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Stakeholder and Institutional Influences on Sustainable Development in the Shale Gas Extraction Industry

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STAKEHOLDER AND INSTITUTIONAL INFLUENCES ON SUSTAINABLE

DEVELOPMENT IN THE SHALE GAS EXTRACTION INDUSTRY

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

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Title: Stakeholder and Institutional Influences on Sustainable Development in the Shale Gas Extraction Industry

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This study of the natural gas production industry in the Northeastern United States aims to explain how sustainability pressures from stakeholders and institutional actors are received, interpreted and acted upon by organizations and managers of the natural gas drilling firms. A number of hypotheses are developed from the stakeholder and institutional literature to empirically test the role organizational characteristics, such firm environmental record, public visibility or size, play in either influencing the level of institutional stakeholder pressure placed on these firms or in the type of stakeholder most relevant to them. Furthermore, this study investigates how managerial characteristics, such as values and beliefs with respect to sustainability, act as a conduit between stakeholder pressure placed on the firms and sustainability practices companies engage in. Finally, this research also aims at identifying the main stakeholder group(s) influential in driving eco-efficiency practices in this industry. The research design integrates 30 interviews and 44 survey responses with secondary data sources including company databases, publicly available firm documents and websites, violations data, as well as online newspaper coverage. Findings indicate that publicly reported environmental indiscretions as well as increased public visibility lead companies to more broadly recognize institutional stakeholders. However, company size does not appear to impact the influence regulatory and economic stakeholders have with respect to sustainability. Furthermore, responses

of the survey participants point to the importance of managerial values and beliefs in mediating

between stakeholder influence and sustainability practices. Finally, eco-efficiency practices in

this industry appear to be primarily influenced by internal stakeholders.

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CHAPTER I: INTRODUCTION

Introduction and Study Context

The exploration and extraction of natural resources has an established history in Pennsylvania where Edwin L. Drake drilled the world's first oil well in 1859 (Yergin, 1992). More recently, with renewed commercial interest in natural gas from the Marcellus and Utica shale formations, the boom times have returned once more to Pennsylvania and other contiguous states. While economically welcomed, the drilling for natural gas presents pollution and regulation problems and creates concerns for property owners (Reeder, 2010). Environmental hazards in extracting gas include heavy traffic, road accidents, toxic chemical spills, and emissions from wells; hazards in waste disposal include concentrated wastewater, leaking wastewater pits, and wastewater discharges from treatment plants (Urbina, 2011b). Social problems tied to this type of energy development may include stratified job growth, community dissatisfaction, mental health problems, education shortfalls, and others (Jacquet, 2009). Due to these environmental and social risks the industry is facing considerable scrutiny from stakeholders, such as government regulators, environmental groups, local communities, the media, and others, to act in a sustainable manner. This study seeks to investigate how these sustainability pressures from stakeholders and institutional actors are received, interpreted and acted upon by managers of the natural gas drilling firms. The shale gas industry is in a developmental phase with a regulatory and legal environment in flux (Reeder, 2010), which offers a unique opportunity to investigate institutional influences along with stakeholder

pressures. Furthermore, the types of firms engaged in natural gas exploration and drilling also includes smaller "non-traditional" energy firms, which allows for an investigation of stakeholder and institutional influences on smaller organizations.

Problem Statement

While organizational "greening" studies have often taken institutional perspectives, research in this domain has not clarified how institutional factors along with stakeholder pressures influence firm sustainability practices. Most past research investigating stakeholder influence either applies stakeholder theory (Buysse & Verbeke, 2003; Murillo-Luna, Garcés-Ayerbe, & Rivera-Torres, 2008; Sharma & Henriques, 2005) or institutional theory (Lounsbury, 2001; Peng & Lin, 2008; Ramus & Montiel, 2005), but not both.

Additionally, we know little about how broad institutional influences for sustainability are mediated by factors, such as a firm's public visibility or its environmental record. Prior studies have not accounted for these organization-level variables and how they might affect the sustainability pressures exerted by stakeholders and perceived by managers.

Furthermore, sustainability practices focused on preserving the environment at the most basic level are often mandated by regulators since firms may not always act in the best interest of society. However, some sustainability practices, such as eco-efficiency, yield benefits for both the firm and the environment, so firm managers may be more inclined to pursue them. Yet, our understanding if these practices are indeed only self-motivated or if firm managers are encouraged by outside pressures to engage in them, is flawed.

Finally, prior organizational research investigating pressures for environmental or sustainability issues has almost exclusively focused on large, publicly traded corporations, which according to the U.S. Small Business Administration, represent only 0.3% of all employer firms in the United States ("How important are small businesses to the U.S. economy? ,"). Hence, our knowledge if smaller organizations are influenced by a different set of stakeholders than large public firms in their sustainability practices is incomplete.

Statement of Purpose and Research Questions

The purpose of this study is to investigate how institutional and stakeholder pressures influence firms and firm managers in the shale gas industry to adopt sustainability practices. The study integrates both institutional and stakeholder arguments to identify the factors that influence firms and their managers to adopt said practices. More specifically, this study aims to investigate paths and mediating factors of institutional and stakeholder pressures for sustainability, examine variability in sustainability practices between firms, and explore if smaller firms are responsive to different stakeholders than larger size firms.

This study attempts to answer the following research questions:

RQ1: Do firms with an inferior environmental record perceive increased institutional pressures for environmental sustainability?

RQ2: Do firms with higher public visibility perceive increased institutional pressures for sustainability?

RQ3: Do firms, which are subject to increased institutional, and stakeholder pressures from environmental or social constituents, and who employ managers with supportive values and beliefs with respect to sustainability, adopt higher levels of sustainability practices?

RQ4: Do smaller organizations or their managers assign importance to a different set of sustainability stakeholders than larger organizations or their managers?

RQ5: Are eco-efficiency sustainability measures firms undertake driven primarily by internal organizational stakeholders, or to what extent do institutional industry pressures play a role in influencing these practices?

Significance of the Study

The concept of sustainable development is not new to organizational research, but the scope of how the concept has been operationalized in prior studies has been limited. Typically, studies defined the concept more narrowly emphasizing the ecological dimension instead of applying the tridimensional construct, which also includes a social and an economic dimension

(Sharma & Henriques, 2005; Sharma & Vredenburg, 1998). Hence, our understanding of how stakeholders and institutions influence all three dimensions is limited. This study helps build a nascent research stream that recognizes the notion that in order for development to remain sustainable, it must satisfy environmental, social, and economic concerns.

Furthermore, this study contributes to a unification of institutional and stakeholder-based theory, which is supported by the fact that both theories share a similar ontological system world-view underpinned by the quest for social legitimacy (Chen & Roberts, 2010). Integrating both theories in a single study provides a more comprehensive view because we can see the broader social processes through the perspective of institutional theory and the more practical and immediate managerial concerns through the lens of stakeholder theory.

Additionally, this study empirically tests propositions hitherto only raised in theoretical arguments that institutional pressures are mediated by organizational characteristics, namely a firm's environmental record and the extent of its public visibility, in influencing the firm's sustainability practices (Delmas & Toffel, 2004). Moreover, since this study includes small firms with the objective to ascertain whether managers of small firms respond to a different set of stakeholders with respect to sustainability, it extends our knowledge of an underresearched population of organizations. In the same vein, this investigation also extends the literature on eco-efficiency by empirically testing the motivations behind eco-efficiency practices.

On a more practical note, gaining an understanding of their own firm's "ranking" in terms of the extent of sustainability practices relative to the industry as a whole is likely to be of value to managers involved in natural gas drilling. The results of the study may be shared in an

aggregated form with those firms, which choose to participate and request the information. From the results, firms could identify areas for improvement of their sustainability practices or the stakeholders they engage with.

Assumptions

This research assumes that by incorporating environmental and sustainability issues into the business paradigm better theory and better outcomes are possible than if we were to treat business as a separate domain from the natural environment. Sustainability materialized as a synthesis of two opposing worldviews: technocentrism and ecocentrism (Gladwin, Kennelly, & Krause, 1995). Technocentrism postulates that humans are superior to the natural realm and that no limits should be placed on growth, since science and technology will provide the tools to address any environmental problems resulting from this growth. At the opposite end of the spectrum, ecocentrism considers the natural world as superior to humans, which are seen as unfit to address all environmental issues and the only way to resolve these environmental problems is to place limits on growth in order to not exceed the earth's capacity to sustain life (Pane Haden, Oyler, & Humphreys, 2009). Technocentrism and ecocentrism are extreme positions, which are plagued by internal contradictions that cannot be reconciled; they fail to integrate culture and the environment (Gladwin et al., 1995). Sustainability is situated somewhere in the middle between these two positions and may offer a more feasible roadmap for the future because it views neither humans nor the natural world as superior, but sees them as interconnected (Pane Haden et al., 2009). So, taking sustainability as a guiding paradigm, this research assumes that organizations,

such as those engaged in natural gas exploration and development, can benefit by recognizing and incorporating environmental and social issues into their strategies, policies, and practices. Admittedly, there may also be somewhat of an action research component to this study since it may highlight the importance of incorporating sustainability issues in managerial decision making and taking into account not only economic stakeholders, but a wider range of environmental and social constituents.

Definitions of Terms

Hydraulic fracturing or hydrofracking: Hydraulic fracturing is the process of creating fissures, or fractures in underground formations to allow natural gas to flow. In deep shale gas formations, like the Marcellus, water, sand (which together make up over 99% of the fluid), and chemical additives are pumped under high pressure into the formation to create fractures, which allows the natural gas to flow into the wellbore and be collected at the surface ("Marcellus shale hydraulic fracturing fact sheet," 2010).

Marcellus shale: "The Marcellus shale is an organic-rich black shale that was deposited in an oxygen-deficient marine environment during Middle Devonian time (~390 million years ago). Long known to be a source rock for many conventional oil and gas reservoirs in the Appalachian basin, it is now being explored as an unconventional reservoir. The formal name for this rock unit is the Marcellus Formation."("Frequently asked questions (FAQs) regarding the Marcellus shale gas play," 2011).

Shale: A dark fine-grained laminated sedimentary rock formed by compression of successive layers of clay-rich sediment (Butterfield, 2003).

Stakeholder: Stakeholders of a firm are defined as any group or individual, who can affect or is affected by the achievement of the firm's objectives (Freeman, 1984).

CHAPTER II: LITERATURE REVIEW

Chapter Overview

The purpose of this study is to investigate how institutional and stakeholder pressures influence firms and firm managers in the shale gas industry to adopt sustainability practices. The study integrates both institutional and stakeholder arguments to identify the factors that influence firms and their managers to adopt said practices. To carry out this study, it is necessary to conduct a critical review of current literature on a number of topics. Specifically, four major areas of literature are reviewed: a) Sustainable development and eco-efficiency; b) Shale gas industry and environmental issues; c) Institutional theory and institutional pressures; and d) Stakeholder theory and stakeholder pressures. The review also includes a critical analysis of prior studies with an institutional and stakeholder focus.

The review of sustainable development and eco-efficiency concepts provides the necessary framework for development of the dependent constructs of the study. The industry overview grounds the study in the specific industry context and covers the environmental issues connected to it. Covering institutional and stakeholder theory and critique of associated studies serve the purpose of identifying and evaluating independent pressure sources in both the broader social web of institutional relationships as well as in the immediate organizational environment. Finally, the chapter concludes with the research model employed as a conceptual framework and development of the specific research hypotheses.

To carry out this review of selected literature, a number of information sources were utilized including journal articles, industry articles, newspaper articles, books, Internet sources,

and government statistics. These sources were accessed through EBSCO Host (all databases), Web of Science, search for electronic library pilot holdings, interlibrary loan requests, and general web searches through Google scholar and Google keyword searches. No delimiting timeframe was applied to these searches. However, with an emergence of green issues in the business literature in the mid 1990's, selection of works focused on materials from that period onwards. Similarly, for stakeholder and institutional topics, some of the seminal work originated in the 1980's, which provided a reference point for subsequent identification of pertinent literature. To aid in the synthesis and critique of the selected sources, a literature tally matrix was created as suggested by Machi and McEvoy (2009).

Sustainable Development

The basic concept of sustainable development has been around for centuries; it originated in 17th century Germany not only as an idea, but as a law governing the rate at which timber was to be harvested so the forests could renew themselves over time (Birnbacher & Schicha, 1996; Kirchgässner, Schrefel, & Lauber, 1997).

Over the last 30 years, organizational researchers have employed a number of definitions with environmental and/or social dimensions, such as corporate social responsibility, corporate social performance, environmental management, and more recently corporate sustainability, which is also referred to as sustainable development (Montiel, 2008). While the former concepts have been operationalized in many different ways, sustainable development has the benefit of building on a common definition stemming from the UN-Report *Our Common Future*, which

defined sustainable development as "Development that meets the needs of current generations without compromising the ability of future generations to meet their needs and aspirations" (WCED, 1987, p. 43). Departing from this macro-level definition, organizational researchers have since refined the concept to be applied at the organizational level and included economic, social and environmental dimensions (Steurer, Langer, & Konrad, 2005). However, these three dimensions may not always be equally impacted as competing objectives between them exist. An overemphasis of economic factors may yield less social inclusiveness as only few benefit (Sachs, 2004). For example, companies may have a positive economic impact on a region with their development, but from a social perspective, not all stakeholders may see an improvement or some may even see negative effects. In the current study context, the development primarily occurs in rural areas, which are often unprepared for the rapid increase in growth. Those businesses or individuals that are not directly connected to the development may see adverse effects, such as inflationary or employment pressures (Jacquet, 2009). This study recognizes the complexity and difficulty involved with sustainable development, but does not attempt to discuss or address these issues from all perspectives. This study builds on the broader framework of sustainable development and considers all three dimensions relevant to firms in the shale gas industry. The specific steps taken to operationalize the concept are outlined in the methods section. Table 1 provides a more detailed explanation of each of the sustainable development dimensions as they apply to this study (Marcus & Fremeth, 2009).

Table 1

Sustainable Development Dimensions

Sustainability Dimension	Description
Environmental	Organizations create environmental impacts at the local, regional, national, and international levels. These impacts occur in relation to air, water, land, and biodiversity.
Social	This dimension of sustainability includes the impact of an organization's activity on society, including on employees, customers, community, suppliers, and business partners. Social performance is a vital element in support of an organization's license to operate, and supports the organization's ability to deliver high-quality environmental and economic performance.
Economic	This dimension incorporates the ways organizations affect the economies in which they operate. Economic prosperity is captured and disclosed by conventional financial accounting and reporting, but can benefit from additional measures to capture the full range of an organization's economic impact.

Note. Adapted from "Green Management Matters Regardless," by A. A. Marcus and A. R. Fremeth, 2009, *Academy of Management Perspectives*, 23, p. 19.

Eco-Efficiency

Since this study more closely investigates the motivations behind eco-efficiency sustainability measures firms undertake it is appropriate to briefly discuss this concept and how it is applied to this research context. Eco-efficiency was first introduced by Schaltegger and Sturm (1989) and more broadly publicized by Schmidheiny (1992). It involves producing goods or

services while at the same time reducing the ecological impact and use of natural resources. Over the years since then a number of diverging definitions have emerged. According to Huppes and Ishikawa (2005), two basic variants with respect to product or production can be differentiated: the ratio of value to environmental impact and the ratio of environmental impact to value, one being the exact inverse of the other. For the purpose of this research, it will suffice to define eco-efficiency as conservation approaches (Gladwin et al., 1995), which involve changing of processes and products to reduce wastes at the source, reduce energy and materials usage, conserve or recycle water, and increase fuel efficiency.

