Illusion or Reality:
Does adoption of a certified environmental management system fundamentally alter the environmental impacts of industry?

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ABSTRACT

This thesis seeks to contribute to current literature surrounding the efficacy of certified environmental management systems (EMS) at reducing negative environmental externalities associated with industry. In response to the skepticism in existing scholarship that certified EMSs achieve concrete reductions in negative externalities, a multiple regression model is used to quantitatively analyze the relationship or lack there of between the presence of a certified EMS at an industrial facility and reductions in greenhouse gas (GHG) emissions. Specifically, this thesis examines the presence of the ISO 14001 EMS certification amongst the largest carbon emitting facilities in Alberta to determine whether its presence has a statistically significant correlation to a reduction in emissions. The results of the regression analysis determine that the presence of an ISO 14001 certified EMS does not lead to a reduction in GHG emissions amongst Alberta's largest carbon emitters. This thesis recommends that fundamental changes be made to the ISO 14001 certifying process to ensure a robust approach to manage more complex environmental problems, namely climate change, is adopted.

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Definition of Terms

EMS: Environmental Management System; a strategy put in place within an organization that dictates internal environmental policy (ISO, 2015).

ISO: A series of international certifying standards that govern a variety of aspects of business (ISO, 2015).

ISO 14001: An international certifying standard under the ISO group that seeks to certify Environmental Management Systems (ISO, 2015).

Negative externality: An unintended consequence of business that has a net negative effect on society and/or the environment (ISO, 2015).

GHG emissions: Greenhouse Gas emissions

Co_2e: Carbon dioxide equivalent emissions; a measurement of GHG emissions that aggregates the global warming potential of all GHG emission types in terms of carbon (Environment Canada, 2015).

DJSI: Dow Jones Sustainability Index; an international business index developed by Sustainable Asset Management (SAM) to distinguish outstanding environmental stewards amongst large organizations (DJSI, 2015).

GRI: Global Reporting Index; and international set of guidelines established by the Coalition for Environmentally Responsible Economies (CERES) and the United Nations Environmental Program (UNEP) to assist businesses in a comprehensively displaying of sustainability policy to external parties (GRI, 2015).

GHGRP: Greenhouse Gas Reporting Program; a system specific to Canadian policy governing disclosure of carbon dioxide equivalent emissions emitted by an industrial facility (Environment Canada, 2015).

Chapter 1: Introduction

1.1 Problem

Overview

Industrial activities in business pose serious and tangible threats to both the well being of society and the environment. Negative consequences of activities on environment and society, referred to as negative externalities, can increase in both magnitude and frequency in the face of a growing global economy. The risk of increased negative externalities warrants the need to adequately manage organizational activities to preserve both environmental and social capital.

A variety of systems have been introduced on the global stage to assist organizations in effectively managing the risk of harmful activities that produce negative externalities. Often, management strategies are associated with systems that are voluntary by nature and, in some cases, rely on internally identifying which harmful aspects of the business should be improved over time (Potoski and Prakash, 2015; Fryxell and Wing-hung, 2004; Perez, Amichai-Hamburger and Shterental, 2009; Psomas, Fotopoulos, Kafetzopoulos, 2011). As a result of the voluntary and self-identifying nature of these systems, the effectiveness of these management systems at mitigating negative externalities has long been questioned by scholars (Potoski and Prakash, 2015).

The key contention that experts perceive to be problematic with voluntary certification systems is that they rely on the self-identification of evaluation aspects (Potoski and Prakash, 2015; Perez, Amichai-Hamburger, Shterental, 2009). That is, that when an organization is aggregating material for evaluation by an external body, they may chose to identify problem areas within the business that are simple to fix as opposed

to the problems that may be more problematic to solve (Psomas, Fotopoulos, Kafetzopoulos, 2011). By using the more simplistic problems as a display of managing externalities, a company may achieve recognition for being an outstanding environmental steward while complex problems that produce more significant negative externalities may not be addressed.

ISO 14001

Currently, the largest voluntary certification program used by organizations to address the risk of negative environmental externalities is the ISO 14001 system. The ISO 14001 standard is a certification system for internal environmental management systems (EMS) that was developed as a direct response to the need for organizations to formalize their approach to manage a variety of externalities associated with their activities (ISO, 2015). The standard serves as a tool designed to assist organizations in shaping their environmental management procedures and gain an international recognition via a certification to display a proactive approach to managing negative environmental externalities (ISO, 2015).

Drivers to Certification: Incentivizing Beyond Compliance Initiatives

Sustainability in the context of environment, society and economy is a concept that is becoming ever more present and vital to the long-term success of a variety of organizations. In this context there are a variety of incentives that could provoke an organization to undergo the process of ISO 14001 certification. Holding such a certification is an outward display that an organization has incorporated a proactive

approach to managing negative externalities and that sustainability is present in their business plans.

An outward display of a more robust sustainability strategy than is required by local law can be a key asset to an organization offering a variety of goods and services. The ISO 14001 certification can increase the competiveness of an organization by presenting an outward display of environmentally conscience policy (Psomas, Fotopoulos, Kafetzopoulos, 2011; Boiral and Sala, 1998). This could be valuable not only increasing current market share and accessing new markets (ISO, 2015; Psomas, Fotopoulos, Kafetzopoulos, 2011), but also in altering the perceptions of an organization in the eyes of the public and specific groups of customers (Boiral and Sala, 1998). In addition to improving over all business strategy in terms of competitiveness, having an ISO 14001 certified EMS may also facilitate the reduction in negative environmental and social externalities (ISO, 2015). While the aforementioned benefits provide an effective business case for an organization to become certified, the effectiveness of the certification at truly managing negative externalities still remains a questionable in the minds of many experts (Potoski and Prakash, 2015; Boiral and Sala, 1998; Psomas, Fotopoulos, Kafetzopoulos, 2011).

1.2 Research Purpose

This thesis will examine the effectiveness of the presence of an ISO 14001 certified EMS at reducing the intensity of a key negative environmental externality associated with activities of many organizations; greenhouse gas emissions (GHG). The ISO 14001 certification was chosen as the key basis for analysis as it is currently the most

widely adopted certification on the global stage as determined by the scholarship (Potoski and Prakash, 2015). The purpose is thus to determine whether the presence of an ISO 14001 certified EMS affects positive change and is an effective tool to reduce GHG emissions at industrial facilities.

The effectiveness of the presence of an ISO 14001 certified EMS in an organization will be evaluated by this thesis using Alberta's' largest GHG emitters as the sample space. Alberta's largest emitters are an effective study space as the industrial activities carried out by the industrial sectors in this area, namely energy companies, are often characterized by environmentally damaging activities and large volumes of GHG emissions (Environment Canada, 2015). Additionally, there is uncertainty as to whether these negative externalities and GHG emissions are diminished by environmental management strategies or if these strategies are a tool used by companies to control public perceptions of industry (Davidson and MacKendrick, 2004). The following questions will serve to guide focused research;

1. Does the presence of an ISO 14001 certified EMS address the concern of GHG emissions amongst Alberta's largest emitters?
2. To what extent is this relationship statistically significant?
3. What other variables effectively contribute to the reduction of environmental externalities within Alberta's largest GHG emitters?

