	0.02	0.06	0.96	-0.04	0.05
L4.	0.0035	0.02	0.15	0.88	-0.04	0.05
CIR%	0.0071***	0.00	4.83	0.00	0.00	0.01
L1.	0.0027*	0.00	1.93	0.06	0.00	0.01
L2.	-0.0001	0.00	-0.11	0.91	0.00	0.00
L3.	0.0014	0.00	1.04	0.30	0.00	0.00
L4.	-0.0017	0.00	-1.16	0.25	0.00	0.00
GM%	-0.0363**	0.01	-2.65	0.01	-0.06	-0.01
L1.	0.0111	0.01	0.82	0.41	-0.02	0.04
L2.	0.0095	0.02	0.55	0.59	-0.03	0.04
L3.	-0.0228	0.02	-1.19	0.24	-0.06	0.02
L4.	0.0018	0.02	0.11	0.92	-0.03	0.04
Recession	-0.1150	0.13	-0.86	0.39	-0.38	0.15
L1. Recession 1	0.2030	0.17	1.20	0.24	-0.14	0.54
L2. Recession 1	-0.0266	0.17	-0.16	0.87	-0.36	0.31
L3. Recession 1	-0.1845	0.17	-1.09	0.28	-0.53	0.16
L4. Recession 1	0.1207	0.12	0.99	0.32	-0.12	0.36
Constant	-1.5114***	0.48	-3.14	0.00	-2.48	-0.55

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.99; Prob > F = 0.00*

The return on assets elasticity of return on sales, i.e., the effect of a percentage change in ROA percent on ROS percent was about 1%, while for capital intensity elasticity of ROS was

about 1.2%. While the elasticity of ROA percent is statistically significant at the 1% level, that of capital intensity is not statistically significant.

Table 4.4: Estimated Elasticities for Bunge's Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf. Interval]	
ROA%	0.949***	0.123	7.720	0.000	0.702	1.195
CIR%	1.162	2.195	0.530	0.599	-3.242	5.567
GM%	-0.116	0.261	-0.440	0.658	-0.639	0.407

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%;*

4.2.3. ADM Company

ADM Company had no multicollinearity in the original regression model presented in chapter three hence no variable was removed from the initial equation. Table 4.5. below shows the effects that ADM's firm characteristics on its performance.

Its return on assets, capital intensity, debt-equity ratio, and gross margin percent had positive effects on ADM's performance, all of which were statistically significant at the 1% level. A percentage increase in ADM's return on assets led to an approximately 2.3 percent increase in its return on sales. A one percent increase in capital intensity results in a 0.004 percent increase in the firm's return on sales. The table further showed that a percentage point increase in the debt-equity ratio leads to about 0.007 percentage point decrease in ROS. Similarly, a percentage increase in the firm's gross margin percent results in approximately a 0.1 percent increase in ADM's return on sales.

The table shows that the positive effect of the presence of a recession in the previous quarter on ADM's performance is statistically significant at the 10% level. None of the other lagged variables presented statistically significant effects on ROS.