Many firms have realized that it is more economical to reduce process wastes before they are generated. However, eco-efficiency may also involve significant investments, and firms may only undertake those projects, which involve small to medium internal investments (Christmann, 2000; Hart, 1995; Russo & Fouts, 1997; Sharma, 2000). In case the investments are large, the private firm costs of the resources used or the pollution generated may not justify – in terms of normal private returns – the investment that would be needed to reduce them. Nevertheless, in terms of resource usage, waste disposal, and emissions, firms often do not operate at the frontier of economic efficiency, and once they put forward the managerial effort, cost savings can be realized in addition to reducing their environmental footprint (Ekins, 2005).

In the natural gas drilling industry, millions of gallons of water are utilized for a single well and between 10 percent and 40 percent of the water injected into each well resurfaces in the first few weeks of the hydrofracking process, which highlights water usage as a target for eco-efficiency measures. Indeed, drilling firms in Pennsylvania have started to recycle water, but

according to state records, firms recycled less than half of the wastewater they produced during the period of July 2009 to December 2010 (Urbina, 2011b).

Major Shale Gas Industry Developments and Environmental Issues

Shale Gas Production and Outlook

"Shale gas refers to natural gas that is trapped within shale formations. Shales are fine-grained sedimentary rocks that can be rich sources of petroleum and natural gas." ("What is shale gas and why is it important?,"). "In 2010, U.S. shale gas production reached 4.87 trillion cubic feet (23 percent of total U.S. natural gas production), compared with 0.39 trillion cubic feet in 2000. This shows both the rapid growth and absolute importance of the shale gas resource to the United States. Rising production from shale gas resources has been credited with both lower natural gas prices and declining dependence on imported natural gas. The U.S. Energy Information Administration (EIA)'s Annual Energy Outlook 2011 also reflects the growing importance of U.S. shale gas. It projects that shale gas will account for about 46 percent of U.S. natural gas production in 2035" ("Shale gas is a global phenomenon,").

However, more recently, some members of the U.S. Energy Information Administration as well as market and industry analysts are questioning the long-term viability of the shale gas industry (Urbina, 2011a, 2011c). A decline of U.S. natural gas prices from over $10 since mid-2008 to approximately $4 per thousand cubic feet by the end of 2011 (see figure 1) coupled with

considerable uncertainty about the amount of undeveloped reserves of gas producers, raise

doubts about the commercial feasibility of shale gas development. A multi-year evaluation of

production costs of ten shale gas operators finds an average $7 per thousand cubic feet break-

even cost for shale gas formations in the United States (Berman, 2010). Furthermore, the shale

gas reserves producers forecast are based on individual well lives of as much as 65 years, with

about half of the reserves forecast in years 20 to 65 (Berman, 2010). However, some initial case

evidence from the Barnett shale (see figure 2 for location), which has the longest production

history, suggests that if wells' production declines in the current manner, many of its 9,000 or so

wells will become financially unviable within 10 to 15 years (Urbina, 2011c).
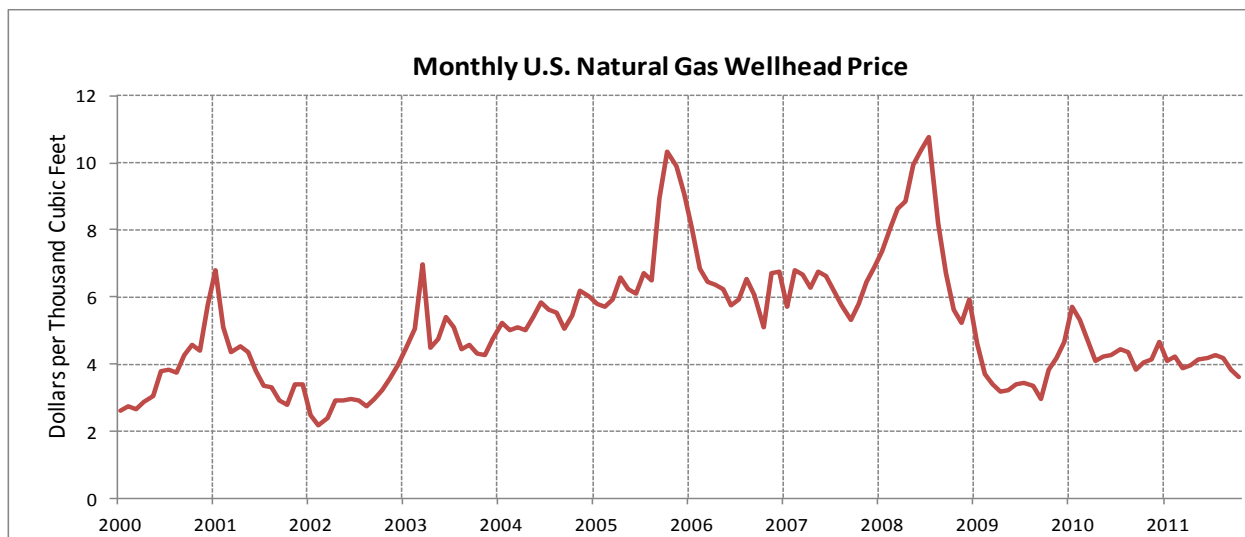
Figure 1. Monthly U.S. Natural Gas Wellhead Price. Adapted from the U.S. Energy Information
Administration.

Industry Makeup and Developments

The producers of natural gas in the United States comprise over 6,300 firms, which range in operations from large integrated producers (majors) with worldwide operations in all segments of the oil and gas industry, to small local firms that may only have partial interests in a single well ("Industry and Market Structure," 2010). A common way to divide the activity of energy companies into different businesses is to distinguish upstream operations, which include the exploration, development, and production of natural gas, from downstream operations, such as distribution and marketing. In this study, the focus is on the upstream segment, specifically the shale gas industry, which is often referred to as the unconventional gas industry. The shale gas industry has traditionally been dominated by smaller firms, who specialize in the short-term nature of the gas plays requiring constant reinvestments and drilling to maintain production (McNulty, 2009). However, more recently, larger, more traditional energy firms have started acquiring interests in shale gas indicating a movement toward consolidation in the industry sector (Reddall, 2011).

Marcellus Shale Development

The Marcellus Shale is the most expansive shale gas formation in the United States, spanning six states in the northeastern United States (figure 2). Recent technological innovations in horizontal drilling and hydraulic fracturing allowed for growth of natural gas extraction from alternative sources, including the Marcellus shale (Harper, 2008). In 2003, the first operator drilled the first economically producing wells into the Marcellus formation in Pennsylvania using

horizontal drilling and hydraulic fracturing techniques similar to those used in the Barnett shale

formation in Texas (*Modern Shale Gas Development in the United States: A Primer*, 2009). As

of April 2011, approximately 3,000 Marcellus shale wells have been drilled and approximately

6,400 have been permitted according to the Pennsylvania Department of Environmental

Protection ("Marcellus shale oil & gas industry resources,").

Figure 2. Shale Gas Formations Lower 48 States. Adapted from U.S. Energy Information
Administration based on data from various published studies. Updated March 10, 2010.

Utica Shale Development

The Utica shale is a rock layer located a few thousand feet below the Marcellus shale (see figure 2 for location) and is believed to become another viable resource for natural gas, but also for oil and natural gas liquids, which are worth significantly more than natural gas on an energy-equivalent basis ("Utica shale - the natural gas giant below the Marcelllus?,"). Most of the development of the Utica shale to date has occurred in eastern Ohio and Ontario, Canada, where the Marcellus is not present and the Utica shale is less than 4,000 feet below the surface. While the significant depths and lack of information currently present challenges to development of this resource, the Utica shale may also become economically attractive where the Marcellus shale has been developed since drilling pads, roadways, pipelines, gathering systems, and landowner relationships already exist ("Utica shale - the natural gas giant below the Marcelllus?,"). As of December 2011, the Ohio Department of Natural Resources has issued 96 drilling permits for the Utica shale ("Utica/point pleasant shale wells," 2012).

Environmental Issues in Shale Gas Development

The exploration and extraction of shale gas as a non-renewable resource has raised a number of local environmental concerns. In general, the energy industry impacts the natural environment in the areas of species habitat preservation at exploration and drill sites, environmental restoration of contaminated soil, and risk reduction of environmental accidents and wastes (Sharma & Vredenburg, 1998). In the shale gas industry, the environmental concerns largely center on three main issues: First, large amounts of water are required for the fracturing

of wells, which may affect availability of water for other uses, and can affect aquatic habitats. Second, hydraulic fracturing fluid, which contains potentially hazardous chemicals, can be released by spills, leaks, or various other exposure pathways. Any such releases can contaminate surrounding areas. Third, fracturing also produces large amounts of wastewater (or brine), which can contain dissolved chemicals and other contaminants that require treatment prior to disposal or reuse ("What is shale gas and why is it important?,"). This issue is especially prevalent in Pennsylvania, where injection of wastewater into deep wells that serve as natural repositories is not possible due to unique local geological formations (Abdalla, Drohan, Saacke Blunk, & Edson, 2011). A recent study focused on surface water quality in Pennsylvania found that the presence of wells in a watershed increases the concentration of downstream total suspended solids (TSS) and the release of treated shale gas waste by permitted treatment facilities increases downstream concentration of chloride levels (Olmstead, Muehlenbachs, Shih, Chu, & Krupnick, 2013).

Shale gas development comes with environmental risks; however given the relatively short time period since the increase in drilling activity, these risks are still not yet well understood. An analysis of priority environmental risks not adequately addressed by government regulation and/or voluntary industry practices assessed by experts from government agencies, industry, academia, and NGOs was conducted by Resources for the Future, an independent economic research and analysis organization (Krupnick, Gordon, & Olmstead, 2013). The study indicated a consensus among experts from all groups that risks to surface water quality are paramount (from site preparation, fracturing and completion, and storage/disposal of fracturing

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fluids and flowback), while also recognizing risks to air quality (from methane leaks from drilling or fracturing and completion) and risks to groundwater quality (from fracturing and completion and storage/disposal of fracturing fluids and flowback).

<div align="center">**Institutional Influences on Sustainable Development**</div>

Institutional Theory

Institutional theory has been applied widely in the organizational literature to investigate diffusion of numerous practices, such as adoption of TQM initiatives (Westphal, Gulati, & Shortell, 1997), implementation of recycling programs (Lounsbury, 2001), adoption of voluntary green initiatives (Clemens & Douglas, 2006) and others. This study employs institutional arguments to explain adoption of sustainable development activities firms undertake.

Institutional theory emphasizes that firms do not exist in a vacuum; they are embedded, and to an extent constrained by, a social web of relationships with other social actors (Granovetter, 1985). The theory generally investigates how firm-*external* forces influence organizations by considering the processes by which structures, including schemas, rules, norms, and routines, become established as authoritative guidelines for social behavior (Scott, 2004). DiMaggio and Powell (1983) identified the process of *isomorphism*, which forces firms connected with the same institutional environment to resemble each other over time. Organizations, so the authors suggest, exist in fields of other organizations that influence their

behavior. When these organizational fields become "structurated" (i.e. well-defined and mature), they exert powerful influences on the behavior of the organizations within them. Furthermore, the authors differentiated three types of institutional pressures, which lead to isomorphism: First, *coercive isomorphism*, stemming from government regulation or public opinion; second, *mimetic isomorphism*, resulting from standard responses to uncertainty, i.e. imitating other, successful firms; and third, *normative isomorphism*, associated with industry standards, best practices, professional organizations, and the like (DiMaggio & Powell, 1983). As Scott (1991) pointed out, institutional arrangements and social processes limit the range of possibilities or repertoires determined by the group of organizations that makes up the firm's institutional field.

In sum, institutional theory explains why firms in a common industry tend to conform to the same practices; however, there are additional considerations that apply to sustainability practices.

Institutional Theory and Organizational Sustainability

Firms in a single industry are subject to the same legal, regulatory and environmental considerations. As discussed in the introduction, the shale gas industry poses considerable environmental risks. When firms share the same organizational field, it also means that its members are affected in similar ways by institutional forces emanating from them (Jennings & Zandbergen, 1995). For example the BP oil spill of 2010 not only impacted the firms that were immediately connected to the crisis, it undermined the legitimacy of all firms in the oil industry. Similarly, in the shale gas industry, concerns about the safety of the hydraulic fracturing process

affect all drilling firms. As pointed out by Jennings and Zandbergen (1995), such concerns often lead to regulatory (coercive) enforcement. However, specific industry characteristics may also help explain the expected level of institutional pressures.

Institutional Considerations Applicable to Natural Resource Extraction

The shale gas industry harvests a natural resource, a common good, which has been made subject to property rights claims. The type of industry is likely to affect the level of institutional pressures and the sustainable practices firms within it will put in place. For example, firms in the financial services sector are less pressured to act in an environmentally sustainable manner as opposed to firms in the oil and gas sector. The energy industry is also subject to an increased level of scrutiny from governmental institutions and the public due to public awareness of past indiscretions and the potential danger its activities represent to the natural environment (Jones, 1999). For this reason, prior cross-industry studies investigating institutional or stakeholder influences on sustainability practices controlled for the type of industry (Buysse & Verbeke, 2003; Gallo & Christensen, 2011; Henriques & Sadorsky, 1999).

In addition to the type of industry, the developmental stage of the industry is also likely to have an effect on the level and nature of institutional pressures. Hoffmann's (1999) study of the evolution of environmentalism in the U.S. chemical industry over more than three decades indicated that the relationships between firms and institutions evolves over time from one first characterized by coercive regulatory pressures, followed by normative and mimetic forces. The firms in this industry first rejected and later embraced the environment as a strategic issue.

Bansal's (2005) organizational study of the forestry, mining, and oil & gas industries found that media pressures were more important in the early years and that sustainability is an evolving concept influenced to a varying degree over time by institutional factors. More recently, Delmas and Montes-Sancho (2010) discovered that institutional pressures exerted a more powerful influence on firms when particular sustainability practices were just emerging. These results may not directly translate to the shale gas industry, but given that the industry is an early developmental phase (Reeder, 2010), it is likely that the industry is currently characterized by a predominance of coercive pressures.

The position of a firm in the supply chain is also likely to affect the level of institutional pressures. If the good is sold directly to consumers, the level of institutional pressure for sustainable behavior is expected to be higher than if the good is primary or intermediate in nature because of the increased sensitization to environmental externalities typical in consumer goods industries (Khanna & Anton, 2002; Lerner & Fryxell, 1988).

Finally, the industry structure and the level of competition is thought to more directly influence the level of sustainability practices firms engage in. If the level of competition is higher, firms are more likely to engage in sustainable behaviors than in oligopolistic scenarios (Darnall, 2009; Jones, 1999). As pointed out earlier, the shale gas industry involves many smaller firms, which is indicative of a more competitive market structure.

From these arguments, we can expect that the shale gas industry is likely characterized by a high level of institutional pressure for sustainable development. Also, since the shale gas

industry is an early developmental stage, these institutional pressures are likely of a coercive nature.

Pressures from Institutional Stakeholders in the Social Context

Institutional stakeholders are constituents, which are part of the social context and influence all firms (Yang & Rivers, 2009). In this section, the review covers the stakeholders in the social context from the environmental management and organizational literature that are of relevance to the shale gas industry. These stakeholders include government regulators, non-government organizations, industry, the media, and local communities. While the subsequent section covers each of these stakeholder groups separately, it is important to point out that these stakeholders are often interconnected and the degree of their interconnectedness may determine the level of pressure they can exert over firms (Granovetter, 1973; Rowley, 1997). The final list of institutional stakeholders is based on a literature review of pertinent stakeholder studies as well as industry-specific considerations.