The answers to the guiding questions above will assist in the creation of a statistical framework and multiple regression model to determine the value of the presence of an ISO 14001 certified EMS in relations to reducing GHG emissions and will add to the discussion about the effectiveness of voluntary certifications to mitigate

negative externalities associated with industrial activities. Additionally, a series of suggestions and best practices for public and private sectors will be drawn from the results of this thesis to fill potential gaps in effectiveness of ISO 14001 certified EMSs at reducing GHG emissions within the sample space.

1.3 Limitations

While there are many certifications under both the scope of EMS and the umbrella ISO group, this thesis will only seek to evaluate the specific effectiveness of the ISO 14001 standard. As the ISO 14001 standard is the basis of analysis, only the environmental aspect of negative externalities will be considered by this thesis.

In addition, this thesis may be limited by the statistical model used to test the relationship between the presence of an ISO 14001 certification and the negative environmental outcomes. Some of the internal limitations of the model could include omitted variable bias. That is, there could be a variable that is not included in the regression analysis that could have a relationship with negative environmental outcomes. If such a variable is not accounted for it could cause a biased estimation of the relationship between the presence of an ISO 14001 certified EMSs and negative environmental outcomes. The lack of accessibility to an expansive data set and key figures from privately held companies might influence the amount of information that is analyzed in the regression model.

Another key limitation of this thesis is that the sample, Alberta's largest GHG emitters, may limit the applicability of the results to other market places and firms who do not emit such volumes of GHGs . Due to the unique features of the market in Alberta,

such as governance, cultural influences and environmental policy surrounding industrial activities, it may prove challenging to use the model to make inferences about other industrial sectors on the global stage. The specificity of this thesis allows for an in-depth analysis of Alberta's largest GHG emitters in the context of environmental certifications, however, it is also limited in its applicability to understand relationships between EMS certifications and environmental outcomes in a global context.

Chapter 2: Literature Review

The consequences of human activities have long threatened the environment and ecosystem. In order to examine and evaluate the effectiveness of EMS's at managing the consequences imposed by industrial activities on the natural world, it is important to understand how a variety of EMS's and other sustainable business initiatives have become a modern management solution. An extensive review of existing literature will explore the perspectives from a wide variety of scholarship to determine if EMS's are an effective tool to mitigate adverse impacts. The analysis below will delve into: the definition of both positive and negative externalities; give an analysis of a variety of sustainable business systems available in the market place; identify drivers to adoption of these systems; and examine to what extent subject matter specialists have accepted a certification approach as a robust solution to managing the negative externalities of business.

2.1 Dissecting Externalities

Within this thesis, the impacts imposed by industrial activities are defined as externalities. Externalities can be both positive and negative in their impact upon the environment or society. Positive externalities are the result of an unintended consequence of an organizational activity that results in a positive outcome for society or the environment. Inversely, negative externalities are the result of an unintended consequence that produces a negative or harmful impact on society or the environment. The need to manage negative externalities in particular has become increasingly important due to a growing interest in ecological and social preservation. This increased

interest has required the need for a resolution on the part of businesses and organizations to incorporate environmentally and socially responsible policy into their corporate models. There is a significant body of literature that examines the response of the business community to the demand to go beyond compliance in a society that places increasing value on long-term sustainability.

2.2 EMS's and Sustainable Business Indices as a Direct Response

One way in which the business community has responded to the increased value placed on sustainability is the variety of systems that enable them to adopt internal and external systems to show that sustainability has been integrated into their corporate plan. Sustainable business indices, sustainability reporting frame works and EMS's are key methodologies that an organization can incorporate into their overarching business strategy. By incorporating these systems into their internal and external strategy, organizations can respond to the increased demand for integration of environmentally and socially conscious policies into their business plans. The following will provide an overview of some of the key methodologies

used by businesses to signify beyond compliance sustainability initiatives for an organization. Namely, The Dow Jones Sustainability Index (DJSI), the Global Reporting Imitative (GRI) and the ISO 14001 EMS certifying system will be examined. It should be noted, however, that there are many other niche systems that will not be discussed by this portion of this thesis.

Dow Jones Sustainability Index (DJSI)

The DJSI provides a clear business focus on performance associated with the adoption of a sustainability index (Lopez et al., 2007,p. 285)(Fowler and Hope, 2007). As the system for evaluating sustainability indicators is based on the same methodologies used to identify accounting indicators, experts argue that there is competitive advantage gain from the linkage to socially responsible behaviour (Lopez et al., 2007). Organizations may be driven to beyond compliance initiatives, such as attaining DJSI, out of a desire to match investment policies with values that translate positively bearing in mind increased demand for integration of environment into business plans (Fowler and Hope, 2007).

The DJSI was launched in 1999 as a response to negative publicity and legislation brought about by major corporate accounting scandals in the United States and Europe (Fowler and Hope, 2007). The scandals were perceived as ethically deficient and brought about a major surge in creation of sustainability indices to rebuild trust in for profit companies (Fowler and Hope, 2007). The index is based around a series of both environmental and social indicators (Lopez, 2007, p.288). Experts identify that the DJSI is the most important sustainable business index because of the prestige and credibility of Dow Jones brand that can be clearly integrated into an investment portfolio (Lopes et al., 2007, p.289)(Fowler and Hope, 2007). Sustainable Asset Management (SAM), a Zurich based funds management firm developed the standard with the key goal being to distinguish leaders amongst fortune 500 companies and create a place in the investment industry for sustainability (Barkawi, 2004 as cited by Fowler and Hope, 2007). The first step companies must take to incorporate the DJSI into their portfolio is to fill in a detailed

questionnaire covering a wide range of weighted data to explain economic, environment and social components to be considered for inclusion in a series of third party evaluations (Folwer and Hope, 2007; Lopez et al., 2007). The data is reviewed by SAM and then again by other bodies such as non-governmental organizations, international institutions and academics (Fowler and Hope, 2007). External documents such as annual reports, environment reports, health and safety reports and media such as press releases are all evaluated in the review process. After the review by a variety of bodies, the application is subject to an external audit by a SAM affiliate, where a score is calculated (Fowler and Hope, 2007, Lopez et al., 2007, p. 289).

While the third party evaluation process is arguably robust, the DJSI is subject to criticism based on exclusiveness to Fortune 500 companies. Small and medium size firms have no option to participate in this form of sustainability reporting and the DJSI leads to the crowding out of the market (Lopez et al., 2007). Larger firms have more resources to devote to the DJSI questionnaire and the emphasis on economic factors is felt by critics to have too much bearing in the evaluation process (Fowler and Hope, 2007). As well, the effectiveness at creating additional value by adopting the DJSI is not unanimously accepted by scholars. While some studies find inconclusive results (Fowler and Hope, 2007), others are able to affirm that the presence of the DJSI evaluation in an organization is a value-added endeavor (Lopez, 2007, p.288). In fact, increases in profitability due to the exclusive presence of the DJSI indicator in a business model is cited by Lopez (2007). In addition, the DJSI is controversial because it makes a direct attempt to monetize a variety of social and environmental aspects that are difficult to quantify, pushing ethical boundaries (Lopez et al., 2007). Lopez et al. (2007) argue,

however, that from the perspective of upper management, it is crucial to draw links between how sustainability might increase business performance in the future (p. 288). The upper management focus on sustainability being equated to profitability must be satisfied under current organizational constructs (Lopez et al., 2007).