Table 4.5. Effect of Firm Characteristics on ADM's Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	2.2503***	0.07	32.20	0.00	2.11	2.39
L1.	-0.0865	0.07	-1.23	0.22	-0.23	0.05
L2.	-0.0765	0.07	-1.07	0.29	-0.22	0.07
L3.	-0.0960	0.07	-1.39	0.17	-0.23	0.04
L4.	0.0203	0.07	0.30	0.77	-0.12	0.16
CIR%	0.0037***	0.00	4.03	0.00	0.00	0.01
L1.	-0.0011	0.00	-1.12	0.27	0.00	0.00
L2.	-0.0006	0.00	-0.60	0.55	0.00	0.00
L3.	-0.0007	0.00	-0.73	0.46	0.00	0.00
L4.	-0.0003	0.00	-0.31	0.76	0.00	0.00
DER%	-0.0066***	0.00	-4.77	0.00	-0.01	0.00
L1.	-0.0004	0.00	-0.30	0.76	0.00	0.00
L2.	0.0007	0.00	0.47	0.64	0.00	0.00
L3.	-0.0001	0.00	-0.09	0.93	0.00	0.00
L4.	0.0015	0.00	1.08	0.29	0.00	0.00
GM%	0.0920***	0.02	5.18	0.00	0.06	0.13
L1.	0.0140	0.02	0.77	0.44	-0.02	0.05
L2.	0.0201	0.02	1.08	0.28	-0.02	0.06
L3.	0.0148	0.02	0.79	0.43	-0.02	0.05
L4.	0.0151	0.02	0.83	0.41	-0.02	0.05
Recession	-0.1548	0.11	-1.43	0.16	-0.37	0.06
L1. Recession						
1	0.2088*	0.11	1.91	0.06	-0.01	0.43
L2. Recession						
1	-0.0233	0.11	-0.22	0.83	-0.24	0.19
L3. Recession						
1	0.0478	0.11	0.45	0.65	-0.16	0.26
L4. Recession						
1	-0.0157	0.10	-0.16	0.88	-0.21	0.18
Constant	-0.4953	0.95	-0.52	0.60	-2.38	1.39

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.98; Prob > F = 0.00*

The return on assets elasticity of return on sales, i.e., the effect of a percentage change in ROA percent on ROS percent was about 0.8% while gross margin percent elasticity of ROS was about 0.5%. The elasticity of the ROA is statistically significant at the 1% level while that of the

gross margin percent is statistically significant at a 5% level. The elasticity results are presented in Table 4.6.

Table 4.6: Estimated Elasticities for ADM's Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf. Interval]	
ROA%	0.803***	0.137	5.850	0.000	0.530	1.075
CIR%	0.111	0.252	0.440	0.661	-0.389	0.611
DER%	-0.195	0.201	-0.970	0.335	-0.594	0.205
GM%	0.517**	0.216	2.400	0.019	0.089	0.946

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%*

4.2.4. Tyson Foods

A variance inflation factor (VIF) test was conducted to assess multicollinearity within the original empirical regression model. Multicollinearity was detected within the model (Table 4.5) and hence capital intensity ratio, debt-equity ratio, and gross margin percent were removed from the model. The VIF results of Tyson Foods' new regression model are presented in Table 4.7 below.

Table 4.7. VIF Test Results for Tyson Foods Inc.

VARIABLE	VIF	1/VIF
ROA%	1.75	0.57
L1.	1.75	0.57
L2.	1.83	0.55
L3.	1.79	0.56
L4.	1.34	0.75
CIR%	20.87	0.05
L1.	29.36	0.03
L2.	29.11	0.03
L3.	27.11	0.04
L4.	15.48	0.06
DER%	11.87	0.08
L1.	21.47	0.05
L2.	22.92	0.04
L3.	27.51	0.04
L4.	15.67	0.06
GM%	22.90	0.04
L1.	34.96	0.03
L2.	36.28	0.03
L3.	28.65	0.03
L4.	2.88	0.35
Recession	3.85	0.26
1.recession	6.68	0.15
1.recession	5.96	0.17
1.recession	6.85	0.15
1.recession	4.28	0.23
Mean VIF	15.33	

Tyson's return on assets had a positive effect on the firm's performance. The results showed that the effects of return on assets were statistically significant at 1% level. A percentage point increase in Tyson's return on assets resulted in a 2.26 percentage point increase in the firm's return on sales. The first and second lags of the recession variable affected ROS significantly at the 5% level. The long-run effect of recession on ROS is approximately 0.05 percentage point, where this is the statistically significant cumulative effect of recession over four periods on ROS.

The lags of return on assets presented had no statistically significant effects on ROS. This is presented in Table 4.8 below.