Government regulatory pressures. Shale gas firms are harvesting a natural resource and due to the likelihood of negative externalities (Coase, 1960), government regulation is the most apparent institutional constituent to coercively influence firms in this industry. Henriques and Sadorsky's (1996) study, which included the natural resource sector, found government regulations to be the most frequently mentioned source of pressure in the adoption of environmental management practices. The shale gas industry is embedded in a complex web of

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regulatory parties ranging from local municipalities, which issue planning or zoning ordinances, to state authorities, which regulate the drilling and permitting process, to the United States Environmental Protection Agency (Reeder, 2010). In Pennsylvania, the Department of Environmental Protection's Bureau of Oil and Gas Management has the responsibility of the statewide oil and gas conservation and environmental programs to facilitate the exploration, development, and recovery of oil and gas reservoirs in an environmentally responsible manner ("Bureau charter,"). In West Virginia, the Office of Oil and Gas of the West Virginia Department of Environmental Protection is tasked with the same mandate. Since these state agencies issue well permits, perform well site inspections, and issue violations and fines, they effectively control a firm's license to operate and can influence a firm's legitimacy. These state agencies can withhold or discontinue the provision of a resource (well permits) in order to induce a change in the firm's behavior (Frooman, 1999). However, this ability to influence a firm's environmental behavior is often limited by a lack of resources, which forces regulators to carefully prioritize their activities (Potoski & Prakash, 2005).

Regulators tend to focus on pollution control; they establish a minimum environmental standard against which firms are assessed. In the framework of sustainable development however, pollution control comprises only one aspect within the environmental dimension. Studies focusing on this dimension, such as Sharma and Henriques (2005), identified additional sub-categories requiring increasing organizational commitment and resources, such as eco-efficiency, recirculation, eco-design, ecosystem stewardship and business redefinition. In the

aforementioned study, no stakeholder influenced pollution control, likely because it was a given in the Canadian forestry industry (Sharma & Henriques, 2005).

Some evidence also points out "that firms in more intensively regulated industries are particularly likely to respond to poor environmental ratings by improving their environmental performance" (Delmas & Toffel, 2010, p. 18).

Pressure from non-government organizations. Non-government organizations can exercise coercive pressure on firms by engaging in environmental or social activism. For the purpose of this study, the focus is primarily on local and extra-local environmental non-government organizations companies engage with since these organizations are most active in influencing firms in the shale gas industry. Common methods these organizations employ to influence firms include environmental group protests, disruption of company operations, releasing reports to the media, or political lobbying efforts designed to result in stricter environmental regulations (Henriques & Sharma, 2005). The organizational management literature includes numerous case examples describing how companies have changed their sustainability practices as a result of pressures from environmental groups. These groups may either target individual firms, which are likely those with a poor environmental record (Hendry, 2006), or advocate for changes in environmental practices, which affect all firms in a given industry.

In the context of the Marcellus shale, there is a large amount of interest by environmental groups because of the environmental impact of drilling operations, especially with respect to drinking water supplies and land resources (Booher et al., 2010).

Industry pressures. Industry pressures come from a variety of organizations including industry and trade associations, leading firms in the industry, and other industry institutions, such as coalitions. There is empirical evidence to suggest that industry associations motivate firms to adopt sustainable practices by establishing voluntary guidelines for environmental conduct (Christmann, 2004; Delmas & Montes-Sancho, 2010). In the realm of the shale gas industry, associations, such as the American Gas Association (AGA) or the American Petroleum Institute (API) assert such normative isomorphic pressures over the firms in the industry (DiMaggio & Powell, 1983). Trade associations can have a similar influence through hosting of trade conferences, which may put pressure on firms, which have not reached the same level of implementation (Lenox & Nash, 2003). Furthermore, firms in the industry may look to leading firms to imitate sustainable practices. This practice is thought to be a response to environmental uncertainty (DiMaggio & Powell, 1983), or can be a result of a lack of incentives for firms to adopt government mandated environmental practices in ways suitable to their own needs (Jennings & Zandbergen, 1995). Finally, other industry organizations, such as coalitions may be formed to represent industry interests or to preempt government regulations. An example of the latter is the creation of the Global Climate Coalition, which opposed government actions to reduce the effects of climate change (Revkin, 2009). In the shale gas industry, the Marcellus

Shale Coalition, to which many of the drilling firms belong, acts in a normative fashion by addressing regulatory issues, providing education to its members and also representing the industry in the media ("About the Marcellus shale coalition," 2011).

Media pressures. The media has the potential of coercively influencing firms by releasing negative reports about their practices, which can undermine a firm's legitimacy. The media is also likely to influence other stakeholders, such as environmental interest groups and public opinion in general. Furthermore, the media can shape institutional norms by choosing the stories worth reporting and framing them to reflect editorial values (Bansal, 2005).

Empirical studies have emphasized the importance of media influences on corporate environmental practices (Bansal, 2005; Bansal & Roth, 2000; Henriques & Sadorsky, 1996). Media pressures may be more relevant for firms, which engage in reactive environmental strategies, i.e. achieve a lower level of sustainability. Henriques and Sadorsky (1999) highlighted that managers pursuing more proactive environmental strategies perceived all stakeholders *except* the media as important, whereas managers of firms pursuing more reactive environmental strategies were more susceptible to media influences.

Finally, media-related pressures may be more important early in an industry's development. Bansal's (2005) longitudinal study of the Canadian forestry, mining, and oil and gas industries indicated a decreasing importance of media pressures over time.

Given this empirical evidence and the fact that the shale gas industry is in an early developmental stage, media-related pressures are likely to be more prevalent, but may only be relevant for firms, which attain lower levels of environmental sustainability.

Local community pressures. Local community groups can exert coercive pressure on firms by electing local public officials representing their interests and filing citizen lawsuits (Delmas & Toffel, 2010). Other tactics community groups may utilize include letter-writing campaigns and boycotts (Chiu & Sharfman, 2011). A number of studies indicate that local community pressures positively influence firm sustainability or at least their environmental practices (Florida & Davison, 2001; Henriques & Sadorsky, 1996; Kassinis & Vafeas, 2006). A key finding from Kassinis and Vafeas' (2006) study is that communities, which are characterized by more political engagement, higher income, and higher population density had less exposure to toxic emissions. In the context of the shale gas industry, numerous additional groups at the local community level can make legitimate claims on sustainable company practices. These groups or individuals may include local economic development organizations, local schools, landowners or adjacent landowners, local business owners, hospitals, emergency services, and others.

Varying Sustainability Practices in a Common Industry Environment

The theoretical arguments advanced so far provide some insight into how institutional factors external to firms can lead to homogeneity of sustainability practices. Based on these arguments we would expect that all firms within the same industry pursue the same or similar

sustainability strategies since they are all affected by the same institutional forces. However, a number of prior studies found variability of environmental or sustainability practices among firms in a single industry context (Henriques & Sharma, 2005; Sharma, 2000; Sharma & Vredenburg, 1998). How can these variations in the same institutional context be explained? This has been a subject of debate in the institutional literature for quite some time and is not well understood. Sources of these variations may stem from varying pressures exerted by stakeholders on firms or from varying interpretations of these pressures. In the next section, the theoretical arguments and empirical findings from the institutional literature are summarized and critiqued.

Critique of Studies of Institutional Influences on Environmental Practices and Sustainability

Institutional theory has been widely applied in the organizational literature to investigate environmental issues. Most of the studies examine institutional influences on various industries at a certain point in time (Delmas & Toffel, 2008; Peng & Lin, 2008; Ramus & Montiel, 2005). However, we know that institutional forces tend to change over time and the institutional actors or issues viewed as critical at one point in time may not be critical at a later stage in an industry's development (Hoffman, 1999; Kraatz & Zajac, 1996). Therefore, studies conducted at various stages of an industry's evolution would provide further insight into which institutional influences are more prevalent at each stage.

In addition to time-related issues, we know little about how field-level institutional or stakeholder pressures are mediated by factors, such as organizational characteristics and

managerial interpretation to affect variability in sustainable firm responses to these pressures. Many studies account for firm size and industry as control variables, but do not offer insight into how organization-level variables account for differences in environmental or sustainability practices (Aragon-Correa, 1998; Buysse & Verbeke, 2003; Henriques & Sadorsky, 1999). A notable exception is a recent study by Delmas and Toffel (2008), which investigated how influential legal and marketing departments increased the likelihood of firms to adopt government voluntary programs, or pursue ISO 14001 certification, respectively.

Furthermore, viewing how pressures for sustainability are perceived and acted upon by firms through a single theoretical lens may not provide sufficient insight. However, most past research investigating stakeholder influence either applies stakeholder theory (Buysse & Verbeke, 2003; Murillo-Luna et al., 2008; Sharma & Henriques, 2005) or institutional theory (Lounsbury, 2001; Peng & Lin, 2008; Ramus & Montiel, 2005), but not both. Integrating both theories in single study provides a more comprehensive view because we can see the broader social processes through the perspective of institutional theory and the more practical and immediate managerial concerns through the lens of stakeholder theory. Additionally, integrating the theories is further supported by the fact that both theories share a similar ontological system world-view underpinned by the quest for social legitimacy (Chen & Roberts, 2010). Institutional theory explains a social process, i.e. how structures, including schemas, rules, norms, and routines, become established as reliable guidelines for social behavior (Scott, 2004). The theory is useful in explaining how institutional actors at various levels of analysis, from the global macro-level to the micro-level of the individual manager, influence the adoption of sustainability

practices and how heterogeneity may result from varying interpretations, norms and cultures. Stakeholder theory on the other hand can explain how managers prioritize the various stakeholder demands and also offers insight into the type of influence strategy and pathway a particular stakeholder is likely to utilize when persuading a firm (Frooman, 1999). A review of stakeholder theory and associated studies is provided in the next section.

In summary, this study extends the existing literature by investigating the shale gas industry in an early developmental stage, and therefore providing insight into the institutional and stakeholder influences prevalent early in a "non-traditional" industry's life cycle. Moreover, this study considers organizational characteristics and managerial interpretation as mediating factors on firm sustainability practices. Finally, this study draws from both institutional theory and stakeholder theory to arrive at a more holistic view of pressures for sustainability.

Stakeholder Influences on Sustainable Development

Stakeholder Theory – Firm Focus

This study investigates how institutional and stakeholder pressures influence firms and firm managers to adopt sustainability practices. Stakeholder theory is a useful framework to investigate stakeholder importance, stakeholder actions and firm responses. Stakeholder theory was originally developed by Freeman (1984), who proposed a four step stakeholder management process firms should follow: First, identify all relevant stakeholder groups with respect to the

issue being at hand; second, determine the stake and salience of each stakeholder group; third, determine how effectively the needs or expectations of each group are currently being met; and fourth, modify organizational policies and priorities to take into account any unmet stakeholder needs.

Freeman (1984) highlights the managerial responsibility to balance the interests of stakeholders over time, but does not provide a basis for deciding between competing stakeholder interests (Kaler, 2006). Mitchell, Agle, and Wood (1997) analyzed a number of studies and concluded that managers pay attention to stakeholders, who are powerful (i.e., have the ability to influence the firm), are legitimate (based on contractual or legal obligation), and urgent (i.e. have time-sensitive or critical claims). These attributes have received reasonable empirical support in subsequent research (Laplume, Sonpar, & Litz, 2008). However, there are competing theories with respect to stakeholder salience; with some arguing that it is a function of organizational culture and commitments (Buysse & Verbeke, 2003; Henriques & Sadorsky, 1999), others asserting that it depends on the organizational life-cycle stage (Jawahar & McLaughlin, 2001), and still others claim that it rests upon the politicized framing of stakeholders within an industry (Fineman & Clarke, 1996).

In contrast to this more managerial or strategic view, a separate branch of the stakeholder literature considers the ethical and moral dimensions of stakeholder claims on firms. The question this body of literature is asking is not, which stakeholders firms pay attention to, but which stakeholders firms *should* pay attention to (Jones, 1995; Rodgers & Gago, 2004). Traditionally, shareholders were viewed as the primary stakeholders of the corporation and the

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only social responsibility of corporations was to make money for them (Friedman, 1962). Taking a historical perspective, Rodgers and Gago (2004) characterized this societal period as one dominated by psychological egoism motivated by self-interest, which has since graduated to an information age and the beginnings of a stakeholders' ethical concern period. To reflect this societal development, more recent stakeholder theory poses that various stakeholder groups have legitimate claims on corporate governance, including regulators representing the public, customers, employees, and suppliers (Clarkson, 1995; Yang & Rivers, 2009). There is a clear linkage between this ethical and moral branch of the stakeholder literature and sustainable development in the sense that both are concerned with a more balanced and equal participation of stakeholders, which traditionally have not been part of the discussion (Acemoglu, Johnson, & Robinson, 2002; Sachs, 2004). In sum, this normative approach to stakeholder theory is primarily proscriptive, indicating what firms should do rather than providing an empirically testable theory (Fineman & Clarke, 1996).

Stakeholder Theory – Stakeholder Focus

To address some of the theoretical shortcomings addressed earlier, Frooman (1999) shifts the perspective from the firm to the stakeholders themselves and offers a typology of resource relationships and influence strategies based on resource dependence theory. This approach offers a model to predict *how* various stakeholders are expected to influence firms based on their resource dependence with the firm. Frooman (1999) suggests that there are two types of resource control strategies; withholding and usage. With withholding strategies, stakeholders discontinue

the provision of a resource to a firm in order to induce a change in the firm's behavior. With usage strategies, the stakeholders continue to supply the resource, but with conditions attached. Frooman (1999) also specifies direct and indirect pathways; a direct pathway involves the direct manipulation of the flow of resources to the firm whereas an indirect pathway flows through other stakeholders. For example, since environmental non-government organizations have a low interdependence with the firm they are likely to choose an indirect pathway through regulatory organizations to influence the firm's environmental practices.

A number of empirical studies have utilized Frooman's (1999) typology, with mixed results. Frooman expected methodological challenges from measurement of the independent variable (i.e. measuring the extent of resource dependence), which led most empirical researchers to utilize varying research methods, such as hypothetical vignettes (Elijido-Ten, Kloot, & Clarkson, 2010; Frooman & Murrell, 2005), or qualitative interviews (Hendry, 2005; Tsai, Yeh, Shu-Ling, & Ing-Chung, 2005). Each of the studies provides some empirical support for the model, but each study also identifies additional variables to consider, such as additional demographic variables (Frooman & Murrell, 2005), influence strategy selection factors (Hendry, 2005), and institutional legitimacy (Tsai et al., 2005). The most recent study (Elijido-Ten et al., 2010) , although based on a small sample, does lend support to Frooman's (1999) model, but asserts that the effectiveness of the model is "tempered by the level of significance placed on the event by the stakeholders". In other words, so the authors, the model is more suitable when analyzing scenarios with a large and potentially adverse impact on the relevant stakeholders.

Pressures from Stakeholders in the Organizational Context

Stakeholder in the organizational context are tied to the specific firm and typically include employees, suppliers, customers, and shareholders or owners (Yang & Rivers, 2009). However, this list is likely to change with the scope of the organizational practices of concern to the stakeholders (social, environmental, and economic concerns), the industrial context, organizational factors, and managerial interpretation and values. According to Buysse and Verbeke (2003), the relevant stakeholders of an organization at any point in time is largely an empirical question.

In the shale gas industry, an example of a relevant stakeholder group in the organizational context is the landowners, who lease their land (or more specifically the mineral rights) to the drilling firms. In order to identify the salient stakeholder groups in the organizational context with respect to sustainability issues, this study develops an initial stakeholder list from organizational and industry literature and employs a survey to assess stakeholder salience overall.

Stakeholder Influence on Small Firms

This study explores if smaller firms are influenced by a different set of stakeholders than larger firms in their sustainability practices. What constitutes a small firm varies from study to study depending on the context. However, organizational researchers focusing on institutional or stakeholder influence tend to exclude small firms from their analysis, either because of limited or complete lack of publicly available data about them or because they are presumed as having

insufficient resources for sustainable activities (Aragon-Correa, Matias-Reche, & Senise-Barrio, 2004; Bansal, 2005; Buysse & Verbeke, 2003; Delmas & Toffel, 2008; Henriques & Sharma, 2005; Sharma, 2000; Sharma & Vredenburg, 1998). This is a concerning shortcoming of past research, since according to the U.S. Small Business Administration, small firms represent 99.7% of all employer firms in the United States ("How important are small businesses to the U.S. economy? ,").