Global Reporting Initiative

The Global Reporting Initiative (GRI) approaches the need to display beyond compliance initiatives using a different methodology. While the DJSI provides a precise index for indicating a direct linkage between corporate policy and sustainability initiatives, the GRI provides a reporting framework for firms to best present sustainability policies and initiatives to interested parties.

The GRI came about as a response to the growing number of requests for information about an organizations' environmental and social performance (Willis, 2003; Milne and Gray, 2013). Without any framework for answering these requests, the responses were often time consuming, inconsistent, incomplete and lacked comparability across players in different industries (Willis, 2003). While reporting practices blurred across both industry players and international borders, the Coalition for Environmentally Responsible Economies (CERES) worked in partnership with the United Nations Environmental Programme (UNEP) to formulate a careful solution to the growing concern of failures on the front of sustainability reporting (Willis, 2003; GRI, 2015).

In 1999 the first draft of the GRI was released for a pilot test amongst a variety of industries with the goal of providing a set of equivalent standards to guide firms in sustainability reporting in the context of environment, social initiatives and economic

indicators (Willis, 2003). By 2000, a revised set of multidisciplinary standards was released with four fundamental components (Willis, 2003; GRI, 2015). Part A includes and introduction and general guidance for sustainability reporting (Willis, 2003). Part B includes detailed information about reporting principles and practices (Willis, 2003). Part C provides a guide as to what should be included in report content (Willis, 2003) Lastly, part D outlines the information that should be included in the annex such as relevant facts and figures (Willis, 2003). The GRI was designed in this way to ensure transparency and a format that is universally legible across industries and nations (GRI, 2015). It is important to note that the GRI reporting framework is voluntary by nature (Milne, 2013), however, the standard is emerging as a commonality amongst key players around the globe as a best practice for sustainability reporting (GRI, 2015).

ISO 14001 EMS Certifying Standard

While the scholarship discussing the DJSI and the GRI provides a dialogue on business performance associated with external indicators, the question of internal environmental performance remains a key gap. A different approach has been adopted by the ISO 14001 EMS certification system. The ISO 14001 certification focuses on the creation of an internal EMS that requires organizations to have a documented system to deal with materials from a life-cycle perspective (Psomas et al., 2011). This ensures that environmentally conscious practices become fundamental throughout operations and aims to reduce harmful outcomes of industrial activities (Psomas et al., 2011). The ISO 14001 certification for internal EMS's does not explicitly connect with the translation of its presence in business terms. Rather, an EMS certified by ISO 14001 provides a highly

structured framework for writing and implementing environmental policy into an organizations' corporate strategy on a self-identifying and voluntary basis (Boiral and Sala, 1998). That is, a company is able to choose which aspects of their business are subject to evaluation in the certifying process and which areas are not to be evaluated (Boiral and Sala, 1998).

In 1996, the first ISO 14001 standard was published by the Geneva based International Organization for Standardization (ISO); the worlds' largest standardization practice (Potoski and Prakash, 2013). Experts attribute the creation of an environment specific standard in 1996 as a reaction to the 1992 United Nations Conference on Environmental Development, otherwise known as the Rio Earth Summit (Potoski and Prakash, 2013). The development of the standard explicitly addressed the outcomes of the summit that demanded more from businesses in terms of environmental stewardship (Potoski and Prakash, 2013). Since 1996, a second iteration was issued in 2004 and, most recently, the newest ISO 14001 iteration of the standard was released in September 2015 (ISO, 2015).

As aforementioned, the standard is voluntary by nature and intended to be flexible so that it can be applied to a breadth of organizations regardless of manufacturing processes, ownership structure or size (Psomas, 2011)(ISO, 2015). When an organization is ready to undergo the certification process, they will aggregate documents and processes to describe their internal EMS and other environmental initiatives (ISO, 2015). The process of aggregating documents is done based on a self-identifying process such that the organization has the choice of which documents and processes will be under review during the certification process (Potoski and Prakash, 2015). Next, the

organization will seek out an external certification body as certification is not completed by the ISO 14001 group, but rather by an accredited third party associate (ISO, 2015). By employing the use of a third party, the ISO group asserts that the value an impartial assessment of the EMS in question will be upheld in the certification process (ISO, 2015). Assessment covers a variety of factors such as procedures for handling environmental emergencies, labeling potentially harmful substances, environmental performance evaluations and lifecycle assessments (Boiral and Sala, 1998). Environmental policy, planning, implementation, checking corrective action, management review, and continual improvement are the key criteria that are vital to attaining an ISO 14001 certification for an internal EMS (Boiral and Sala, 1998)(ISO, 2015). Following the third party assessment to verify that the above values are upheld, the organization will be awarded a certification that allows them to use the ISO brand name as an external signal of beyond compliance environmental stewardship (Potoski and Prakash, 2013). If an organization does not achieve certification, they will be provided with a series of suggestions for improvement should they wish to seek certification for their internal EMS in the future (ISO, 2015).

The ISO 14001 system is currently recognized as the largest and most widely adopted EMS certification system globally (Psomas et al., 2011). Currently the standard is present in the vast majority of countries across the globe and sees continual growth each year (ISO, 2015). As ISO 14001 owns its' merit as the most widely adopted set of environmental standards in the world, investigation into the motivating drivers to adoption and an evaluation of the standards' effectiveness is vital to determine the impact and ISO 14001 certified EMS has on environmental performance. As this thesis seeks to

determine the relationship between the presence of an ISO 14001 certified EMS and improved environmental performance, the ISO 14001 certification standard will be the focal point for analysis.

2.3 Motivations to Adopt IS0 14001

The growing societal concern for environmental protection is at the epicenter for the demand of certified EMS's such as those recognized by the ISO 14001 standards. Society may gain some intrinsic value in knowing that an organization has taken deliberate action to incorporate environmental factors into their corporate policy by means of a certified EMS. While ISO 14001 may have value to society, there must be equal benefit for an organization to seek and incorporate the certification into their business strategy. This is an analysis that aims to qualify both internal and external motivations for an organization to incorporate an ISO 14001 certified EMS into their internal corporate policy.

Experts have identified that a key external motivation for an business to adopt and ISO 14001 certified EMS is to secure market share within the industry for which they are producing goods or services (Boiral and Sala, 1998; Fryxell et al., 2004; Lyon and Maxwell, 2007). Boiral and Sala (1998) assert that an organization is at risk if they chose not to adopt an ISO 14001 certified EMS. Should an organization not pursue certification, it could result in a major barrier to growth in global and local trade (Boiral and Sala, 1998). If an organization does not abide by the values of their down-stream customer and uphold their reputation as a business accordingly, the customer may chose to take their business elsewhere (Fryxell et al., 2004). This is ever more threatening in a

globalized world where national governments are adopting international trade standards similar to those of the ISO 14001 (Boiral and Sala, 1998). In some cases, it was found that the presence of an ISO 14001 certification may enable an organization to charge a premium price for goods (Fryxell et al., 2004).

While the ISO14001 brand may increase competitiveness in the market place and promote trade, another external motivating factor for organizations to adopt the standard is to display beyond regulatory compliance (Psomas et al., 2011). By having an ISO 14001 certified EMS, an organization can indicate explicitly to stakeholders they are aiming to exceed measures set by regulatory bodies by adopting the voluntary system (Potoski and Prakash, 2013)(Boiral, 1998). The presence of the certification thus contributes to a positive corporate image (Psomas et al., 2011). Improving relationships with stakeholders is an aspect that is of increasing importance to organizations given the rise of social media platforms that can be used to voice concerns and opinions (Boiral, 1998). Externally, the ISO 14001 may be a useful tool and can carry some weight in terms of marketing a 'green' business approach to customers, governments and society.