Table 4.8: Effect of Firm Characteristics on Tyson Foods' Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	2.2583***	0.07	31.32	0.00	2.12	2.40
L1.	-0.0039	0.08	-0.05	0.96	-0.16	0.15
L2.	-0.0274	0.08	-0.35	0.73	-0.18	0.13
L3.	0.0342	0.08	0.44	0.66	-0.12	0.19
L4.	0.0650	0.07	0.93	0.36	-0.07	0.20
Recession	0.4443	0.42	1.06	0.29	-0.39	1.28
L1. Recession						
1	-0.8266**	0.39	-2.13	0.04	-1.60	-0.06
L2. Recession						
1	0.8745**	0.39	2.23	0.03	0.10	1.65
L3. Recession						
1	0.1089	0.40	0.28	0.78	-0.68	0.89
L4. Recession						
1	-0.1250	0.37	-0.33	0.74	-0.87	0.62
Constant	-0.0761	0.32	-0.24	0.81	-0.71	0.55

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.93; Prob > F = 0.00*

The return on assets elasticity of return on sales was about 1%, The elasticity results are presented in Table 4.9 below.

Table 4.9: Estimated Elasticities for Tyson Foods' Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	**1.077*** **	**0.081**	**13.360**	**0.000**	**0.917**	**1.238**

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%*

4.2.5. Conagra Company

The empirical regression model for Conagra Company exhibited multicollinearity. Table 4.10 presents the results from the variance inflation factor (VIF) test. The table shows that multicollinearity existed within capital intensity ratio, debt-equity ratio, and gross margin percent. Consequently, those variables were removed from the model.

Table 4.10: VIF Test Results for Conagra Company

VARIABLE	VIF	1/VIF
ROA%	1.90	0.53
L1.	1.94	0.52
L2.	1.91	0.52
L3.	1.70	0.59
L4.	1.73	0.58
CIR%	12.91	0.08
L1.	16.08	0.06
L2.	15.94	0.06
L3.	14.29	0.07
L4.	12.93	0.08
DER%	13.58	0.07
L1.	24.56	0.04
L2.	22.92	0.04
L3.	20.87	0.05
L4.	10.88	0.09
GM%	12.27	0.08
L1.	14.15	0.07
L2.	13.90	0.07
L3.	13.73	0.07
L4.	11.84	0.08
Recession	3.28	0.31
1.recession	5.67	0.18
1.recession	6.60	0.15
1.recession	8.34	0.12
1.recession	4.89	0.20
Mean VIF	10.75	

Conagra's regression model comprised return on sales as the dependent variable and the firm's return on assets and recession variable were the independent variable. The results of the new regression model constructed for Conagra are presented in Table 4.11.

The firm's return on assets influences Conagra's performance positively. This effect is statistically significant at the 1% level, as shown in Table 4.11 below. An increase in Conagra's returns on assets by one percent resulted in an approximately 5.6 percent increase in the firm's return on sales. Furthermore, an increase in the return on assets by a percentage point results in an increase in Conagra's return on sales by approximately 0.64 percent two quarters from the current quarter. This effect is statistically significant at 1% level. Conversely, the increase in the return in assets in the current quarter causes Conagra's return on sales to decrease by roughly 0.43 percent a year later. This effect is statistically significant at 5% level. The long-run effect of ROA on ROS is approximately 0.21 percentage point, where this is the statistically significant cumulative effect of ROA over four periods on ROS.

Recession and its lags are shown to not affect Conagra's return on sales.