Firm size is likely to affect the types of stakeholders that are deemed important. Most studies have not investigated this aspect since most of them exclude small firms or used firm size only as a control variable. Smaller firms may be more responsive to their customers since this stakeholder group is most important to the survival of the business (Chrisman & Archer, 1984). Small firms may in general be more responsive to stakeholders with a direct economic stake in the organization, internal stakeholders (management and non-management employees), and regulatory stakeholders (Darnall, Henriques, & Sadorsky, 2010). However, these findings will require additional validation, since Darnall et al. (2010) relied exclusively on survey data for dependent and independent variables, focused on the manufacturing sector, and included firms in six different countries subject to significantly different institutional settings, which likely influenced the dependent variable (proactive environmental practices).

Critique of Studies of Stakeholder Influences on Environmental Practices and Sustainability

In order to study firm responses to sustainability pressures, it is a requirement to identify the stakeholders concerned with sustainability issues. Past studies have varied in terms of the stakeholder groups identified as relevant with respect to environmental issues. Murillo-Luna, et al. (2008) identify internal economic stakeholders, external economic stakeholders, corporate government stakeholders, regulatory stakeholders, and external social stakeholders. Buysse and Verbeke (2003) offer an alternative classification of stakeholders, which includes internal primary stakeholders, external primary stakeholders, secondary stakeholders, and regulatory stakeholders. Table 2 provides the individual stakeholders from these two studies, which make up these stakeholder groups.

Table 2
Stakeholder Classification

Stakeholder Classification by Murillo-Luna, Garces-Ayerbe & Rivera-Torres (2008)				
Internal economic stakeholders	External economic stakeholders	Corporate government stakeholders	Regulatory stakeholders	External social stakeholders
-Employees -Labor unions	-Customers -Suppliers -Financial Institutions -Insurance companies -Competitors	-Managers -Shareholders / owners	-Environmental legislation -Administration control	-The media -Citizens / communities -Ecologist organizations

Stakeholder Classification by Buysse & Verbeke (2003)			
Internal primary stakeholders	External primary stakeholders	Secondary stakeholders	Regulatory stakeholders
-Employees -Shareholders -Financial institutions	-Domestic customers -International customers -Domestic suppliers -International Suppliers	-Domestic rivals -International rivals -International agreements -Environmental non-governmental organizations -The media	-National (and regional) governments -Local public agencies

Not only do the stakeholder groups identified in each study vary (which may be explained by the difference in context or industries studied), past studies also vary in how constructs and variables are defined and operationalized. For example, the definition of the dependent variable includes environmental proactivity (Darnall et al., 2010; Murillo-Luna et al., 2008), ecological sustainability (Henriques & Sharma, 2005), environmental strategies (Buysse & Verbeke, 2003; Sharma, 2000), environmental commitment profile (Aragon-Correa et al.,

2004; Henriques & Sadorsky, 1999), green management adoption (Peng & Lin, 2008), adoption of ISO 14001 certification (Delmas & Toffel, 2008) or environmental performance (Kassinis & Vafeas, 2006). Starting from differing definitions, these researchers have operationalized these dependent constructs in very different ways. For example, Kassinis and Vafeas (2006) have operationalized environmental sustainability in a very narrow, albeit reliable way by using pollution data provided by the U.S. Environmental Protection Agency's Toxic Release Inventory. These authors utilized a measure of pollution that does only account for one sub-concept of environmental sustainability, which comprises only one of three sustainability dimensions. In addition to pollution control, environmental sustainability also includes the concepts of eco-efficiency, recirculation, eco-design, ecosystem stewardship, and business redefinition (Henriques & Sharma, 2005). Such a large range in how the dependent construct was operationalized makes comparisons between study results difficult and also hinders progress in terms of our understanding of stakeholder influence on sustainability and related issues.

This study recognizes sustainability as a broader concept and operationalizes the concept in line with the broader framework of sustainable development to help build a small, but growing literature. However, how the concept of sustainability is operationalized is often reflective of specific industry characteristics, which is not something the current study will be able to address.

Many previous studies using a stakeholder framework rely heavily on claims made by firm managers as to the extent of their sustainability practices without adding to the validity by utilizing data sources external to the firms (Buysse & Verbeke, 2003; Darnall et al., 2010; Gallo & Christensen, 2011; Gonzalez-Benito & Gonzalez-Benito, 2010; Murillo-Luna et al., 2008).

Comments made by managers may not necessarily be representative of the firm's sustainability

activities and may also be subject to social desirability bias. Furthermore, since both independent

and dependent variables are collected with the same instrument, methodological problems, such

as common method variance, need to be addressed. In order to avoid some of these issues, this

study utilizes both primary and secondary data and includes multiple measures of stakeholder

and institutional pressures and sustainable development.

Furthermore, as pointed out in the previous section on firms size, studies investigating

stakeholder influence tend to focus only on large-size firms, which means results are truly only

valid for large, publicly traded corporations and cannot be generalized to other types of

organizations.

Finally, many studies controlled for the influence of industry on stakeholder pressures

(Buysse & Verbeke, 2003; Gallo & Christensen, 2011; Henriques & Sadorsky, 1999). While

results of those studies may be generalizable to a larger population beyond a single industry, the

by-product is also a less parsimonious statistical model.

Research Model and Hypotheses

This study examines the influence of institutional sustainability pressures mediated by

organizational characteristics along with pressures from stakeholders in the organizational

context. Furthermore, this study investigates if smaller firms respond to a different set of

sustainability stakeholders than larger size firms. Finally, this study also investigates the pressure

sources behind eco-efficiency activities. To test these propositions, five research hypotheses grounded in the sustainability context are advanced. Figure 3 provides a visual depiction of the research model and the hypothesized relationships for the first three hypotheses. Of course, the model is a simplification of the highly complex stakeholder environment organizations operate in. The measures tied to these variables are discussed in the methods chapter along with the control variables.
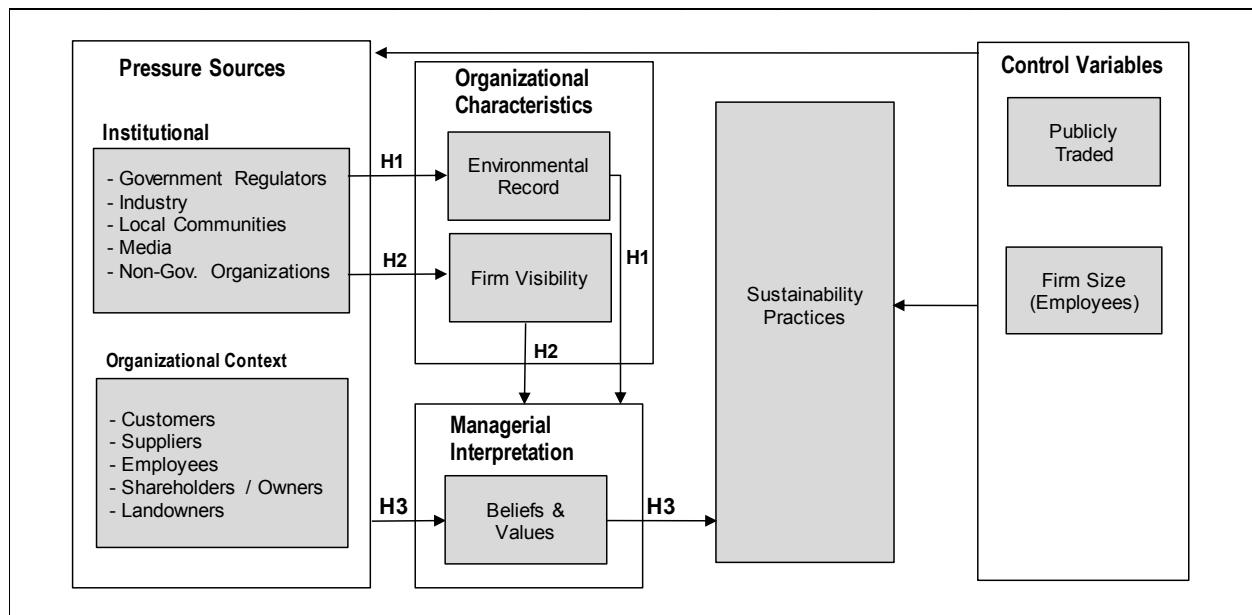
Figure 3. Research Model.

Based primarily on theoretical arguments raised in the institutional literature (Delmas & Toffel, 2004), this study posits that institutional pressures are mediated by organizational characteristics, namely a firm's environmental record and the extent of its public visibility, in influencing the firm's sustainability practices. So in essence these characteristics should only

play a role for stakeholders, which are only loosely connected to the firm. Institutional stakeholders, such as regulators, local communities, and environmental non-government organizations, increasingly put pressure on firms with a poor environmental record or on those firms with a high degree of public visibility in the organizational field. For stakeholders, who have a stronger, mostly economic connection to the firm, such as customers, suppliers, employees, etc., pressures for sustainability are mediated by firm managers in frequent contact with these stakeholders.

Managerial interpretation, or how managers perceive sustainability issues based on their personal attitudes, values and beliefs, is posited to be crucial for both pressures from institutional stakeholders as well as pressures from stakeholders in the organizational context in influencing firm sustainability practices.

Environmental Record

This study examines the mediating effect of firm environmental record on institutional pressures. Our understanding of the role organizational characteristics play in mediating between institutional pressures and sustainability practices is very limited. Nevertheless, these organizational characteristics are thought to affect the level of pressure exerted by stakeholders to influence firms (Delmas & Toffel, 2004). Firms with a poor environmental record are often subject to more review and scrutiny by regulators and local communities (Delmas & Toffel, 2004), as well as non-government organizations, and possibly other stakeholders. These firms are seen as lacking in basic environmental protections and a more immediate benefit to the

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environment and the communities would result if they were to improve their environmental practices.

An organization's environmental record may not only influence the level of pressure exerted by stakeholders, but also influence how managers themselves perceive stakeholder pressures and how they respond to them. Managers of firms, which have experienced environmental spills or other accidents, may be more sensitized and therefore more receptive to stakeholder influences than their counterparts at other organizations (Prakash, 2000). Managers may also perceive certain pressures more strongly than others based on the firm's strategic approach to environmental issues. In fact, firms focusing on pollution prevention – a mid-level strategy in the environmental sustainability dimension – tend to perceive regulatory pressures more strongly (Buysse & Verbeke, 2003). Therefore, the following hypothesis is offered:

Hypothesis 1 (H₁): As firm environmental record declines, firms perceive increased institutional pressures for environmental sustainability.

Null Hypothesis (H₀) 1: There is no relationship between a firm's environmental record and institutional stakeholder pressures for environmental sustainability.

Firm Visibility

This study also investigates the mediating effect of firm visibility on institutional pressures. Like for a firm's environmental record, our understanding of how firm visibility

mediates between institutional pressures and sustainability practices is limited. Leading firms are likely subject to increased pressure and scrutiny because of increased visibility to social and environmental stakeholders. For example, social and environmental activists have targeted leading firms, such as Starbucks, Nike, and McDonalds in part because of their market leadership position (Roberts, 2003; Rowley & Berman, 2000). The effectiveness of these stakeholders hinges upon their ability to either inflict financial pain to firms (e.g. lost sales or markets, fall in share values), or to damage their public image, or both (Fineman & Clarke, 1996). In the shale gas industry, leading firms may include those more commonly known because of their presence in other energy sectors or global scale, or possibly those with a more public profile due to increased media coverage. The information provided in the news media about a firm's activities helps to reduce the information asymmetry between firm managers and outside stakeholders; more informed stakeholders are more likely to take action focused on more visible firms (Brammer & Millington, 2006). Therefore, the following hypothesis is proposed:

Hypothesis 2 (H₂): Firms with higher public visibility perceive increased institutional pressures for sustainability.

Null Hypothesis (H₀) 2: There is no relationship between firm public visibility and institutional pressures for sustainability.

Managerial Interpretation

Variability in sustainability practices in a common industry environment may not only stem from different levels of pressure exerted by stakeholders, but can also be the result of the mediating effect of managerial interpretation. How managers interpret sustainability issues has been recognized as important by both the institutional and stakeholder literature. Theoretically, objective external pressures exerted by stakeholders for sustainability are transformed through an organizational process into perceived pressures (Delmas & Toffel, 2004). When these pressures permeate the organizational boundary, they are filtered and interpreted by managers in line with the firm's unique history and culture, which leads to different sustainability practices (Levy & Rothenberg, 2002).

Furthermore, how organizations are structured internally is thought to be a source of heterogeneity as well. Organizations are likely to channel external pressures to different subunits, each of which frames pressures according to their typical functional routines, leading to variance of sustainability practices (Hoffman, 2001). For example, an organization's legal department may frame environmental issues or sustainability in terms of regulatory compliance whereas an organization's human resources department may frame sustainability in terms of social responsibilities to its employees and the community.

Finally, how firm managers perceive sustainability issues is likely to depend on their personal attitudes, values and beliefs with respect to environmental or social issues (Murillo-Luna et al., 2008), their personal theories of economic and instrumental purpose, and their self or role identities (Fineman & Clarke, 1996). If managers hold a more positive emotional association

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with respect to sustainability, feel they can gain from actions to preserve the environment, and

feel a sense of controllability; they are likely to be more receptive to stakeholder influences

(Jackson & Dutton, 1988; Sharma, 2000). In consequence, managers, who are more receptive to

sustainability influences, are expected to more likely implement sustainability practices in their

organizations. By implementing these practices, managers act as a sort of aggregator of the

various individual demands coming from the various stakeholder groups; they may "not respond

selectively to the different stakeholder groups, but respond to all of them in a similar way"

(Murillo-Luna et al., 2008, p. 1238). Therefore, the following hypothesis is offered:

> *Hypothesis 3 (H₃)*: Firms, which are subject to increased institutional and stakeholder
>
> pressures from the organizational context, and who employ managers with supportive
>
> values and beliefs with respect to sustainability, will adopt higher levels of sustainability
>
> practices.

> *Null Hypothesis (H₀) 3*: There is no relationship between institutional and stakeholder
>
> pressures from the organizational context, managerial values and beliefs, and the level of
>
> sustainability practices adopted.

Firm Size and Stakeholder Salience

As outlined earlier, firm size is likely to affect the types of stakeholders that are deemed

important. Smaller firms may be more responsive to their customers (Chrisman & Archer, 1984),

or to economic stakeholders in general, as well as regulatory stakeholders (Darnall et al., 2010).

Reasons why small firms may view regulatory stakeholders as more important may stem from an

increased threat of litigation. In an empirical study of enforcement actions by the U.S.

Environmental Protection Agency, Firestone (2002) found that environmental agencies were

seven times more likely to impose penalty actions related to violations of environmental

regulations on smaller firms. There may be several reasons for this behavior; first, agencies may

be more suspicious of smaller firms since empirical evidence suggests that they are less

environmentally responsive (Etzion, 2007); second, greater regulatory scrutiny may be due to the

fact that smaller firms possess fewer financial resources to litigate penalties imposed on them

and do not have the ability to hide behind the veil of a corporation (Firestone, 2002); and third,

since smaller firms possess fewer resources, they may have more of a financial incentive to

accommodate regulatory stakeholders (Pfeffer & Salancik, 1978). To test these propositions in

this research context, the following hypothesis is advanced:

Hypothesis 4 (H₄): As firm size decreases, firms are increasingly influenced by
regulators and economic stakeholders in their sustainability practices.

Null Hypothesis (H₀) 4: Firm size has no effect on the types of stakeholders deemed
important in influencing sustainability practices.