While the need for increasing competitiveness in the market and signaling to government and society that environmental policy is present in an organization, some experts argue that internal factors are the primary motivators for a firm to adopt an ISO 14001 certified EMS (Boiral and Sala, 1998; Psomas et al., 2010). The literature presents four key internal motivations for an organization to adopt the ISO 14001 standard. First, it takes the burden off of the organization to create original standards for ensuring the environmental policy is engrained throughout the organization's operations. Second, it offers a better control mechanism for employee behavior. Third, it minimizes

environmental liabilities. Fourth, it maximizes efficient use of resources and reduces waste (Psomas et al., 2011; Boiral and Sala, 1998; Fryxell et al., 2004). The standard ensures that a rigorous process for environmental management is used through systematic guidelines with explicit direction for documentation (Boiral and Sala, 1998). This takes the burden off of the organization to create an original system for managing environmental concerns. The explicit outline documentation that the ISO 14001 EMS provides can also be effective at controlling the activities of employees in how they relate to the environment (Boiral and Sala, 1998). By providing a more stringent mechanism to account for employee activity, an organization can see where risks and liabilities in their activities exist (Boiral and Sala, 1998). Furthermore, if an environmental disaster were to occur despite careful measures taken by the organization and its' employees, having the ISO 14001 standard could be effective at hedging legal liabilities as the process emphasizes constant documentation of procedures and actions taken (Psomas et al., 2011). Lastly, gaps in efficiency could be illuminated through the rigorous documentation required by self-identified aspect of evaluation (Fryxell et al., 2004). Improvement initiatives could be formulated and implemented according to the efficiency analysis element that the ISO 14001 standard provides to organizations (Fryxell et al., 2004).

A key literature analysis provides insights into external and internal motives for business to adopt the ISO 14001 certifying standard for their EMS. External factors such as securing market share, increasing capacity for trade as well as signaling proactive environmental values to society and regulatory bodies are key to understanding influences that incentivize the adoption of ISO 14001. In addition, organizations are

internally motivated based on benefits from a rigorous EMS such as improved efficiency and reduced risk and liability should an environmental disaster occur. While scholars are able to determine significant motivating factors for firms to adopt an ISO 14001 certified EMS, the effectiveness of the system at reducing negative externalities in terms of environmental impacts is still left to question with little agreement in the literature.

2.4 Are ISO 14001 Certified EMSs Effective in Multiple Contexts?

While the international community reveres the ISO 14001 EMS certifying system as the most widely accessible, its effectiveness at mitigating negative environmental impacts is subject to much criticism in scholarship. Some studies have found that the ISO 14001 certification provides little to no benefit for an organization in general terms (Psomas et al., 2011). Others maintain that ISO 14001 is a great leap forward for addressing negative environmental externalities, however, the standard needs fundamental adjustments to ensure meaningful action is taken to reduce negative outcomes (Boiral and Sala, 1998; Fryxell et al., 2004; Lyon and Maxwell, 2007; Potoski and Prakash, 2013; Perez et al., 2009). The following analysis provides a discussion about the current barriers to success for the ISO 14001 EMS certification system at mitigating negative externalities and facilitating change in industry towards a more sustainable outlook.

The first barrier identified by the scholarship focuses on firm-wise evaluation and reveals that the amount of paper work associated with ISO 14001 certifying process is a barrier to the system reducing negative environmental outcomes (Boiral and Sala, 1998; Psomas et al., 2011). A key concern raised by corporate leaders throughout interview

style analysis was that the ISO 14001 caused more bureaucracy for the organization as opposed to meaningful environmental results (Boiral and Sala, 1998; Psomas et al., 2011). Interestingly, however, it was noted that organizations that were identified by both Boiral and Sala (1998) and Psomas et al. (2011) as exceptional environmental stewards placed less emphasis on the paperwork associated with achieving and maintaining an ISO 14001 certified EMS and more on the positive outcomes for their organization.

Another key criticism of the ISO 14001 certifying standard is that the increase in employee obligations will lead to resistance to the standard's effective adoption (Boiral and Sala, 1998). The ISO 14001 EMS standard places significant emphasis on extensive documentation of policies and practices (ISO, 2015). It is felt by experts that the increased strain put on employees could lead to disengagement and difficulty in adopting changes to best practice (Boiral and Sala, 1998; Fyxell, 2001). As the change management an ISO 14001 certified EMS is associated with is that of increasing organizational agency to become better environmental stewards, employee resistance is a significant factor that must be carefully addressed in an organizations strategy when adopting the ISO 14001 standard.

Cost and constraints could also undermine the effectiveness of the ISO 14001 system at mitigating environmental impacts and creating an organizational mind shifts. Achieving and maintaining the requirements of the standard can come at a high cost to organizations (Boiral and Sala, 1998). The cost to firms is both capital and labour intensive. That is, the standard requires upfront monetary investment and perhaps an even more costly investment of time for corporate management, environmental personnel and industrial workers depending in type of firm (Boiral and Sala, 1998). Should an

organization not be dedicated to the paying for the costs of the standard and continual improvement, the standard may not be a priority that could damage its' potential effectiveness at reducing negative environmental outcomes.

Lastly, and perhaps the largest criticism the ISO 14001 EMS certifying standard garners from the academic realm, is that the voluntary nature and self-identification of items to be evaluated on may exemplify green washing (Potoski and Prakash, 2013; Lyon and Maxwell, 2007; Boiral and Sala, 1998, Fryxell et al., 2004, Psomas et al., 2011; Delmas and Keller, 2005). Green washing refers to the over exaggeration of positive environmental practices within an organization's policy (Diffenderfer and Baker, 2011). While green washing many be an unintended consequence of the ISO 14001 EMS certification system, it is of chief concern as the standard deliberately distances itself from any mandatory environmental outcomes and relies on self-identification for areas of continual environmental improvement (Fryxell et al., 2004). By disassociating itself from explicit and tangible outcomes, the ISO 14001 certifying standard is left open for interpretation by organizations and their leadership (Delmas and Keller, 2005; Psomas et al., 2011). A lack of binding responsibility could lead to free-riding, deception of external interested parties and, ultimately, very little difference made to reduce negative environmental externalities on the part of an organization (Delmas and Keller, 2005). The voluntary nature where by organizations self-identify aspects for evaluation could also lead to an organization choosing only the 'low hanging fruit' for evaluation. That is, the organization may chose to target aspects of their business that are easy to make changes to and improve environmental performance on in their ISO 14001 certified EMS, while other aspects that are more difficult to address remain unchanged. For example, a

company may chose that their facility be evaluated on paper usage, an aspect that is relatively straight forward to make changes on, as opposed to GHG emissions, an aspect that is difficult to make changes on as industrial activities maybe hinged on carbon intensive activities. While conquering small tasks to better environmental performance may help in writing success stories, the major aspects of a business that have the most negative impact on the environment may be overlooked by the certification process. As ISO 14001 could lead to a false display of environmental stewardship, the literature asserts that the standard should be used only as a tool as opposed to the standard being an end in itself in the context of environmental performance and reducing negative externalities of business (Boiral and Sala, 1998).