Table 4.11. Effect of Firm Characteristics on Conagra's Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	5.6072***	0.21	26.86	0.00	5.19	6.02
L1.	-0.0808	0.21	-0.38	0.71	-0.51	0.34
L2.	0.6424***	0.21	3.03	0.00	0.22	1.06
L3.	-0.0687	0.21	-0.32	0.75	-0.49	0.36
L4.	-0.4299**	0.21	-2.08	0.04	-0.84	-0.02
Recession	-0.1615	1.35	-0.12	0.91	-2.85	2.53
L1. Recession						
1	-2.3534	1.62	-1.45	0.15	-5.57	0.86
L2. Recession						
1	2.2472	1.80	1.25	0.22	-1.33	5.83
L3. Recession						
1	-2.6794	1.87	-1.44	0.15	-6.38	1.02
L4. Recession						
1	1.5194	1.53	1.00	0.32	-1.51	4.55
Constant	-1.9609***	0.55	-3.55	0.00	-3.06	-0.86

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.91; Prob > F = 0.00*

The return on assets elasticity of return on sales, i.e., the effect of a percentage change in ROA percent on ROS percent was about 1%. The elasticity results are presented in Table 4.12 below.

Table 4.12: Estimated Elasticities for Conagra's Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	**1.701*** **	**0.638**	**2.670**	**0.009**	**0.435**	**2.968**

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%*

4.2.6. IBM Company

The IBM initial regression model was run and multicollinearity within the model was assessed. The model exhibited multicollinearity after the variance inflation factor (VIF) test was conducted. The results of the VIF test are shown in Table 4.13 below.

Table 4.13. VIF Test Results for IBM Company

VARIABLE	VIF	1/VIF
ROA%	3.55	0.28
L1.	3.30	0.30
L2.	3.18	0.31
L3.	2.91	0.34
L4.	2.12	0.47
CIR%	11.03	0.09
L1.	5.13	0.20
L2.	4.26	0.23
L3.	4.07	0.25
L4.	9.56	0.10
DER%	8.80	0.11
L1.	17.26	0.06
L2.	18.35	0.05
L3.	22.95	0.04
L4.	13.00	0.08
GM%	11.49	0.09
L1.	12.16	0.08
L2.	11.08	0.09
L3.	10.90	0.09
L4.	3.26	0.31
Recession	4.52	0.22
1.recession	9.00	0.11
1.recession	7.76	0.13
1.recession	7.36	0.14
1.recession	3.63	0.28
Mean VIF	8.43	

Multicollinearity was observed and a new regression for Conagra was constructed. Table 4.14 presents the effects of the firm characteristics on IBM's performance. The firm's returns on assets is a significant positive predictor of IBM's performance. IBM's return on sales increases by approximately 4.83 percent when the return on assets increases by 1%. Additionally, the third and fourth lags of ROA affected ROS. A percentage point increase in the third lag of ROA resulted in a 0.21 percentage point increase in the return of sales. This is statistically significant at the 10% level. However, a percentage point increase in the fourth lag decreased ROS by 0.33 percentage

point. The effect of the coefficient is statistically significant at 1% level. The long-run effect of ROA on ROS is -0.11 percentage point, where this is the statistically significant cumulative effect of ROA over four periods on ROS. Recession and its lags presented had no statistically significant effects on ROS.

Table 4.14. Effect of Firm Characteristics on IBM's Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	4.8323***	0.11	43.06	0.00	4.61	5.05
L1.	-0.1322	0.12	-1.15	0.25	-0.36	0.10
L2.	0.1243	0.11	1.10	0.28	-0.10	0.35
L3.	0.2137*	0.11	1.87	0.07	-0.01	0.44
L4.	-0.3282***	0.11	-2.97	0.00	-0.55	-0.11
Recession	-0.1269	0.86	-0.15	0.88	-1.82	1.57
L1. Recession 1	-0.0303	0.88	-0.03	0.97	-1.78	1.72
L2. Recession 1	-1.0793	0.89	-1.21	0.23	-2.84	0.68
L3. Recession 1	0.0849	0.89	0.10	0.92	-1.68	1.85
L4. Recession 1	0.1196	0.83	0.14	0.89	-1.53	1.77
Constant	-0.0699	0.59	-0.12	0.91	-1.23	1.09

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.96; Prob > F = 0.00*

Table 4.15: Estimated Elasticities for IBM's Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	**1.230**	**4.080**	**0.300**	**0.764**	**-6.860**	**9.320**

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%;*

4.2.7. Intel Company

The initial regression model was run, and multicollinearity was tested using the variance inflation factor (VIF). The results of the VIF test for Intel Company are presented below in Table 4.16. Capital intensity and debt-equity ratio exhibited multicollinearity and hence were both dropped from the model.