Eco-Efficiency and Stakeholder Salience

Unlike general business competencies, which yield private benefits the firms can fully appropriate and firms are therefore self-motivated to seek, sustainability competencies are likely influenced by other causes (Marcus & Anderson, 2006). However, some sustainability practices, such as eco-efficiency, are more complex because they contain elements of both the economic as well as the environmental dimension of sustainability. There are both economic as well as environmental benefits in implementing eco-efficiency practices; by changing processes to reduce wastes at the source, reducing energy and materials usage, conserving or recycling water, and increasing fuel efficiency, firms can benefit financially while at the same time reducing their environmental impact.

Firms may therefore undertake smaller and medium size "low-hanging fruit" investments primarily based on (internal) economic considerations, i.e. in response to internal stakeholders (Christmann, 2000). Because of the economic benefits, it is also likely that eco-efficiency measures are influenced by shareholders or owners and may also be promoted by industry, and trade associations in a normative fashion (Christmann, 2004; Delmas & Montes-Sancho, 2010). Finally, eco-efficiency practices may also be influenced by leading firms, which develop new practices, such as for example technologies that allow for the recycling of wastewater from the drilling process.

There is little empirical research investigating the drivers behind eco-efficiency measures. A prior study in the natural resources sector supports the notion that eco-efficiency practices firms undertake may not be influenced by external stakeholders (Sharma & Henriques,

2005). However, the study did not test for internal drivers of eco-efficiency practices. In order to test for both internal and possibly external sources of pressure for eco-efficiency, the following two hypotheses are proposed:

Hypothesis 5a (H_{5a}): Eco-efficiency sustainability practices are primarily influenced by internal organizational stakeholders.

Hypothesis 5b (H_{5b}): Eco-efficiency sustainability practices are influenced by both internal organizational stakeholders as well as institutional industry stakeholders.

Null Hypothesis (H_0) 5a: Eco-efficiency sustainability practices are not primarily influenced by internal organizational stakeholders.

Null Hypothesis (H_0) 5b: Eco-efficiency sustainability practices are neither influenced by internal organizational stakeholders nor institutional industry stakeholders.

Chapter Summary

This study investigates how institutional and stakeholder pressures influence firm managers in the shale gas industry in adopting sustainability practices. The study integrates both institutional and stakeholder arguments to identify factors that influence firms and firm managers to adopt said practices. Sustainability comprises the main dependent construct of this inquiry. Sustainability as a concept consists of environmental, social and economic dimensions. Eco-efficiency involves producing goods while at the same time reducing the ecological impact and use of natural resources.

The reviewed literature suggests that institutional pressures from government regulators, non-government organizations, the media, and local communities, along with stakeholder influences from the organizational context, such as those from employees, suppliers, customers and others, play a prominent role in influencing sustainable development. While institutional pressures affecting all firms suggest homogeneity of firm responses in a single industry context, varying pressures exerted by stakeholders along with varying managerial interpretations of these pressures are thought to lead to variability of environmental or sustainability practices among firms. Theoretical arguments from the institutional literature point to the importance of organizational characteristics, such as a firm's environmental record and its visibility to outside stakeholders in mediating institutional pressures for sustainability. Also, prior empirical studies lend support to the importance of managerial interpretation in influencing how institutional and stakeholder pressures are perceived, evaluated and acted upon.

Furthermore, prior empirical studies tend to exclude small firms from the analysis because of limited or complete lack of publicly available data or because they are presumed to lack the resources for sustainable activities. A review of the literature on smaller firms suggests that they may be influenced by a different set of stakeholders in their sustainability practices.

Prior empirical results point out that eco-efficiency practices are likely self-motivated by firms since they yield economic benefits, but may also be influenced by institutional and stakeholder pressures (Sharma & Henriques, 2005).

This study empirically tests these propositions not specifically examined by earlier studies by advancing a research model and developing associated hypotheses.

CHAPTER III: METHODS

Research Purpose and Methodological Approach

This study examines the influence of institutional sustainability pressures mediated by organizational characteristics along with pressures from stakeholders in the organizational context. The study follows a post-positivist quantitative research paradigm (Willis, 2007) to investigate stakeholder influence on sustainability with a goal of identifying the nature of the relationships between these concepts. More specifically, the purpose of the study is to investigate paths and mediating factors of institutional and stakeholder pressures for sustainability, examine variability in sustainability practices between firms, and explore if smaller firms are responsive to different stakeholders than larger size firms. While the stakeholders and sustainability practices may be unique to the shale gas industry context, the way different types of firms respond to social pressures for sustainability and the causal pathways this influence takes is likely similar to other research situations. Although no prior studies address stakeholder influence on sustainability practices in the shale gas industry specifically, research on similar industries nevertheless provides a strong theoretical framework for developing hypotheses about outcomes within the energy sector. We can therefore make and test predictions based on institutional theory and findings of prior empirical studies. For example, based on prior empirical studies, we can predict that those firms, which are subject to increased social pressures for sustainability, are more likely to implement higher levels of sustainability practices compared to firms, which are subject to lesser pressures (Darnall et al., 2010; Murillo-Luna et al., 2008;

Sharma, 2000). However, as a consequence of focusing on firms active in drilling for shale gas, the generalizability of the findings is limited to similar industries at a similar stage of development.

Rationale for Quantitative Research Design

The research design consists of a non-experimental quantitative field study of firms in the natural gas drilling industry. This choice is made since there would be significant difficulties involved in attempting to conduct an experimental study in an organizational context. To address the specific research purposes, a quantitative research design was chosen as the objective of the study is not to explore the social complexities, individual experiences and interpretations of firm managers with respect to stakeholder interactions, but to test specific hypotheses and examine relationships between stakeholders, firms and their sustainability practices.

The research design aims at increasing validity by collecting data from both primary and secondary data sources (Yin, 2003). Primary data sources include a survey instrument and supporting semi-structured interviews. Secondary data sources include company databases, publicly available firm documents and websites, violations data, as well as online newspaper coverage.

It is important to note that even though the study includes semi-structured interviews, makes use of firm documents/websites as well as media coverage, the data collected from these sources are subsequently analyzed primarily from a quantitative vantage point in order to evaluate whether numerical patterns found substantiate the relationships established from the

other more purely quantitative data sources. While this reductionist approach to analyzing the qualitative data leaves out some of the subtle complexities, richness and industry-specific context shared in the interviews or provided in the documents or media coverage, it aligns with the overall quantitative research methodology chosen for the project. However, the researcher may make use of the richness of these data in a future project, which will follow a qualitative research approach.

Participant Selection

The population for the study includes all natural gas operators active in Marcellus and Utica shale drilling in the following states: Pennsylvania, West Virginia, and Ohio. An initial list of firms was compiled from the various state environmental protection agencies' well permit data. Any firm that had applied for a Marcellus and/or Utica permit in the timeframe from January 2006 to March 2012 was included on the initial list. After removing any duplicate records, this resulted in a total listing of 145 organizations ("Active Marcellus shale operators list,");("Well list of Marcellus shale activity from Division of Mineral Resources Management "); ("Database Information," 2011). The list was then refined using Dun & Bradstreet and LexisNexis databases by adding company profile information, such as parent-child relationships, number of employees, annual sales, legal status, address, etc. This process along with subsequent contacting of firms via telephone reduced the number of active operators to 125 companies when counting organizations at the parent-level. Some firms had applied for permits, but never started

drilling; some had given up their natural gas production operations or their operations altogether or were only involved in the distribution of natural gas.

The participants for the interviews and/or industry survey emerged by contacting the appropriate managers at all companies via telephone and email, introducing the study and its purpose, and obtaining consent. The approach to contact all firms was favored over purposeful selection to maximize responses as it was likely that a good portion of those contacted would not be willing to participate considering the sensitivity of the topic. In the same vein, for some or the larger participating firms, the survey was distributed to at most two additional respondents to obtain a cross-section of perspectives. Hence, the level of analysis for the survey is the individual firm manager, whereas the remaining data were collected at the firm level.

Secondary Data Sources

Secondary data collection was conducted first from April to June 2012. Sources included company databases, a content analysis of publicly available firm documents and websites to obtain measures for sustainable development and institutional and stakeholder pressures. Furthermore, secondary data sources supply the measures for the firm environmental record as well as firm visibility variables. The following sections discuss these secondary data sources in more detail.

Company Databases

Company profile data were gathered by searching the Dun & Bradstreet and LexisNexis databases for the company names and verifying a match by also including city and state details. Data captured includes parent-child relationship, address information, phone number, website, annual revenue, legal status (public vs. private ownership) and number of employees. For a number of firms, especially smaller operations, if the searches in the company databases did not return a match, web searches using Google were conducted and profile data captured if sources were deemed credible, such as for example the web-based small business source Manta (www.manta.com).

Content Analysis of Public Documents

A content analysis (Neuendorf, 2002; Weber, 1985) of publicly available firm documents, such as annual reports, corporate responsibility/sustainability reports (if available), and websites was conducted from April to June 2012. While traditionally more qualitatively oriented, this study approaches the content analysis from a quantitative vantage point in order to evaluate whether the numerical patterns found further support the relationships established from the other more purely quantitative data sources. Most companies that publish these types of reports had already published their 2011 reports; for those who did not, the 2010 reports were analyzed. The purpose of this content analysis is twofold: First, it supports the identification of who the salient stakeholders are from the firm's perspective. Emphasis placed on certain stakeholders in an annual report is indicative of the stakeholders' leverage over the company

(Frooman, 1999). This is likely also the case when stakeholders are mentioned or addressed on firm websites and environmental or sustainability reports. Second, the content analysis is intended to provide insight into the sustainability *actions* firms are undertaking in all three dimensions of sustainability.

The advantage of this content analysis is that it does not rely on a single managers' assessment of the sustainability activities undertaken, but gives the firm's official description of these practices. "The annual report is the most publicized and visible document produced by publicly owned companies" (Wolfe, 1991, p. 302). However, the use of annual reports, corporate responsibility or sustainability reports has been criticized as "greenwashing," claiming that firms use these reports as a form of green impression management, but never actually implement green or sustainable policies (Ramus & Montiel, 2005). What is more, firms may also undertake and evaluate sustainability initiatives in dramatically different ways. Nevertheless, despite these concerns, assessments of social responsibility from annual reports have been shown to agree with independent third-party reviews (Meek, Roberts, & Gray, 1995).

Since this industry also involves many smaller firms, which are not publicly traded, the content analysis will at minimum include the company's website and if no website is available, the measurement of the firm's sustainability practices will be limited to the self-assessment provided with the survey instrument.

Firm Environmental Record and Firm Visibility Data

The data to determine a firm's environmental record were collected in the form of violations and fines data (where available) from the Departments of Environmental Protection in Pennsylvania, West Virginia, and Ohio for the time period of January 2006 to March 2012. The data to assess a firm's public visibility were obtained from regional newspaper coverage associated with the respective firm. More details on both of these data sources are provided in the measures section.

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Primary Data Sources

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Primary data sources include semi-structured interviews with managers and an online survey. The next section covers these two data sources in more detail.

Semi-Structured Firm Interviews

The first primary data source involved semi-structured interviews with natural gas managers concerned with environmental and/or sustainability matters. Since this study follows a quantitative research perspective, the general purpose of the interviews was to find out if responses provided align with the hypothesized relationships between concepts derived from the literature review. In that vein, the questions were formulated in a more structured manner rather than an open-ended format. To prepare to carry out the interviews, contact information was obtained first from the various Departments of Environmental protection, company websites, industry associations, and via searches of the professional social networking site LinkedIn

(www.linkedin.com). Second, the appropriate managers were contacted via telephone and email, to introduce the study and its purpose, and to obtain consent. These interviews served two main purposes: First, the information gathered helps the researcher better understand the industry context and ensure the subsequent analysis captures all relevant stakeholders. Second, the interviews also serve to obtain a second assessment of the drivers behind sustainability and eco-efficiency practices. The interviews were geared to ascertain the details of the managers' sustainability-related perceptions. More specifically, respondents were asked to identify and assess the important stakeholders impacting sustainability at their firms. Furthermore, managers were requested to define sustainability, describe how it is affecting the industry overall and their firms and discuss the sustainability practices their firm is undertaking. The questions for the semi-structured interviews are provided in Appendix A.

Industry Survey

As outlined earlier, given the relatively small number of organizations, all shale gas drilling firms in Pennsylvania, West Virginia, and Ohio were contacted requesting completion of the questionnaire. The survey was made available online using Qualtrics. Given the somewhat sensitive nature of the topic, some resistance from managers in responding to the firm survey questions with a sustainability context was expected. To mitigate this issue, the length of the survey overall has been limited and the questions are framed in more of a comparative manner requesting respondents to rate their firm's performance relative to the industry as a whole.

The industry survey is providing insight into the importance firm managers attach to various stakeholders, assess their values and beliefs with respect to sustainability issues, and obtain their perception as of the extent of the sustainability practices their firms engage in compared to other firms in the industry. The content of the survey was developed using industry-specific sources ("Oil and gas industry guidance on voluntary sustainability reporting," 2005; "Oil and gas industry guidance on voluntary sustainability reporting," 2010) and literature sources (Darnall et al., 2010; Jackson & Dutton, 1988; Sharma, 2000; Steurer et al., 2005). The survey instrument is provided in Appendix B.

<center>**Measures**</center>

Sustainable Development Measure One

Sustainable development as a dependent construct is measured via the survey instrument in addition to the document content analysis (measure two below). The survey instrument includes a high level definition of sustainability consistent with the principles outlined by Bansal (2005). Cueing the respondent's memory using a particular definition improves accuracy and lowers response distortion and clarifies that respondents had equal opportunity to access the definition (Fowler, 1995). In total, the survey includes 16 items to measure the three dimensions of sustainability; ten for environmental sustainability; three for social sustainability; and three for economic sustainability.

Sustainable Development Measure Two

The second measure of sustainable development is obtained via a content analysis of annual reports, environmental or corporate responsibility/sustainability reports (if available), and company websites. To operationalize sustainable development via the content analysis, an evaluation scale is utilized to assess the extent of each firm's sustainability efforts. The evaluation scale is provided in table 3.

Table 3
Evaluation Scale Sustainability Efforts

Code	*Category*
0	Contains no sustainability-related information
1	Contains some sustainability-related information, but no examples
2	Contains examples of either economic and social sustainability activities or economic and environmental sustainability activities
3	Contains examples of environmental, social, and economic sustainability activities
4	Provides year-over-year tracking of environmental, social, and economic sustainability indicators

To conduct the content analysis, for each firm, the available public sources, such as its latest annual report, sustainability/corporate responsibility report, or website were analyzed following the evaluation scale provided in table 3.

Validity of Sustainable Development Measure

At a basic level, a measure is valid if it accurately reflects the concept it is intended to measure (Babbie, 2005). As described above, two measures of sustainable development are utilized in this study, each of which is operationalized and measured using different data sources aimed at increasing validity (Yin, 2003). Measure one is developed by examining sustainability literature and relevant industry literature and by creating survey-items for each sustainability dimension. Measure two is developed by performing a content analysis of annual or sustainability/corporate responsibility reports, or company websites. Utilizing these various data sources and methods also supports the content validity of the sustainable development measure, or the degree to which the measure covers the full range of concepts of interest (Babbie, 2005). Furthermore, convergent validity is a type of construct validity and it exists if a measure is correlated with other measures of the same construct, and is uncorrelated with measures of dissimilar constructs, which would be discriminate validity (Weber, 1985). Since sustainability practices are measured both by using the self-report survey instrument and the document content analysis, a high degree of correlation between the items in the survey instrument making up sustainability practices and the values obtained from the document content analysis would be evidence of convergent validity. Technically, both measures are ordinal, but given that there are five levels for the document-content measure and many more values for the survey-based sustainability measure (summing the sustainability survey items results in many more values), this study will treat both measures as continuous, which is a commonly accepted practice

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(Johnson & Creech, 1983; Zumbo & Zimmerman, 1993). Therefore, to assess the correlation between these two measures, Pearson's correlation coefficient is utilized instead of a rank-based correlation coefficient, such as Spearman's rho or Kendall's tau. Based on 44 observations for the survey-based sustainability measure and 39 observations for the document content measure, the correlation coefficient is 0.48 ($p < 0.005$), which is indicative of a moderate positive linear relation between these measures (Hamilton, 1996). The measures are not strongly correlated, but the relationship is there in the expected direction, which supports convergent validity.