Despite the aforementioned criticisms, the literature acknowledges that there is a lack of significant statistical evidence to prove or disprove the effectiveness of the presence of an ISO 14001 certified EMS at reducing negative environmental externalities (Fryxell et al., 2004). This thesis seeks to fill the empirical gap by analyzing the correlation between environmental outcomes of Alberta's largest greenhouse gas emitters and the presence of an ISO 14001 certified EMS in corporate policy.

CHAPTER 3: METHODS

As the purpose of this thesis is to delineate a relationship between the presence of an ISO 14001 certified EMS in an industrial facility and the potential impacts on reducing negative externalities in terms of greenhouse gas emissions, a multiple regression analysis is the primary methodology that will be used. A multiple regression analysis is the most effective means for analyzing the potential relationship between an independent variable, an ISO 14001 certified EMS, and a dependent variable, greenhouse gas emissions, through a quantitative lens. The multiple regression analysis will prove or disprove a whether a statistically significant relationship exists between the presence of and ISO 14001 certified EMS in an industrial facility and greenhouse gas emissions.

3.1 Sample Selection

The sample for which the multiple regression analysis is based for this thesis is Alberta's largest greenhouse gas emitters. Alberta's largest emitters were selected as a sample because of two key features.

First, Albertan companies have long been the subject of environmental debates and discourse (Davidson and MacKendrick, 2004). Alberta companies, in particular those that are related to the energy industry, are perceived to be large contributors to the economic well being of Canada (Davidson and MacKendrick, 2004). While energy companies may provide economic benefits for Canadians, the nature of the industry's operations pose significant negative environmental risks, such as increased carbon emissions, and have, thus, been enshrined in controversy (Davidson and MacKendrick, 2004). As a result of the negative perception of Alberta industry, some companies have

chosen to pursue ISO 14001 certified EMS as an outward display of an increased awareness of the negative environmental impacts associated with their business. The adoption of ISO 14001 certified EMSs on the part of large emitters in Alberta provides a basis for determining the effect of self-identifying environmental programs at reducing serious negative environmental impacts of industry, namely, greenhouse gas emissions.

A second reason why Alberta' largest greenhouse gas emitters will inform that study space of this thesis is that documentation of the environmental outcomes of industrial emissions are publicly available. Environment Canada's database provides key statistics for large greenhouse gas emitters in the province of Alberta (Environment Canada, 2015). The database is underpinned by the Canadian Greenhouse Gas Reporting Program (GHGRP), which is a policy mandating that facilities emitting above 50 kilotons of carbon dioxide equivalent units (CO_2e) a year submit a report for publicly held records (Environment Canada, 2015). The database provides summary statics for each large emitting facility that includes the name of the company that owns the facility, CO_2e emitted per year in kilotons, the number of employees working at the facility, and an environmental contact point to answer all questions. Environment Canada's large emitter database was used to construct the multiple regression model to assess whether a voluntary and self identifying ISO 14000 certified EMS is an effective means for reducing CO_2e emissions. By using CO_2e emissions as the key environmental metric for analysis, the ability of the EMS to address a large and fundamental concern associated with Alberta's industry can be tested.

3.2 Variables and Multiple Regression Model

In order to determine if an ISO 14001 certified EMS has an impact on environmental outcomes, a preliminary simple regression model will be tested. The null hypothesis is that no relationship exists between the presence of an ISO 14001 certification and environmental outcomes. That is, even though a company may have incorporated a certified EMS into their business plan at the facility level, it makes little or no difference to the kilotons of CO_2e emitted at the site. Alternatively, should the null hypothesis be rejected using the simple regression model as a test, the presence of a certification EMS does, in fact, have some relationship with CO_2e emitted by the facilities. The presumable relationship in the case that a statically significant relationship exists would be negative as the overarching goal of having a certified EMS is to reduce the impact of negative externalities. The simple regression model is as follows:

$$\boldsymbol{CO_2e\ Emitted_i = \beta_0 + \beta_1\ Presence\ of\ ISO\ 14001\ Certified\ EMS_i + u_i}$$

Where;

CO_2e Emitted$_i$ represents the dependent variable and a negative environmental outcome of industry in Alberta; greenhouse gas emissions in terms of kilotons of CO_2e emitted.

Presence of ISO 14001 Certified EMS$_i$ represents the key independent variable and is a dummy variable where; 1 is assigned to facilities that have an ISO 14001 certified EMS and 0 is assigned to facilities that do not have an ISO 14001 certified EMS.

u_i is the error term for facility *i* and is intended to be a place holder for all other relevant variables that could not be included in the model as it currently constructed.

i is each facility large emitting facility in the province of Alberta as determined by the Environment Canada database in the year 2013 (year for which the most recent data was available).

While the simple linear regression above may prove or disprove a preliminary statistical relationship between the presences of an ISO 14001 certified EMS and CO_2e emitted at large emitting facilities in Alberta, a series of control variables must be incorporated into the model to ensure the validity of the results. Below is the multiple regression model for which a series of control variables are incorporated into the model to ensure that the relationship between the key variable of interest; the presence of an ISO 14001 certified EMS and the dependent variable; $C0_2e$ emitted at a facility *i*, is statistically significant or not. Each control variable may have an impact as they are incorporated into the multiple regression model.

The multiple regression model is as follows:

$$\mathbf{CO_2e}\ \textit{Emitted}_i = \beta_0 + \beta_1\ \textit{Presence of ISO 14001 Certified EMS}_i + \beta_2\ \textit{Ownership Structure}_i + \beta_3\ \textit{Number of Employees}_i + \beta_4\ \textit{DJSI}_i + \beta_5\ \textit{Industry-wise analysis (energy/forestry/manufacturing/agriculture)}_i + u_i$$

Where the control variables are as follows;

Ownership Structure$_i$ represents a dummy variable where 0 is assigned to companies that are owned by the government and 1 is assigned to companies that are owned privately.

Number of Employees$_i$ represents a continuous variable that gives an indication of, and control for the relative size of a facility in the sample.

DJSI$_i$ represents a dummy variable where 1 is assigned to facilities that are owned companies that were recognized as an outstanding environmental steward on the DJSI and 0 is assigned to companies that were not recognized on the DJSI in the year 2013.

Industry-wise Analysis (energy/forestry/manufacturing/agriculture)$_i$ represents a control variable for each of the industries present in the sample space; energy, manufacturing, forestry and agriculture. Each industry is to be layered into the multiple regression model individually to determine and control for any effect of the given industry on CO_2e emitted facility-wise.

u_i is the error term for facility *i* and is intended to be a place holder for all other relevant variables that could not be included in the model as it currently constructed.

i is each facility large emitting facility in the province of Alberta as determined by the Environment Canada database in the year 2013 (year for which the most recent data was available).

3.3 Guidelines for Interpretation of Results

The above model should be used to interpret the relationship between the dependent variable, CO_2e emitted, and the key independent variable of interest, the presence of an ISO 14001 certified EMS. Should statistically significant results appear, a relationship can be identified by means of a statistical correlation. Furthermore, this result would effectively suggest that an ISO 14001 certified EMS could be a tool used by high CO_2e emitting facilities in Alberta to reduce on of the key negative impacts of their current business; greenhouse gas emissions. Inversely, if no statistically significant relationship appears, this means that an ISO 14001 certified EMS has no quantifiable impacts in terms of CO_2e emitted as identified by the model. This result would affirm the skepticism present in the literature that the pursuit of a voluntary, self-identifying ISO 14001 certified EMS may not be an effective means for reducing CO_2e emitted by a facility.