Table 4.16. VIF Results Test for Intel Corporation

VARIABLE	VIF	1/VIF
ROA%	4.80	0.21
L1.	5.34	0.19
L2.	6.03	0.17
L3.	6.09	0.16
L4.	5.62	0.18
CIR%	17.98	0.06
L1.	28.11	0.04
L2.	27.03	0.04
L3.	24.99	0.04
L4.	14.33	0.07
DER%	20.42	0.05
L1.	26.26	0.04
L2.	24.70	0.04
L3.	23.71	0.04
L4.	17.08	0.06
GM%	5.47	0.18
L1.	8.60	0.12
L2.	9.17	0.11
L3.	9.66	0.10
L4.	6.70	0.15
Recession	3.27	0.31
1.recession	5.64	0.18
1.recession	5.56	0.18
1.recession	5.95	0.17
1.recession	3.84	0.26
Mean VIF	12.65	

Intel’s return on assets has a significantly positive effect on the firm's performance. A one percent increase in the firm’s returns on assets led to an increase in its return on sales by 5.28

percent. Contrarily, a one percentage point increase in Intel's return on assets in the prior quarter leads to a decrease in the firm's return on sales by about 0.78 percent.

The table also shows that Intel's gross margin percent is a negative predictor of the firm's performance. An increase in the gross margin by one percent resulted in a decrease in the firm's return on sales by 0.06 percent. This effect is not statistically significant. However, the first, second and fourth lags of the gross margin affected ROS positively. A percentage point increase in the prior gross margin increases ROS by 0.15 percentage point which is statistically significant at the 5% level. A percentage point increase in the second and fourth lag increased ROS by 0.11 percentage point and by 0.19 percentage point respectively. They are both statistically significant at the 10% level.

The return on assets elasticity of return on sales, i.e., the effect of a percentage change in ROA percent on ROS percent was about 0.63%, while for gross margin elasticity of ROS was about 1.72%. Both elasticities are statistically significant at the 1% level. The results indicate that the gross margin elasticity of ROS is elastic. This means Intel could enhance its ROS performance by increasing its gross margin instead of building its assets, holding all other variables constant in any period with or without recession. However, in expansionary periods, the gross margin elasticity of ROS was 1.7 while the ROA elasticity of ROS was 0.63, confirming the focus at Intel on gross margin. The elasticity results are presented in Table 4.18.

Table 4.17. Effect of Firm Characteristics on Intel's Performance

VARIABLE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	5.2776***	0.19	28.18	0.00	4.91	5.65
L1.	-0.7752***	0.18	-4.19	0.00	-1.14	-0.41
L2.	0.0061	0.19	0.03	0.97	-0.37	0.38
L3.	-0.2587	0.19	-1.33	0.19	-0.65	0.13
L4.	-0.2862	0.20	-1.45	0.15	-0.68	0.10
GM%	-0.0589	0.07	-0.85	0.40	-0.20	0.08
L1.	0.1519**	0.07	2.24	0.03	0.02	0.29
L2.	0.1130*	0.07	1.70	0.09	-0.02	0.24
L3.	0.0339	0.07	0.49	0.62	-0.10	0.17
L4.	0.1899*	0.07	2.80	0.01	0.06	0.32
Recession	1.0846	1.02	1.07	0.29	-0.93	3.10
L1. Recession						
1	-1.4011	1.03	-1.36	0.18	-3.44	0.64
L2. Recession						
1	0.2512	0.99	0.25	0.80	-1.71	2.21
L3. Recession						
1	0.2497	0.97	0.26	0.80	-1.68	2.18
L4. Recession						
1	0.0750	0.99	0.08	0.94	-1.88	2.03
Constant	-24.3626***	7.58	-3.21	0.00	-39.40	-9.32