Institutional and Stakeholder Pressures Measure One

The individual institutional stakeholders and stakeholders in the organizational context are the agents, which pressure firms to act sustainably. These pressures are measured via the survey instrument and therefore represent respondents' perceptions. Managers are asked to assess the importance of each stakeholder in influencing the firm's sustainability practices overall and specific for eco-efficiency sustainability practices. The survey includes the same 13 items (one for each stakeholder) for both the sustainability stakeholders and the eco-efficiency stakeholders. The scores of the individual items then are then summed to arrive at a total measure of stakeholder pressure. For example, the score for institutional stakeholder pressure for sustainability would be calculated by summing the total scores for government regulators, non-government organizations, industry, the media, and local communities.

Institutional and Stakeholder Pressures Measure Two

The second measure of institutional and stakeholder pressures was obtained via a content analysis of annual reports, environmental or sustainability/corporate responsibility reports (if available), and company websites. To operationalize institutional and stakeholder pressures via the content analysis, the documents/websites were examined for references to the various types of stakeholders. Emphasis placed on certain stakeholders in an annual report is indicative of the stakeholders' leverage over the company (Frooman, 1999). This is likely also the case when stakeholders are mentioned or addressed on firm websites and environmental or sustainability/corporate responsibility reports. Total stakeholder pressure for the various types of stakeholders (economic, regulatory, and institutional) was calculated by counting the individual stakeholders referenced in the documents and/or websites. The same 13 stakeholder categories referenced in the survey instrument were applied in this analysis.

Validity of Institutional and Stakeholder Pressures Measure

The validity of the institutional and stakeholder pressure measure is supported in three ways: First, its content validity, or the degree to which it covers the full range of the concept (Babbie, 2005), is maintained by deriving the individual items, or stakeholder groups, from prior studies and from articles discussing the shale gas industry context. Second, the face validity of the measure is assessed by asking the participants of the interviews to evaluate important stakeholders for sustainability and eco-efficiency. Third, convergent validity is assessed in the same manner as for the sustainable development measure, by evaluating the degree of correlation

between the items in the survey instrument making up stakeholder pressure and the count-based measure obtained from the document content analysis. Based on 44 observations for the survey-based measure and 39 observations for the document content measure, the Pearson correlation coefficient for all stakeholders (economic, regulatory & institutional) combined is 0.42 ($p <$ 0.01), indicative of a moderate positive linear relation (Hamilton, 1996). However, when looking at the different main types of stakeholders, the relation is weaker and no longer significant for economic stakeholders (0.23; $p = 0.17$), and slightly weaker than the overall relationship for institutional/regulatory stakeholders only (0.40; $p < 0.05$). Based on these results, a choice was made to exclude the survey-based measure of institutional stakeholder pressure from subsequent analysis. There are three reasons for this choice: First, the document content analysis includes approximately twice the number of observations compared to the survey-based measure. Second, the survey overemphasizes large public companies (for details, refer to the Analysis and Results chapter). Third, the document content analysis measure does not rely on manager's perceptions, but provides an overall company-level assessment of the recognized stakeholders.

Firm Environmental Record Measure One

This study posits that the institutional influences on sustainable practices are mediated by firm environmental record. To measure environmental record, secondary data from the various State Departments of Environmental Protection are utilized. For each firm, these data include the number of violations, as well as the number and amount of fines associated with firms active in Marcellus and/or Utica shale gas drilling. Not all firms have fines levied against them and fines

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are only issued in Pennsylvania. However, violations, which are more common, still provide an indicator of an organization's environmental track record and are therefore included in the analysis for the time period from 2008 to March 2012. The rationale for going back to 2008 is that it may take some time for institutional stakeholders, such as local communities, non-government organizations, and others to learn of a firm's poor environmental track record and increase their level of scrutiny. Since larger organizations have more wells subject to inspection, there is a greater likelihood for violations as compared to smaller firms with only a single or few active wells. To account for this, the statistical analysis includes the ratio of the number of violations per the number of wells drilled.

Firm Environmental Record Measure Two

A second measure of firm environmental record was gathered via an analysis of articles published in five regional newspapers; three located in the most active drilling regions in Pennsylvania, one in Ohio, and one in West Virginia. The articles were accessed electronically via the Newsbank library service. Searches with the company names as keyword were performed for the time period from January 2009 to March 2012. Table 4 provides the specifics about these sources. All articles found for each firm were then analyzed and articles with negative environmental or social content, such as explosions, wastewater dumping, accidents, spills, etc. were recorded separately and counted. The distribution for the count of negative articles variable was positively skewed and heavy tailed with most organizations having no or only a few negative articles and a small number of companies with moderate or high number of negative

articles. To correct the non-normality, first the value one was added to each observation, and then a logarithmic transformation was performed.

Table 4
Media Coverage Sources

State	Location	Newspaper Name
Pennsylvania	Pittsburgh	Pittsburgh Post-Gazette
Pennsylvania	Washington	Observer Reporter
Pennsylvania	Scranton	Times Tribune
West Virginia	Charleston	Charleston Gazette
Ohio	Columbus	Columbus Dispatch

Validity of Firm Environmental Record Measure

The validity of the environmental record measure is likely higher than the self-report measures collected from the firms. Since these data are collected from independent government entities and media sources, they are not subject to social desirability bias or other measurement issues. However, considering that violations are only issued against firms, which violate mandated basic environmental practices, this measure does not capture the full range of environmental sustainability. Firms without violations or fines may still operate at a basic level of environmental sustainability without committing resources to higher level practices, such as eco-efficiency, recirculation, or ecosystem stewardship (Sharma & Henriques, 2005).

Nevertheless, since the purpose of this measure is to identify firms which to a lesser degree meet minimum environmental requirements and are therefore targets of increased stakeholder pressure, the number of violations/well and the number of negative articles provide a way to quantify their record. As for the other measures with two sources, convergent validity is evaluated by calculating the degree of correlation between the number of violations/well (transformed) and the number of negative articles published (log transformed). Based on 125 observations, the Pearson correlation coefficient is 0.51 ($p < 0.001$), which is indicative of a moderate positive linear relation (Hamilton, 1996).

Firm Visibility Measure

This study investigates if institutional influences on sustainable practices are mediated by firm visibility. To measure firm visibility, the total number of articles published in five regional newspapers containing the company's name as a keyword was obtained for the January 2009 to March 2012 time period (see table 4 for sources). The rationale for going back to 2009 is that it may take some time for institutional stakeholders to react to a firm's increasing public profile; this is likely to be more of a gradual process than happens over a longer period of time. The distribution of the number of articles associated with a company was positively skewed and heavy tailed since many of the smaller companies had no articles published and a few companies had a medium or high number of articles published. To correct the non-normality, first the value one was added to each observation, and then a logarithmic transformation was performed.

Validity of Firm Visibility Measure

As with the environmental record measure, the validity of the firm visibility measure obtained from secondary sources is likely higher than the self-report measures collected from the firms. However, using the number of media reports only provides a proxy for the true visibility of firms to their stakeholders. Since no secondary measure is collected for firm visibility, we cannot directly assess the construct validity or more specifically the convergent validity of the measure. However, a simple assessment of convergent validity may be to evaluate how the firm visibility measure is related to firm size (number of employees). Larger firms should also have more of a public profile in the news media. Therefore, the correlation between firm visibility (log transformed) and the number of employees (log/sqrt transformed) was calculated. Based on 125 observations, the Pearson correlation coefficient is 0.67 ($p < 0.001$), which is indicative of a moderate to strong positive linear relation (Hamilton, 1996).

Managerial Values and Beliefs Measure

A complex interrelationship exists between firm practices and values and beliefs. Values are likely the motivation behind developing a practice or capability because they influence firm behavior and practices. However, successful (sustainability) practices in turn can have an impact on the existing values and beliefs (Plaza-Ubeda, de Burgos-Jimenez, & Carmona-Moreno, 2010). This feedback from successful higher levels of sustainability may also lead to more sensitivity to stakeholder pressures; so it would have the opposite effect of what the research model of this study predicts (Buysse & Verbeke, 2003). Furthermore, it is possible that firms with a

sustainability-friendly value system attract a certain stakeholder, in which case the hypothesized causal influence from the stakeholder on the firm's sustainability practices would be spurious. For example, a firm favoring sustainability measures works to develop a system for water recycling, which requires close collaboration with a supplier. In this case, the firm engages in an environmental sustainability practice favored by the supplier (stakeholder), but there is no connection between the supplier's influence and the practice the firm naturally engages in.

In this study, managerial values and beliefs are viewed as mediating between institutional and stakeholder pressures on the one hand, and firm sustainability practices on the other. Managerial values and beliefs are assessed using a three-item perceptive measure on the survey instrument, of which two items were successfully utilized in earlier studies (Jackson & Dutton, 1988; Sharma, 2000). A third item to measure beliefs with respect to the perceived benefits of sustainability has been added. The content validity of the managerial values and beliefs measure is supported by the fact that the individual items were developed primarily from prior studies, so they are more likely to measure the construct they are intended to measure (Babbie, 2005). Interestingly however, an analysis of the responses revealed that one of the items added to measure managerial values and beliefs from prior studies (the last item in table 5) did not meet internal consistency or reliability requirements. This is likely due to the way the question was formulated.

Table 5
Values and Beliefs Measure

Item	Mean (S.D.)	Factor Loading
Sustainability has the potential to provide significant benefits to our company.	4.18 (0.79)	0.944
I am likely to gain rather than lose by actions to support sustainability.	4.02 (0.90)	0.940
Any actions I take to enhance sustainability are not constrained by others in the organization.	3.34 (0.89)	0.114

Note. Total explained variance (3 items): 59.58%; Cronbach's α (3 items): 0.54

Internal consistency can be assessed by how well the items reflecting the same construct yield similar results, i.e. how consistent the results are for different items for the same construct within the measure (Trochim, 2006). First, in order to assess if the values and beliefs measure indeed captures the construct it is intended to capture, a factor analysis is conducted on the 44 survey responses. The factor analysis revealed that the managerial values and beliefs concept is not represented as a singular concept. The third item of the measure has a unique variance of 0.987 and does not load onto the same factor as the first two items (see table 5). Second, with all three item included the reliability coefficient Cronbach's alpha is 0.54, but with the third item removed, it increases to 0.87. Per Peterson (1994), values over 0.7 are acceptable. Therefore, the decision was made to remove the third item from subsequent analysis.

In order for the values and beliefs measure to be utilized for the larger data set, i.e. with the document content analysis data, the two remaining items for the measure were imputed for the non-survey observations using multivariate imputation via chained equations and logistic

regression to account for the ordinal nature of these items (StataCorpLP, 2011a). To model the missing values for these two items, the three predictor variables for stakeholder influence from the document content analysis data were included in the regression imputation along with controls (number of employees transformed and public). Both values and beliefs items were included together in this procedure so they could be imputed simultaneously.

As a final step, to create a single measure for values and beliefs for subsequent analysis, the two items were included in a principal component analysis, which confirmed that the two items can be represented by a single factor explaining 91.28% of the total variance.

Firm Size – Control Variable

Most prior studies investigating stakeholder influence on environmental practices or sustainability have controlled for firm size (Aragon-Correa, 1998; Buysse & Verbeke, 2003; Henriques & Sadorsky, 1999; Sharma & Henriques, 2005). Larger firms have more resources, both in terms of slack resources as well as financial resources to devote to sustainable development. Furthermore, larger firms may also be subject to greater public scrutiny and show increased social responsiveness (Pfeffer & Salancik, 1978). Firm size is measured using the number of employees. Given the severely positively skewed and heavy tailed distribution of this variable (there are few companies with more than 10,000 employees, but most are small or medium in size), a two-step transformation was performed; an initial logarithmic transformation was followed by a square root transformation.

Publicly Traded – Control Variable

Some prior research suggests that public firms differ from private firms in their organizational structure in ways that are independent of firm size (Darnall et al., 2010). These differences related to organizational structure are thought to affect the level of resources and capabilities which can be leveraged to engage in sustainability practices. Also, since it is likely that public firms more broadly inform stakeholders compared to private firms, and this study leverages publicly available documents to a large extent, whether a company is private or public was included as a control in the analysis.

Other Control Variables

Some earlier studies controlled for whether or not companies are multinational organizations (Darnall et al., 2010; Zyglidopoulos, 2002) or whether companies have the ISO 14001 environmental quality certification (Sharma & Henriques, 2005). In case of the former, the variable had no influence and is already represented by the firm size variable; in case of the latter, only a handful of firms had this certification in this industry. Therefore, both variables were excluded from subsequent analysis.

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Reliability and Internal Consistency

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Reliability and internal consistency was assessed for the survey instrument after electronic surveys had been returned by calculating Cronbach's alpha coefficients for the sections of the questionnaire dealing with stakeholder influence or sustainability. Table 6

provides the number of questions along with the Cronbach's alpha coefficients. Per Peterson (1994), values over 0.7 are acceptable. All sections meet this criterion. However, the stakeholder importance for sustainability section has the lowest reliability coefficient, which lends support to the earlier convergent validity assessment and decision to exclude this survey-based measure from further analysis.

Table 6
Survey Instrument Reliability

Survey Section	Number of Items	Cronbach's α
Stakeholder Importance for Sustainability	13	0.715
Stakeholder Importance for Eco-Efficiency	13	0.857
Environmental Sustainability	10	0.873
Social Sustainability	3	0.819
Economic Sustainability	3	0.864

Note. Cronbach's α for sustainability overall: (16 items): 0.894

Ethical Considerations

Ethical issues can arise in all phases of the research process; from data collection to dissemination of the research findings (Bloomberg & Volpe, 2008). Although no ethical issues with respect to the participants or their well-being were expected, this study includes a number of safeguards to ensure the protection and rights of the participants.

Primary data collection of this study includes firm interviews and subsequent survey research. While anonymity cannot be guaranteed to respondents, their rights were protected

during all stages of the research. Prior to conducting the interviews, potential participants were requested to sign an informed consent form, which informs the participants of the identity of the researcher, the identity of the sponsoring institution, the purpose of the study, the benefits of participation, guarantee of confidentiality, and their right to withdraw at any time (Sarantakos, 2005). In addition, participants were informed that this study utilizes third-party data sources including media coverage, environmental regulator data, as well as published company documents. The consent forms are administered to participants of the interview portion of the study in person prior to the interview. Since the survey was first administered electronically via the Internet, permission from participants was obtained before the survey questions were shown.

No negative consequences of the personal interviews for participants were anticipated, but there was a possibility for some stress to participants given the sensitivity of environmental issues in this industry context. Participants may feel that they themselves or their firms are not doing enough with respect to sustainability and as a consequence could react negatively when questioned.

During data analysis, when coding and committing responses to the database, company names and contact information were separated from the responses and stored locally on the researcher's computer. Company names and contact information were not included in data analysis; observations were identified with a generic company ID.

The results of the study are presented in aggregate without identifying any participants either by individual statements or individual identifiable data records. The forms submitted to the institutional review board are provided in appendix C.

Chapter Summary

This study investigates how institutional and stakeholder pressures influence firms and firm managers in the shale gas industry to adopt sustainability practices. The methodology employed to conduct the study employs a quantitative epistemology aimed at investigating paths and mediating factors of institutional and stakeholder pressures for sustainability.