3.4 Data Sourcing and Sorting Process

Another key component that must be included within the methodology section of the thesis is a detailed description of the data sourcing process. A detailed recollection of the process would prove vital if another researcher sought to replicate the research methods for alternative purposes.

As aforementioned, a key source for greenhouse gas emission in terms of CO_2e was Environment Canada's GHGRP database (Environment Canada, 2015). Additionally, the number of employees working at each facility was obtained for the GHGRP data based as well as the names of the company that owned each facility in the

year 2013 (Environment Canada, 2015). By extracting the name of the company who owned each facility data for other variables was populated through additional research. This additional research included exploring company websites, sustainability reports and press releases to extrapolate whether a facility owned by a particular company held a valid ISO 14001 certified EMS, to determine the ownership structure of the facility, to establish whether the company had been recognized on the DJSI, and to discover the sector in which the company was using the facility to produce. While in most cases desk research sufficed to gather all necessary information, in some cases the facility contact information given by the GHGRP database was leveraged to conduct brief phone and/or email interviews to extract the necessary information.

After all data was collected as described above, the data set was programed to communicate with the statistical software of choice; Stata. The programming process included converting all linguistic answers to questions in 'yes/no' formats to a numerical '1/0' format such that the program was able to read the uploaded spreadsheet. Next, a code was written to communicate with Stata to run each of the regression analyses. The code began with the simple regression model and layered in each of the control variables to form the multiple regression analysis that is presented in the results section of this thesis. The Stata code used for this thesis can be found in Appendix A.

CHAPTER 4: RESULTS

4.1 Data Analysis

Table 1: Summary Statistics

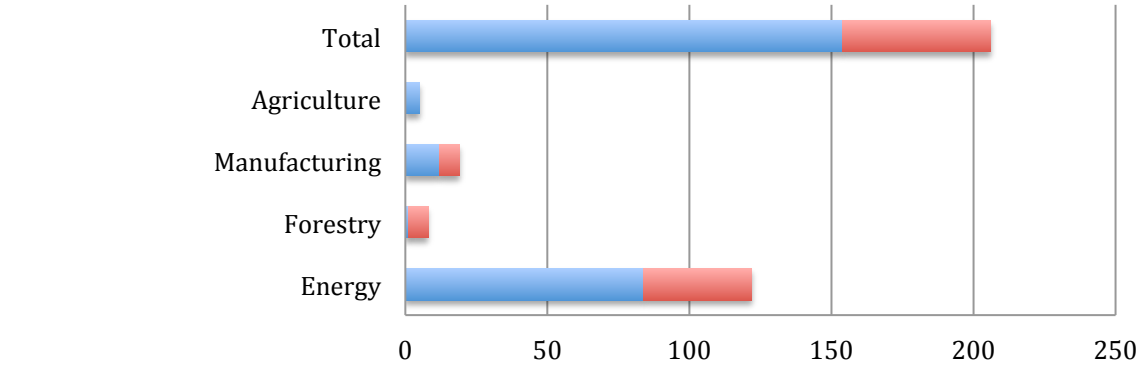
Variable	Number of observations	Mean	Standard Deviation	Minimum	Maximum
Carbon Dioxide Equivalents Emitted by an Industrial Facility (kilotons)	154	757.522	1733.181	0.63	12181.52
Presence of ISO 14001 Certification	154	0.338	0.474	0	1
Number of Employees	154	417.272	1462.931	1	13924
Ownership Structure (Government/Private Sector)	154	0.916	0.279	0	1
Dow Jones Sustainability Index	154	0.032	0.178	0	1
Energy Industry	154	0.792	0.407	0	1
Forestry Industry	154	0.052	0.223	0	1
Manufacturing Industry	154	0.123	0.330	0	1
Agricultural Industry	154	0.032	0.178	0	1

As aforementioned, the data used for analysis in this thesis was collected from the Environment Canada's GHGRP database for large greenhouse gas emitting facilities in Alberta for the year 2013. Additionally, the publicly sourced emissions data was supplemented by data collected from the sustainability reports and websites of associated with each of the facilities. Based on this sample of 154 observations, the mean carbon dioxide equivalents emitted by an industrial facility is approximately 757.522 kilotons (Table 1). The carbon dioxide equivalents emitted by an industrial facility also has a large range, with the lowest volume of equivalents emitted being 0.63 kilotons and the largest

volume being 12181.52 kilotons (Table 1). In terms of the other metrics collected, a high level analysis of the data reveals that the majority of the facilities in the sample size are do not have an ISO 14001 certified EMS (Table 1). Approximately, 33.8% of facilities have a certified EMS (Table 1). Furthermore, the data analysis reveals that the number of employees has a mean of 417 per facility, 91.6% of facilities have private ownership structures and only 3.20% have been recognized on the Dow Jones Sustainability Index as outstanding environmental stewards (Table 1).

In term of industry-wise analysis, descriptive statistics in Table 1 indicates the percentages of the sample that have been classified into different industrial sectors. Within the sample, 79.2% of observations are related to the energy industry (oil and gas/ coal extraction/ other energy sourcing derivatives), 12.3% are classified as manufacturing (chemicals, plastics/ polymers and heavy metals), 5.20% are forestry related and 3.20% fall within the agricultural sector (industrial farms/ fertilizer producers). Of the total number of facilities related to the energy industry, 31.1% have an ISO 14001 certified EMS, while 87.5%, 36.8% and 0.00% of the facilities in the forestry, manufacturing and agricultural industries have certified EMSs, respectively (Figure 1). While data analysis can provide insight into general overhead trends, regression analysis is merited in order to analyze relationships with a sharper focus.

Figure 1. Industry-wise Number of Certified versus Non-certified Facilities



	Energy	Forestry	Manufacturing	Agriculture	Total
Absence of ISO 14001 Certified EMS	84	1	12	5	154
Presence of ISO 14001 Certified EMS	38	7	7	0	52

4.2 Multiple Regression Analysis Estimation Results

The results described in Table 2 indicate that while there is a positive relationship between the presence of and ISO 14001 certification and carbon dioxide equivalents emitted by an industrial facility, the relationship is not statistically significant. That is to say, an ISO 14001 certified EMS does not fundamentally alter the volume of carbon dioxide equivalents emitted by and industrial facility in the sample. This result is clearly supported by the simple regression model (1) in Table 2 where having and certified EMS has no significance in reducing carbon dioxide equivalents emitted by an industrial facility.

The insignificant impact of the certified EMS remained as each of the control variables were incorporated into the regression in Table 2 for models (2) through (9). Expectedly, the variable that maintained statistical significance across all of the

regression models was the number of employees at a given industrial facility. Before industry control variable were added to the model, results show that for every additional employee working at an industrial facility, carbon dioxide equivalents emitted are expected to increase by 0.375 kilotons at the 99% confidence level.