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%; R-squared =0.92; Prob > F = 0.00*

Table 4.18: Estimated Elasticities for Intel's Return on Sales Percent

VARIABLE	ey/ex	Std. Err.	t	P>t	[95% Conf.	Interval]
ROA%	**0.626**	**0.040**	**15.540**	**0.000**	**0.546**	**0.706**
GM%	**1.719**	**0.373**	**4.610**	**0.000**	**0.979**	**2.459**

**** = Statistically significant ≤ 1%; ** = Statistically significant at ≤ 5%; * = Statistically significant at ≤ 10%;*

Chapter 5 - Summary and Conclusion

This chapter presents a summary of the results along with the conclusion for this study. The limitations, suggestions for future research and strategy recommendations are provided for the case firms in the study. In addition, specific conservations between the product focus and sectors of the selected firms are also presented. The chapter is organized into five sections. The first section outlines the process used for this research while the second provides a summary and inferences of the results. The third section presents the limitations of the study. Suggestions for future research and the strategy implications are provided in the fourth and fifth section respectively.

5.1. Summary

The purpose of this study was to assess the performance of the agri-food sector in recession and expansion periods. To accomplish this objective, literature was reviewed to explore perceptions about corporate performance, identify performance indicators, the general effects of recessions, and the effects that recessions have had on the agri-food sector. Also, the extent to which firm characteristics play a role in firms' performance was evaluated and comparisons of these effects were made between the agri-food firms and the non-agri-food firms.

The reviewed literature suggested that performance encompassed broadly an individual, firm or sector effectiveness and efficiency. Some firms measured performance using returns on sales, return on assets and return on equity, which were suggested to be influenced by factors such as firm size, firm age, ownership, leverage, and liquidity. Appropriate firms for this study were selected and a profile for each firm was presented. An analytical framework was developed and

consequently, an empirical model was constructed. Also, hypotheses were made pertaining to the effect of recessions and firm characteristics on firms' performance.

Data from Wharton Research Data Services (WRDS), the Federal Reserve Board Tyson Foods Inc, as well as from the annual reports of the selected firms, for the period 1990 to 2019 were obtained for six firms; four agri-food firms and two technology firms.

An Ordinary Least Squares (OLS) regression model with the selected dependent and independent variables, was used in the study. Possible issues with the regression model like multicollinearity, homoskedasticity, and autocorrelation were tested for and addressed. In so doing, a unique regression for each firm was generated.

5.2. Conclusions

The results of the study's analysis indicated that firms are affected differently during recessions. Firms that share similar characteristics with Bunge, with more than 200 years in existence, and leading in the procurement of grains and oilseeds are likely to be unaffected by recessions. In 2001, for example, Bunge's increase in its operations, improvements in every business division and the success of its agribusiness operation led to the company's success despite the weak global economy at the time. Bunge also weathered the economic storm despite price volatility in the agriculture and agricultural inputs (fertilizer and energy) in 2008 (Bunge, 2008). Additionally, the return on sales of such firms may be positively affected by returns on assets and capital intensity. Conversely, these firms can be expected to also be negatively affected by their gross margin. Meanwhile, capital investment in the quarter immediately preceding the current quarter may have a positive impact on the firm performance in the current year. Historical changes in return on assets and gross margin have no effect on the return on sales of firms like Bunge.