The hypotheses stipulating that firms with an inferior environmental record or higher public visibility perceive increased institutional pressures for sustainability are tested by incorporating both primary and secondary data sources. Firm environmental record is measured by leveraging violations data from the various state departments of environmental protection; firm visibility is measured by obtaining the number of news reports associated with a particular company from various regional media sources. Institutional stakeholder pressure is operationalized by performing a document content analysis of public firm documents. Controls to account for other influences on sustainability or stakeholder influence include firm size, and whether or not the firm is publicly traded.

The hypothesis that firms, which are subject to increased institutional and stakeholder pressures, and who employ managers with supportive values and beliefs with respect to sustainability, will adopt higher levels of sustainability is tested via both primary and secondary data sources. Institutional and stakeholder pressures, is measured by performing a document content analysis of public firm documents. The mediating concept of managerial values and beliefs is measured via statements with respect to sustainability on the survey instrument developed primarily from prior studies. Finally, the sustainable development variable is

operationalized and measured in two ways: First, by operationalizing sustainability from the literature and measuring the extent of its practice by having respondents compare their firm's efforts to the industry overall in the survey instrument; Second, by conducting a document content analysis of annual reports, sustainability/corporate responsibility reports, or firm websites, to arrive at an evaluation of the extent of each firm's activities with respect to sustainable development.

The last three hypotheses investigating whether smaller firms are increasingly influenced by regulators and economic stakeholders in their sustainability practices, or testing the sources of influence on eco-efficiency practices, were evaluated utilizing the survey instrument and document content analysis data. The survey provides measures for stakeholder influence on eco-efficiency practices. The document content data analysis yielded measures for regulatory and economic stakeholder influence.

Finally, ethical concerns were addressed by informing participants properly of the study's scope and their rights to withdraw at any time as well as by ensuring confidentiality in all phases of the research process.

CHAPTER IV: DATA ANALYSIS AND RESULTS

Introduction and Overview

The purpose of this study is to investigate how institutional and stakeholder pressures influence firms and firm managers in the shale gas industry to adopt sustainability practices. The study integrates both institutional and stakeholder arguments to identify the factors that influence firms and their managers to adopt said practices. This chapter presents the analysis and findings from the manager interviews, the online survey as well as the secondary data obtained from the various sources.

Interview Participants

During the time period from July 2012 to January 2013, a total of 30 semi-structured interviews were conducted with managers from 28 different companies. A number of different types of managers participated in the interviews depending on the size and organizational structure of the company and included community relations managers, stakeholder relations managers, environmental health and safety managers, corporate responsibility managers, business operations managers, corporate citizenship managers, etc. In many cases, those managers had a more regional orientation geared toward the firm's Marcellus and/or Utica shale activities, however, in other cases the contacts were responsible for corporate-wide sustainability programs and/or reporting of those programs.

Industry Survey Participants

All managers participating in the interviews also completed the survey instrument. However, a few contacts only had time to complete the survey portion of this research. A total of 44 valid surveys from 34 companies were returned during the time period from July 2012 to February 2013. Four companies returned two surveys each and three companies returned three surveys each. All other firms returned one response. Table 7 provides a summary of the characteristics of the respondent companies.

Table **7**
Respondent Firm Characteristics

Variable	Description	Number of Companies (%)
Ownership	Private	17 (50%)
	Public	17 (50%)
Range of Operations	Exploration of natural gas	32 (94%)
	Drilling and production of natural gas	34 (100%)
	Provider of drilling services and products	2 (6%)
	Provider of drilling consultation services	3 (9%)
	Distribution and marketing of natural gas	9 (26%)
	Oil exploration and development	18 (53%)
	Refining facilities	4 (12%)
	Distribution and marketing of oil	6 (18%)
	*Other activities	6 (18%)
Size	Less than 50 employees	12 (35%)
	From 50 to 1000 employees	9 (26%)
	Over 1000 employees	13 (38%)

* Other activities include natural gas liquids, operating wells for third parties & energy marketing

All participating organizations drill and produce natural gas and most also engage in exploration of natural gas. About half of the companies also explore and develop oil and about a quarter distribute and market natural gas.

From the 44 valid responses, six had some missing data for a single question/section of the questionnaire. A careful review of the missing elements led the researcher to conclude that these data are missing completely at random and are not related to any of the other variables (Graham, 2009). Single imputation using the subgroup mean for the respective question was applied to obtain a complete data set.

In order to test for non-response bias, so to test whether respondents differ in some meaningful way from non-respondents, this study compares key attributes of respondents to those of non-respondents. These attributes are firm size (measured using number of employees or annual revenue) and whether the firm is publicly or privately owned. The one-way analysis of variance (ANOVA) results indicate that there is a significant difference between the mean number of employees (transformed using natural log) of respondents and non-respondents (respondents untransformed mean = 8550, non-respondents untransformed mean = 444; F = 31.63; $p < 0.005$) as well as between the mean annual revenues (transformed using natural log) of respondents and non-respondents (respondents mean = \$37393 million, non-respondents mean = \$724 million; F = 25.8; $p < 0.005$). For both tests, the hypothesis of equal variances could not be rejected based on the results of the Bartlett's chi2 ($p = 0.618$ and $p = 0.209$ respectively). Also, exactly half of the firms, who returned the survey, were public companies (see table 7), whereas of the non-respondent group only 22% were public companies. From these results we

can conclude that responding firms tend to be larger size public organizations compared to those who declined participation. This fact limits the generalizability of the findings from the survey data to all shale gas producers active in the northeastern United States. The non-response bias on the part of smaller operators may be explained by insufficient resources for sustainable activities or a lack of organizational knowledge about public stakeholders and sustainability.

Data Analysis

With the aim to organize the data elements from the various primary and secondary data sources, a relational database was created comprising of various tables. Initially, tables were created for each data source; one for the company profile, one for the media analysis, one for the environmental record, and one for the survey responses. Then, a company ID was assigned at the company level and a unique ID at the manager level to account for the few cases with multiple survey responses for single company. Subsequently, the various data sets were merged to arrive at a complete set of observations. Only relevant company attributes were retained for the analysis, so for example company names, address and other identifiable data elements were removed. To account for the multiple survey responses for a few of the companies, two data sets were created; one containing 135 observations including the manager-level survey responses and a second one containing 125 observations at the company level excluding the survey data.

In order to test the hypotheses, the software package STATA version 12 was used. Table 8 provides a summary of the hypotheses, variables and statistical methods used for testing. All statistical methods listed assume linear relationships between variables. Furthermore, multiple

ordinary least squares (OLS) regression assumes normal, independent, and identically distributed errors, which rarely occur in real data (Hamilton, 1992). In order to investigate if these basic assumptions are met, a number of diagnostic tools were applied during data analysis to check for issues, such as influential cases, multicollinearity, non-normality of errors, etc. Specifically, to test for multicollinearity, variance inflation factors were calculated for all predictor and control variables; non-normality of errors is investigated graphically using residuals versus predicted values plots. Some variables, such as firm visibility and company size (number of employees) were not normally distributed, which per se is not a requirement for regression, but is often associated with statistical problems, such as influence and heteroscedasticity (Hamilton, 1992). Prior research suggests using a logarithmic transformation yields consistent results (Darnall et al., 2010). Please refer to the measures section for the various measures and details on the transformations applied.

Table 8

Hypotheses, Variables and Statistical Methods

No.	Hypothesis	Independent Variable(s)	Dependent Variable	Controls	Statistical Test / Model
1	As firm environmental record declines, firms perceive increased institutional pressures for environmental sustainability.	Environmental Record - Violations/well - Negative articles	Institutional Stakeholder Pressure - Inst. Stakeh. in pub. docs	-Public -Employees	Multiple Regression (OLS)
2	Firms with higher public visibility perceive increased institutional pressures for sustainability.	Firm Visibility - Articles published	Institutional Stakeholder Pressure - Inst. Stakeh. in pub. docs	-Public -Employees	Multiple Regression (OLS)
3	Firms, which are subject to increased institutional and stakeholder pressures from the organizational context, and who employ managers with supportive values and beliefs with respect to sustainability, will adopt higher levels of sustainability practices.	See results section for details, SEM terminology is different		-Public -Employees	Structural Equation Model (SEM)
4	As firm size decreases, firms are increasingly influenced by regulators and economic stakeholders in their sustainability practices.	Company Size	Regulatory & Economic Stakeholder Pressure - Regul./econ. Stakeh. in pub. docs	-Public	Multiple Regression (OLS)
5a	Eco-efficiency sustainability practices are primarily influenced by internal organizational stakeholders.	Internal Stakeholder Importance (Survey)	N/A	N/A	Principal Components Analysis Paired t-test
5b	Eco-efficiency sustainability practices are influenced by both internal organizational stakeholders as well as institutional industry stakeholders.	Internal and Institutional Stakeholder Importance (Survey)	N/A	N/A	Principal Components Analysis Paired t-test

Hypotheses 1, 2 and 4 were tested using multiple-regression (as opposed to bivariate regression) since control variables are included to account for other influences on the extent of stakeholder pressure. To test hypothesis 3, a structural equation model (SEM) was established since the proposed relationships include a mediating variable; managerial values and beliefs.

The structural equation model allows for a combined analysis of the entirety of the research model and its hypothesized relationships by examining the variances and covariances of the variables (Statsoft, 2011). Finally, using this type of measurement model allows for an assessment if the model "fits" the data well enough to be a useful approximation of reality. Hypotheses 5a and 5b were examined by performing a principal components analysis and subsequent stakeholder group analysis via the use of a t-test. Principal components analysis was chosen as it allows the grouping of stakeholders to emerge from the data as opposed to testing with a pre-defined research model since prior research supplies little theoretical guidance in this area. Also, principal components analysis captures all of a variable's variance including its unique and shared variance (Costello & Osborne, 2005).

Results

Before discussing the results of each of the hypotheses, it may be appropriate to briefly cover the overall perceptions participants of the interviews shared with respect to sustainability and how this concept has affected their industry. Many of the interviewees were familiar with the environmental, economic, and social aspects of sustainability; however, some participants, primarily from the smaller firms, had not heard about sustainability. Also, considering the vagueness of the word sustainability itself (Bell & Morse, 2008), respondents offered a wide range of interpretations of the concept and how it applies to their industry. Some did address economic issues, such as long expected well lives or how technological advances, such as

horizontal drilling and hydraulic fracturing, have allowed the industry to become more stable even if the natural gas prices decline. Others could not see how this concept could apply to natural gas since it is a finite natural resource. Nevertheless, some managers, primarily from the larger firms, conveyed not only an understanding of the concept, but also shared how their firms have embraced and operationalized the idea of sustainability – or a similar concept, such as responsible development or corporate responsibility – in some cases down to the level of specific indicators and metrics used to manage progress. These participants shared a broad recognition that their companies have to earn their social license to operate, meaning they have to earn the public's trust and must be considerate of stakeholders, and be proactive in reaching out to them, especially given that the development in the Marcellus or Utica shale is occurring in more densely populated communities than when the unconventional gas industry first started. This development, so the interviewees, does not only affect direct stakeholders, like landowners, but also indirect stakeholders, such as adjacent landowners, those affected by noise, traffic, odor, or maybe even the local resident faced with a longer waiting line at the convenience store. A few interviewees voiced a concern with sustainability at the local level, mentioning how many of the vendors involved with the wells are local, and how they are working to prevent dependencies and increase resilience in these communities to prepare their members for times when the industry will be reducing its presence. In summary, most participants of the interviews were familiar with sustainability, and while their interpretations of the idea varied substantially, they all shared a genuine concern for the environment and the economic and social wellbeing of those impacted by their operations. The results as they relate to the specific hypotheses are discussed next.

Hypothesis 1 predicts that firms with an inferior environmental record perceive increased institutional pressures for environmental sustainability. Hypothesis 2 posits that firms with higher public visibility perceive increased institutional pressures for sustainability. Both of these hypotheses could be tested using the larger data set as the measures for environmental record (number of violations/well and number of negative articles), visibility (number of articles) as well as the measure for institutional stakeholder pressure were obtained from secondary data sources. The overall data set contains 125 observations; 86 of the records have the firm profile data (controls) along with the media/visibility data whereas 78 records have the violations data. Two sets of multiple regressions are conducted to test these two hypotheses; one using institutional stakeholder pressure from the document content analysis inclusive of regulators or government agencies as the dependent variable (table 9); one using institutional stakeholder pressure from the document content analysis exclusive of regulators or government agencies (table 10).

Table 9

Regression Results Hypotheses 1 and 2 Including Regulator

Dependent variable: Institutional Stakeholder Pressure (Doc)

	(1)	(2)	(3)	(4)	(5)
Public	2.23**	2.28**	2.08**	2.11**	2.10**
	(0.50)	(0.52)	(0.50)	(0.52)	(0.50)
Employees	1.73**	1.77**	1.50**	1.59**	1.34**
	(0.40)	(0.41)	(0.41)	(0.42)	(0.43)
Violations		-0.19		-0.16	
		(0.13)		(0.13)	
NegArticles			0.26+	0.24+	
			(0.15)	(0.14)	
Visibility					0.27*
					(0.12)
_cons	-0.65	-0.58	-0.41	-0.48	-0.30
	(0.72)	(0.80)	(0.72)	(0.79)	(0.72)
N	86	78	86	78	86
R-sq	0.60	0.64	0.62	0.66	0.62
adj. R-sq	0.59	0.63	0.60	0.64	0.61
AIC	335.36	299.76	333.95	298.79	332.47
BIC	342.73	309.19	343.77	310.57	342.28

Standard errors in parentheses
+ p<.10, * p<.05, ** p<.01

Two separate analyses were conducted because of the regulators' predominant status in the industry; many firms may not even acknowledge it as a separate stakeholder and consider the regulatory oversight as a 'given'. It also serves to see if any of the parameters significantly change as a result. In both tables 9 and 10, model (1) includes only the controls, models (2), (3) and (4) test hypothesis 1 with one or two predictors and model (5) tests hypothesis 2. The

controls (public vs. private & no. of employees) explain most of the variability of institutional

stakeholder pressure (r-squared). However, the overall model improves slightly when the

predictor variables are added. The Bayesian information criterion (Schwarz, 1978) as well as the

Akaike information criterion (Akaike, 1974) are listed for model comparison; lower values

indicate a better model fit.

Table 10

Regression Results Hypotheses 1 and 2 Excluding Regulator

Dependent Variable: Institutional Stakeholder Pressure excluding Regulator (Doc)

	(1)	(2)	(3)	(4)	(5)
Public	1.92**	1.98**	1.78**	1.81**	1.80**
	(0.43)	(0.44)	(0.43)	(0.44)	(0.42)
Employees	1.51**	1.56**	1.29**	1.39**	1.17**
	(0.34)	(0.35)	(0.35)	(0.35)	(0.36)
Violations		-0.14		-0.11	
		(0.11)		(0.11)	
NegArticles			0.26*	0.24+	
			(0.12)	(0.12)	
Visibility					0.24*
					(0.11)
_cons	-0.74	-0.77	-0.51	-0.66	-0.43
	(0.61)	(0.68)	(0.61)	(0.67)	(0.61)
N	86	78	86	78	86
R-sq	0.61	0.65	0.63	0.67	0.63
adj. R-sq	0.60	0.64	0.62	0.65	0.62
AIC	307.95	274.13	305.55	272.12	304.69
BIC	315.31	283.56	315.37	283.91	314.51

Standard errors in parentheses
+ p<.10, * p<.05, ** p<.01

The influence of violations/well as a predictor was not significant in any of the scenarios; however, what is interesting is that the coefficient is negative, meaning that those companies with fewer violations acknowledge more institutional stakeholders. However, the negative articles measure of environmental record was significant at the $p < 0.10$ level in the model including regulator and at the $p < 0.05$ level in the model excluding regulator when analyzed separately (model 3). Therefore, hypothesis 1 is supported when environmental record is measured by the number of negative articles, but not when measured by the number of violations. Hypothesis 2 is supported by the results as the visibility measure (number of articles) is significant at the $p < 0.05$ level both including and excluding regulators as an institutional stakeholder.