Interestingly, once additional variables were added in models (6) through (9) to control for differences across industries, it became apparent that one industry, overall, emits less carbon dioxide equivalents then the others (Table 2). If an industrial facility is within the forestry sector, results estimate that kilotons of carbon dioxide equivalents emitted are expected to decrease by 809.443 kilotons at the 90% confidence level. While only 5% of observations in the sample belong the forestry sector, it is interesting to note that 87.5% of these observations have an ISO 14001 certified EMS as discussed in the above data section.

Table 2: Regression analysis results of the effect of the Presence of ISO 14001 Certified EMS on Carbon Dioxide Equivalents Emitted by an Industrial Facility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES				Greenhouse gas equivalents emitted by an industrial facility					
Presence of ISO 14001 Certification	234.552	287.683	287.683	235.299	250.036	289.782	359.394	256.799	265.685
	(333.030)	(324.902)	(324.902)	(328.489)	(335.705)	(349.832)	(373.528)	(338.231)	(338.604)
Number of employees		0.359***	0.359***	0.359***	0.357***	0.349***	0.356***	0.353***	0.359***
		(0.126)	(0.126)	(0.125)	(0.125)	(0.124)	(0.126)	(0.125)	(0.126)
Ownership structure				-690.895	-674.812	-612.250	-602.023	-657.841	-683.592
				(533.662)	(538.005)	(544.672)	(548.400)	(538.136)	(540.391)
Dow Jones Sustainability Index					-361.184	-455.754	-441.182	-401.165	-352.953
					(261.096)	(303.521)	(296.126)	(277.491)	(264.151)
Energy Industry						351.686			
						(232.763)			
Forestry Industry							-809.443**		
							(323.942)		
Manufacturing Industry								-274.764	
								(224.029)	
Agricultural Industry									335.108
									(281.740)
Constant	678.323***	510.551***	510.551***	1,160.869**	1,153.562**	810.762	1,095.295**	1,172.937**	1,144.603**
	(145.865)	(115.781)	(115.781)	(527.054)	(529.821)	(603.386)	(538.153)	(527.809)	(531.565)
Observations	154	154	154	154	154	154	154	154	154
R-squared adjusted	-0.002	0.084	0.09	0.085	0.086	0.089	0.082	0.08	0.08

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 5: DISCUSSION

5.1 Results in Connection to Existing Literature

The results from the above regression analysis indicates that the presence of and ISO 14001 certified EMS at an industrial facility does not signal any meaningful outcomes in terms of mitigating climate change. While this thesis addresses this concern specifically in relation to GHG emissions emitted by large, industrial facilities in Alberta, a number of parallels can be drawn from the work of other researchers seeking to evaluate the efficacy of the ISO 14001 EMS certification system at reducing negative environmental outcomes of business. Generally, this thesis provides support to the skepticism of scholars of the ISO 14001 EMS certificate approach to make meaningful environmental change.

As previously mentioned, many scholars of environmental management in the context of business believe that ISO 14001 certified EMSs might not have any tangible impacts to reduce the negative environmental outcomes of business (Potoski and Prakash, 2013; Lyon and Maxwell, 2007; Boiral and Sala, 1998, Fryxell et al., 2004, Psomas et al., 2011; Delmas and Keller, 2005). Doubts raised in the literature are hinged on the fact that the ISO 14001 EMS certifying system is both voluntary and relies on self-identification for aspect for which environmental improvement will occur. By self-identifying these aspects and creating a strategy that seeks only to take action on particular business operations, companies may be entirely missing the point when it comes to making meaningful reductions in more problematic areas of their business (Fryxell et al., 2004). Despite this general consensus amongst the scholars, a major gap in the literature was a lack of empirical analysis to support this claim (Fryxell et al., 2004). This thesis sought to

fill the empirical gap. Data reveals that there is no statistical significance in terms of mitigating climate change through reducing emissions with the presence or absence of an ISO 14001 certified EMS in the context of Alberta's largest GHG emitters.

The contributions of this thesis echo the existing literature in asserting that the ISO 14001 EMS certifying standards are not effective at reducing negative environmental externalities of business. While this thesis adds to the body of literature, key gaps and areas for further research are merited.

5.2 Limitations and Omissions

While the above model and empirical analysis of the relationship between the presence an ISO 14001 certified EMS in a business and the carbon dioxide equivalents emitted at industrial sites provides some interesting results, there are a number of limitations and omissions that exist in the model as presented in this thesis. These limitations include: omitted variable bias, limited accessibility to a robust data set and limitations to external application of results. Limitations and omissions, however, provide an opportunity for further areas of study that will be denoted at the end of this section.

Omitted Variable Bias

A key limitation of the model as presented in this thesis is omitted variable bias. That is, there are additional factors that influence CO_2e emitted at large emitting facilities in Alberta that are not included in the regression function. This is exemplified through the R-squared adjusted score of approximately 0.086 in Table 2 for regression (4). Some of these omitted variables may include; annual revenues of the companies and the

accessibility to external auditors for each company that owns a facility in the sample. These variables could influence the CO_2e emitted by large facility in the sample and bias the model in an up wards direction. That is, if a company has higher revenues and thus has a greater accessibility to external auditors in terms of proximity to the marketplace and additional money to spend, a company may be more inclined to invest in technologies or methodologies that could effectively reduce the CO_2e emitted by their facilities, independent of an ISO 14001 certified EMS. As omitted variables that could have and influence on the kilotons of CO_2e emitted by a facility, the model doe not give the full picture of why some facilities in the sample size have greater emissions then others.

Data Set Constraints

While omitted variables should be explored in more detail and included in future empirical studies, a limitation to including additional variables for the model presented in this thesis was accessibility to a robust data set. Namely, the lack of a central database for companies that had obtained an ISO 14001 certification for their EMS was a key constraint. The lack of a central record keeping system for ISO 14001 certifications was a challenge that resulted in the building of an independent data set that was populated by extensive external research. As aforementioned, this research included sifting through sustainability reports, press releases and contacting company representatives to determine whether or not the facilities in the data set had ISO 14001 certified EMS systems. Moreover, as the majority of the facilities in the sample were owned privately, additional

variables such as annual revenues and accessibility to external auditors could not be captured in the independent data set that was built for the model.

Another key limitation in the data set as it currently exists is that only data for large emitting facilities was retrievable from publicly sourced information. Thus, the results presented above exclusively apply for the relationship between facilities that emit above 50 kilotons of CO_2e annually and the presence of an ISO 14001 certified EMS. In order to make the model more complete, future analysis should focus on procuring emissions data for facilities that emit below 50 kilotons of CO_2e annually. By including large, medium and small emitting facilities more generalized statements could be made for the industrial space in Alberta. This data, however, would need to be privately obtained through a potential survey of medium and small editors in Alberta and would rely heavily on the cooperation of the companies owning these facilities.

External Validity of Results

Due to some of the omitted variables in the model and gaps in the data set presented above, the results attained through analysis suffer in terms of external validity. That is, due to the specificity of the model and the data set, it is difficult to apply the results from this thesis to areas outside of the sample space of large emitting industrial facilities in Alberta. To remedy this limitation, the sample space in the data set could be expanded and additional variables could be added to the model. The expansion of both the data set and variable in the model could give a more complete picture as to the influence of an ISO 14001 certified EMS on greenhouse gas emissions by industry in a general context.

Areas for Further Study

While omitted variable bias, the constraints of the data set and the external validity of the results of this thesis are key limitations, each of these challenges provide opportunities for further study.