The results further showed that firms that bear a resemblance to ADM in structure and other characteristics, such as the generation of significant amounts of revenue from corn and soybean as well as over a hundred years of experience, are likely to be positively affected by recessions. According to Archer Daniels Midland Company (2008, 2009), the company's survival in the face of unfavorable global economic adversity in 2008 and 2009 can be attributed to its industry acumen and its unique network of assets. Similar firms may be positively affected by increases in their returns on assets, capital intensity, and gross margins. Also, *ceteris paribus*, the increase in their debt-equity ratio in the current quarter may cause a decrease in their returns to sales. Past return on assets, capital intensity ratios, debt-equity ratios, and gross margin percent do not affect the current return on sales.

Recessions may potentially have significant negative impacts on firms like Tyson, experiencing decreases in both their return on sales and gross margin percent. During the Great Recession (December 2007- June 2009), the company experienced a significant drop in its net sales, from $268 million in 2007 to $86 million in 2008, and a $537 loss in 2009 (Tyson Foods, 2008, 2009). Furthermore, holding all other things constant, the return on sales for firms like Tyson is influenced by return on assets. These firms may possibly experience an increase in their return on sales with increases in their return on assets. Such firms are also projected to experience decreases in their return on sales in the current quarter due to the presence of recession in the prior quarter. Conversely, these firms are likely to experience increases in their return on sales if there was a recession two quarters before the current quarter. The return on sales of firms like Tyson is not influenced by the firm's return on assets in previous quarters.

Impacts from recessions are likely to be present in firms comparable to Conagra as recession significantly affects their gross margin percent negatively. The return on sales in firms

like Conagra may show increases almost six times the increases experienced in their return on assets. Moreover, previous return on assets may affect the current return on sales of such firms. Return on sales in the current quarter is positively affected by increases in the returns on assets two quarters prior to the current quarter. However, the increase in return on assets four quarters prior will negatively affect the firms' return on sales in the fourth quarter after the current quarter.

The results of the case study reveal, *ceteris paribus*, the performance of firms that bear a likeness to IBM may not be affected by recessions. According to IBM (2008), the firm was well-positioned to succeed during the Great recession because of lessons from the 2002 dot.com crash, which included a focus on significantly increasing pre-tax income and free cash flow. The company also made strategic investments and acquisitions in higher-value segments, such as business intelligence, virtualization and green solutions (IBM, 2008 p. 10). The return on sales of firms with structures parallel to IBM's is expected to be affected by both past and current return on assets. The increase in the return on assets in the current quarter may cause a significant increase in firms' return on sales. Similarly, firms' return on sales in the current quarter is positively affected by recession three quarters before the current quarter. Contrarily, the increase in return on assets in four quarters before the current quarter could possibly result in a decrease in the firms' return to sales in the current year.

Finally, the results of the analysis show that Intel was significantly impacted by recessions as both their return on sales and gross margin percent were negatively influenced. Consequently, firms that share similarities with intel may likely be affected by recessions. Considering Intel's performance in the last recession (December 2007- June 2009), the firm experienced a 2% fall in the 2008 revenue from $37.6 billion in 2007, as well as a fall in net income from $6.98 billion in 2007 to $5.29 billion in 2008 (Intel Corporation, 2008). Holding all other things constant, the

performance of such firms will be affected by both past and present return on assets. When the return on assets increases in the current quarter, the firm's return on assets may also increase. However, these firms may experience a decrease in their return on sales due to an increase in their return on assets in the previous quarter. Though current gross margin may have no effect on the current return on sales, an increased gross margin in the two quarters immediately preceding the current quarter may impact the firms' return on sales positively. Similarly, the increase in the firms' gross margin four quarters before could possibly result in an increase in the firms' return to sales in the current year.

Conclusively, firms that share similarities with Bunge and IBM are likely to be unaffected by recessions. While firms like ADM may be positively affected by recessions, firms that resemble Tyson, Conagra and Intel may be negatively affected by recessions.