First, the model could be expanded to include more control variables as a means for reducing the impact of omitted variable bias. Given more time and greater access to information held by private companies about their business performance, environmental characteristics and internal perspectives on EMS, additional variables could be added to the model. This pursuit would seek to determine why a particular facility emits GHGs and could be used a leverage point to determine how reductions in emissions could be made. By determining what influences the volume of GHG emissions, perhaps, the ISO 14001 EMS certifying standard could be adjusted to support the reducing in emissions.

Additionally, the data set could be expanded to include both more study spaces and environmental metrics to its scope. More provinces could be added to the data set to expand the geographical dimension of the analysis. By adding more regions to the scope of the data set, more generalized conclusions could be drawn from the empirical analysis conducted by this thesis. As well, low and medium emitting facilities could be added to the data set such that generalized conclusions could be drawn for all firms regardless of how many CO_2e are emitted. Moreover, additional environmental metrics could be added to analyze the presence of an ISO 14001 certified EMS on other negative environmental outcomes of business. For example, metrics such as frequency of harmful substances spills at each facility could be an interesting avenue of exploration for future research.

By expanding both the model an the data set to include additional variables an sample spaces, more general conclusions about the impact of ISO 14001 certified EMS on environmental outcomes could be drawn. Further research to determine the relationship empirically would complement the addition of the thesis to the existing body of literature.

5.3 Implications for Policy and Private Sector Environmental Initiatives

Despite the limitations and areas for future research cited above, the results of this thesis provide some suggestions for public and private sector application of certified EMSs for Alberta's large emitting facilities. Based on the data and discussion presented in this thesis, suggestions will be presented to three key groups that have the ability to influence change. These suggestions target: the ISO 14001 certifying body, large emitting private sector industry players in Alberta and various levels of government.

First, the ISO 14001 certifying body could change the process by which facilities are certified to ensure that reduction of negative environmental externalities occurs. Namely, the ISO 14001 group could set mandatory reductions in GHG emissions as a requirement to certify a facilities' internal EMS. By incorporating a fixed target for reduction of CO_2e emitted at a facility an ISO 14001 certified EMS would be effective at targeting meaningful reductions in negative environmental impacts of business. Certification that hinges on measured reductions in GHGs would result in a more robust certificate that could potentially be an effective tool for mitigating climate change at the firm level. Moreover, if the ISO 14001 certifying body deliberately insisted that fundamental changes occur to reduce GHGs as a part of an internal EMS, the

controversial ‘self-identifying’ aspect of the certification could be eliminated. Additionally, the ISO 14001 central certifying body could investigate keeping a central database of certified facilities by location. This would ensure that companies holding an ISO 14001 certified EMS are fulfilling their commitments and that the integrity of the environmental standard as an effective tool to manage the negative externalities is upheld.

Second, should the ISO certifying body not endeavor to adjust the controversial self-identifying aspect of their standard, the private sector could alter their approach. This thesis recommends that large emitting firms in Alberta’s’ private sector should choose to self-identify more fundamentally harmful environmental aspects of their business in their EMS for evaluation in the ISO 14001 certification process. While self-identifying more damaging environmental aspects of business, such as GHG emissions, may be a more difficult pursuit for a business currently emitting a large amount of CO_2e , the likelihood of making meaningful change could be increased.

Third, the public sector could provide a market-based incentivize to large emitting Alberta firms who chose to adopt and ISO 14001 certified EMS into their corporate policy as a means for reducing GHG emissions. An example of a market-based solution that could be employed by the public sector is a tax credit system (Bhatia, 2000). A tax credit system uses shifts in tax burdens to encourage companies to adopt more desirable activities (Bhatia, 2000). That is, if a firm makes the decision to incorporate a policy to measurably reduce the negative externalities of the business, the government will issue credits that reduce the aggregate tax the firm will pay annually (Bhatia, 2000). A tax credit system could be devised to reward firms for successful maintenance of an ISO

14001 certified EMS that achieves measurable reductions of GHG emissions at facilities in their ownership. The economic incentive could put additional pressure on firms to commit to improved environmental standards of operations at their industrial facilities using an EMS certification platform as a key mechanism for change. Alternatively, governments could enshrine an EMS certification system in local law using command and control policies. This could eliminate the controversial voluntary aspect of the ISO 14001 certification, however, it does question whether or not the same outcomes in GHG reductions within Alberta's largest emitting facilities can be achieved without the need for a certified process. In conclusion, the findings from this thesis suggest that both the self-identifying and voluntary nature of the ISO 14001 EMS certifying process should be addressed as a means for making meaningful change in GHG emissions.

CHAPTER 6: CONCLUSIONS

In conclusion, the applicability and success of the ISO 14001 certification system for EMSs is highly variable in the case mitigating GHG emissions of large emitting facilities in Alberta. Quantitative evidence offered by this thesis indicates that there is no statistically significant relationship between the presences of an ISO 14001 certified EMS at an industrial facility reduction of GHG emissions. The lack of correlation echoes the skepticism in existing scholarship surrounding the efficacy of international environmental certification systems to actively contribute to meaningful environmental outcomes. The voluntary and self-identifying nature of the ISO 14001 EMS certification system may not be effective at the task of managing more complex problems such as climate change associated with GHG emissions by industry. As internal indicators may seldom be all encompassing, particularly in the case of emissions, ISO 14001 is not effective at the task of reducing negative externalities associated with business activities.

While the status quo of environmental certifications systems may be cause for concern in terms of green washing, changes could be made as a means for ensuring the reduction of more complex negative environmental impacts of business. The success of the ISO 14001 EMS certifying system to make more meaningful reductions in GHG emissions hinges on shifts in the ISO 14001 group, the private sector and the public sector. Should the ISO 14001 EMS certifying process be fundamentally altered to be more all encompassing with firm guidelines that are not open for interpretation, perhaps the system would be more robust at effectively managing the negative environmental outcomes associated with carbon intensive industries. Alternatively, the private sector could chose to identify more complex problems for evaluation in the ISO 14001 EMS

certifying process. By explicitly targeting more difficult items for evaluation, such as reduction in GHG emissions, perhaps meaningful mitigation targets could be seen to fruition. Additionally, the public sector could look towards different mechanisms to incentivize key industry players to adopt the ISO 14001 as a key means for mitigating climate change. Policy makers could seek to incentivize key industry players through market-based solutions, or, ultimately by enshrining reduction in emissions at industrial facilities via certification in law. Without reform on the part of the ISO 14001 group and the private and public sectors, the ability of an ISO 14001 certified EMSs to manage negative externalities remains unclear and in the case of a reducing GHG emissions amongst Alberta's largest emitting facilities is insignificant.

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Appendix:

Stata code

```
log using "G:\Thesis\Thesisdofile1.smcl"
import excel "G:\Thesis\Thesis Stata file.xlsx", sheet("Sheet1") firstrow
destring, force replace
regress GHG ISO, r
ssc install outreg2
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership DJSI, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership DJSI OilGasEnergy, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership DJSI Forestry, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership DJSI ManufacturingChemicalsscrap, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
regress GHG ISO Employees Ownership DJSI Agricultural, r
outreg2 using thesis1, bdec(3) tdec(3) rdec(3) excel append
display "adjusted R2=" e(r2_a)
```