5.3. Limitations of the study

As many economies focus on the effects of recessions pertaining to unemployment issues, sectors that employ relatively large numbers of people gain greater attention than sectors that employ relatively fewer people. The effects of recessions on the agri-food sector have gained little attention as compared to other sectors of the US economy. Thus, there are very few studies that have either analyzed these effects on the agri-food sector or compared the recessions' effects on the agri-food sector to that of the other sectors of the US economy.

Also, the case study had narrow criteria for the selection of the appropriate firms. The small sample size makes this study narrow in its assessments of the differences in firm performance and thus, narrow in its analysis sectoral performance. Using a larger range or sample size may have

been preferred. However, to acquire data that was not only public but that was also extensive enough to encompass multiple recession periods was necessary for this analysis.

5.4. Policy and Strategy Implications

Firm characteristics are unique. Thus, the firm-specific attributes and advantages must be taken into consideration during the implementation of strategies pertaining to different sectors of the US economy. Agri-food managers may sustain and enhance performance by focusing on maintaining a low debt-equity ratio as the increase in debt-equity ratio had a negative effect on the performance of firms. Albeit, achieving this may be influenced by some other firm characteristics. For example, growth, firm size and profitability have been noted to affect the composition of debt in capital structure (Al-Najjar and Taylor, 2008, as cited Anuar & Chin, 2016).

Results for all firms indicated that the return on sales is positively influenced by the firms' return on assets and thus, firms may implement strategies that will increase the firms' return on assets. Strategies that aim at reducing the firms' asset costs or reducing firm costs, as well as increasing sales revenue relative to their asset base, will help to increase the firms' return on assets.

In developing any policy and strategy, stakeholders must take into consideration the type or cause of the recession. This study focused on three recession periods; July 1990 - March 1991, March 2001-November 2001, December 2007 - June 2009. The first recession was mainly due to the restrictive monetary policy introduced by the Federal Reserve Bank to either curb or reduce inflation. During this period the GDP decline was 1.4% while the unemployment rate was 6.8% (U.S. Bureau of Labor Statistics, 2020). The collapse of the dotcom bubble, compounded by the September 11 terrorist attacks, led to the 2001 recession. During that period, the GDP decline was 0.3% while the unemployment rate was 5.5% (U.S. Bureau of Labor Statistics, 2020). Finally, the

most recent recession, the great recession, was brought on by shortcomings in financial regulations that led to the bursting of the housing bubble and the subprime mortgage industry. During this period the GDP decline was 4.3% while the unemployment rate was 9.5% (Rich, 2013) with nearly 8.7 million jobs lost (Barello, 2014).

The effects of the aforementioned recessions may be different in degree in comparison to recessions that are engendered by different causes such as pandemics. Pandemics such as the Coronavirus Crisis requires social distancing and thus may cause significant interference in supply chains, trade, traveling and production as many workers stay home. The unemployment rate increased from 3.5% in December 2019 to 4.4% in March 2020 (U.S. Bureau of Labor Statistics, 2020), with about 22 million Americans filing for unemployment in just about 4 weeks (U.S. Department of Labor, 2020; Tappe & Luhby, 2020; Lambert, 2020).

5.5. Suggestions for future research

The addition of more firms from other non-agri-food sectors other than the technology sector, making this study more representative of the US economy could be explored. This will give the opportunity to conduct a statistical analysis across the different sectors of the US economy to make inferences. Similarly, expanding the time horizon will allow the study to encompass more recessionary periods. Thus, the opportunity to account for the different causes and attributes of the various recessions will be made possible.

The inclusion of more firm-specific characteristics over time may also be explored. Firm-specific characteristics such as the number of employees, the changes in CEO, the number of $100 million brands or even the strategic initiatives employed by each firm may affect the performance of the firm.

In this study, all the right-hand side variables in the OLS model used are performance indicators. Consequently, for future research, it may be important to develop a composite performance indicator other than the return on sales used in the study. It will be appropriate to determine whether non-financial performance characteristics may have an effect on the financial performance of firms.

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