Hypothesis 3 predicts that firms, which perceive increased institutional and stakeholder pressures from the organizational context, and whose values and beliefs are supportive of sustainability, will adopt higher levels of sustainability practices. Since this hypothesis involves the consolidated influence of all stakeholders, which can be thought of as a latent (or unobserved) construct as well as a mediating variable, values and beliefs, the use of a structural equation model (SEM) with confirmatory factor analysis (CFA) is appropriate. Also, STATA's default estimation method, maximum likelihood (ML) is chosen to obtain values for the unknown or free parameters (StataCorpLP, 2011b). Four models are presented using path diagrams. To assess how well the observed data fit the hypothesized model, a number of goodness of fit statistics are assessed (see table 11). The bottom row provides threshold values (Hooper, Coughlan, & Mullen, 2008) to ease in the comparison of the models.

Table 11
Goodness of Fit Statistics

Model	χ2	RMSEA	AIC	BIC	CFI	SRMR	CD
1	**0.240**	0.095	674.944	699.897	**0.973**	0.086	0.966
2	**0.356**	**0.051**	700.420	732.028	**0.992**	**0.052**	0.977
3	**0.346**	**0.054**	701.476	734.747	**0.991**	**0.054**	0.982
4	0.000	0.239	1453.454	1502.177	0.865	**0.062**	0.912
Threshold	>0.05	<0.07	N/A	N/A	>0.95	<0.08	N/A

Note. No thresholds are provided for AIC & BIC because those indices are not normed to a 0-1 scale (Akaike, 1974; Schwarz, 1978). CD or coefficient of determination is like an R^2 for the entire model; values close to 1 indicate a good fit (StataCorpLP, 2011b).
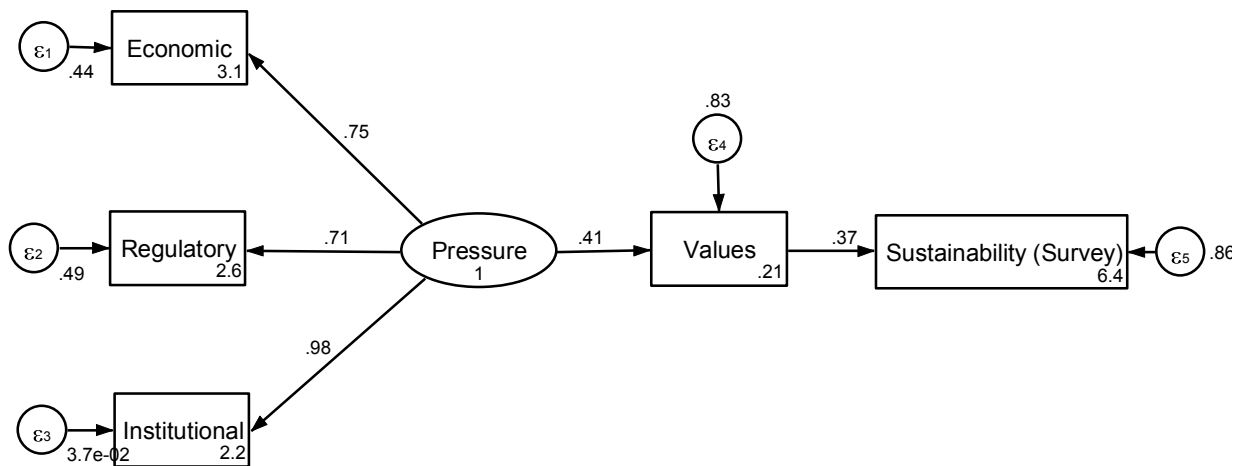
Figure 4. Hypothesis 3 - Model 1 (n = 39).
Note. The variance of the latent pressure factor has been fixed to 1 to provide a scale.

The first model is the simplest one containing three measured exogenous variables to represent the latent stakeholder pressure factor from economic, regulatory, and institutional stakeholders along with the values and beliefs observed endogenous variable, which mediates between the latent stakeholder pressure factor and the sustainability measure from the survey

instrument. This model does not include any of the controls, but fits the data reasonably well

(based on the chi2 and the comparative fit index [CFI] – see table 11). With 39 observations and

6 parameters, the model meets the rough guideline of 5 observations per parameter as a condition

to have reliable maximum likelihood parameter estimates (Bentler & Chou, 1987). All

standardized covariances, i.e. correlation coefficients between the variables are significant at the

$p < 0.01$ level (refer to appendix D for equation level coefficients). These covariances are the

ratios of each parameter estimate to its standard error distributed as a z statistic (Hoyle, 1995).

The structural component of the model indicates that values and beliefs mediate the relationship

between institutional and stakeholder pressure and sustainability practices at a moderate level

(0.41 correlation or 0.17 R^2 between stakeholder pressure and values and beliefs; 0.37 correlation

or 0.14 R^2 between values and beliefs and sustainability practices).
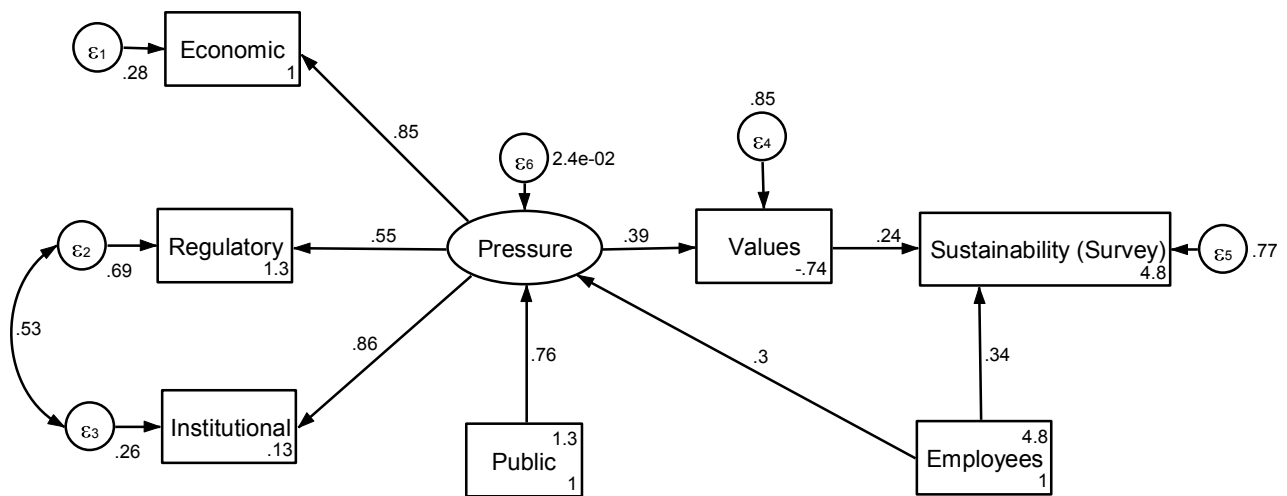
Figure 5. Hypothesis 3 - Model 2 (n = 39).
Note. Correlated error terms between Regulatory and Institutional added since both are institutional in nature, which is otherwise not represented in the model.

When controls are added in model 2, the overall model fit improves (see table 11). The analysis and results for hypotheses 1 and 2 as well as prior research suggest that company size (employees) affects both the total stakeholder pressure as well as the extent of sustainability activities. However, whether a company is public or private may only influence the level of stakeholder pressure, but not the level of sustainability activities. The correlation between stakeholder pressure and values and beliefs remains about the same (0.39 or 0.15 R^2) and is still significant at the $p < 0.01$ level, whereas the correlation between values and beliefs and sustainability practices has declined to 0.24 or 0.06 R^2 ($p < 0.1$).
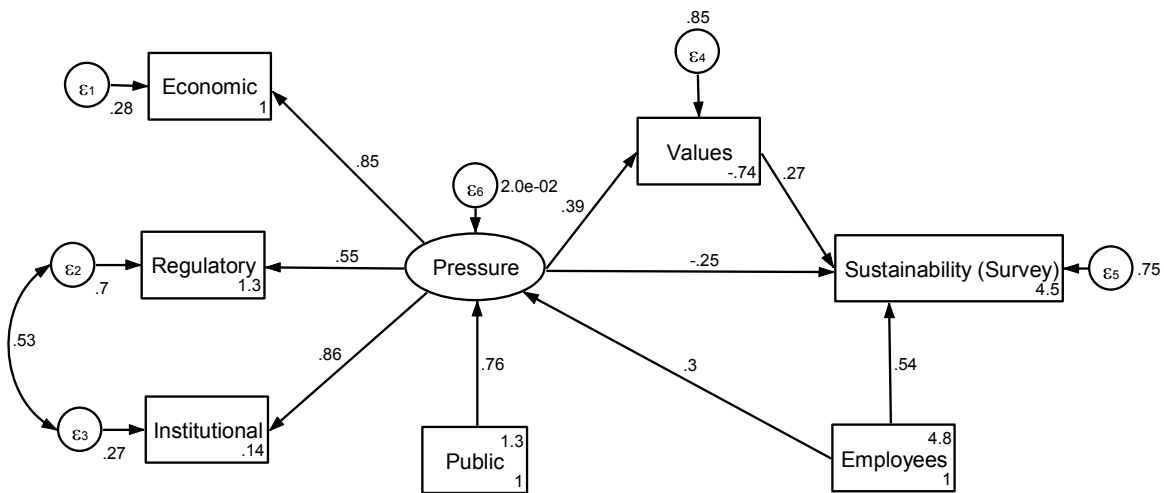
Figure 6. Hypothesis 3 - Model 3 (n = 39).

Model 3 provides a slight modification to model 2 with an added direct path between the stakeholder pressure latent factor and sustainability. The overall model remains a good fit (see table 11). Since values and beliefs are thought to mediate between stakeholder pressure and

sustainability, adding this path should help further evaluate the nature of the relationship. The path coefficients change only slightly; the path between values and beliefs and sustainability slightly strengthened to 0.27 correlation or 0.07 R^2 ($p < 0.1$) when compared to model 2. Also, the correlation coefficient between stakeholder pressure and sustainability is negative and not significant, which lends support to the hypothesized mediating nature of values and beliefs.
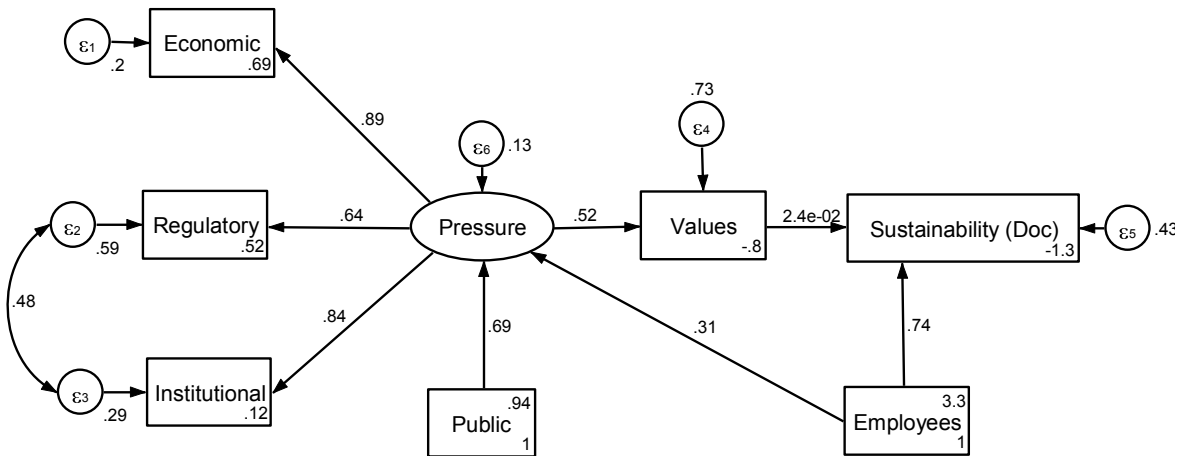
Figure 7. Hypothesis 3 - Model 4 (n = 96).

Model 4 is identical to model 2, but involves the larger data set with the imputed values and beliefs measure and the sustainability measure from the document content analysis. The overall model is no longer a good fit (see table 11); only one fit statistic, the standardized root mean squared residual, which tests the size of the residuals, meets threshold requirements. Looking at the structural component of the model, the path between stakeholder pressure and values and beliefs has strengthened (increased to 0.52 correlation or 0.27 R^2). However, the

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correlation between values and beliefs and sustainability is much lower (0.02 correlation) and no longer significant. It is possible that the way the values and beliefs measure was imputed (see measures section) may have impacted the results for model 4.

Overall, models 1, 2 and 3 lend support to hypothesis 3, but the results could not be replicated for the larger data set.

Hypothesis 4 states that as firm size decreases, companies are increasingly influenced by regulators and economic stakeholders in their sustainability practices. Like hypotheses 1 and 2, this hypothesis could be tested using the larger data set from the document content analysis and the firm profile data. 86 of the overall observations have the firm profile data along with the document content analysis data. The regression results show that firm size measured by the number of employees is *positively* related to the number of economic and regulatory stakeholders recognized in public documents (refer to table 12). So, as firm size decreases, fewer economic and regulatory stakeholders are recognized, not more. This finding may be a result of the less comprehensive documents and websites smaller firms tend to make available, likely because of fewer resources devoted to informing external stakeholders.

Table 12

Regression Results Hypothesis 4

```
Dependent Variable: Economic and Regulatory Stakeholder Pressure (Doc)
────────────────────────────
                        (1)
────────────────────────────
Employees             0.74*
                     (0.30)

Public               2.98**
                     (0.38)

_cons                1.83**
                     (0.54)
────────────────────────────
N                        86
R-sq                   0.69
adj. R-sq              0.68
────────────────────────────
Standard errors in parentheses
+ p<.10, * p<.05, ** p<.01
```

In order to further evaluate these results for hypothesis 4, a one-way Analysis of variance (ANOVA) is carried out on the survey responses assessing the different economic and regulatory stakeholder types for sustainability by company size (see table 13). The 44 survey responses were divided into two about equal size groups by number of employees; the cutoff for the large size group is >500 employees. As shown in table 13, no significant differences exist between larger and smaller firms in terms of importance of economic and regulatory stakeholders, except for management and employees, which are considered more important by the larger firms.

Table 13

ANOVA of Economic and Regulatory Stakeholder Types by Company Size

| Stakeholder Type | Overall Mean (s. d.) | Company Size | | ANOVA F | Prob > F | Bartlett's χ^2 Prob |
		Large (n = 21) Mean (s. d.)	Small (n = 23) Mean (s. d.)			
Suppliers	3.54 (1.13)	3.76 (0.94)	3.33 (1.26)	1.64	0.21	0.20
Landowners	4.12 (0.90)	4.14 (0.91)	4.10 (0.90)	0.02	0.89	0.97
Regulatory	4.48 (0.73)	4.62 (0.59)	4.35 (0.83)	1.47	0.23	0.13
Customers	3.80 (1.17)	3.76 (1.18)	3.83 (1.19)	0.04	0.85	0.95
Competitors	3.16 (0.91)	3.19 (0.87)	3.12 (0.97)	0.06	0.81	0.64
Management	4.28 (0.76)	4.52 (0.60)	4.05 (0.82)	**4.67**	**0.04**	0.16
Employees	4.02 (0.76)	4.33 (0.58)	3.74 (0.81)	**7.71**	**<0.01**	0.13
Investors	4.07 (1.19)	4.29 (1.19)	3.87 (1.18)	1.36	0.25	0.97

Finally, for hypothesis 4, a review of the transcripts from the interviews was conducted with a focus on the types of sustainability stakeholders mentioned by larger firms vs. smaller firms. Figure 8 provides a breakout of the types of stakeholders mentioned in the interviews by company size.

Stakeholders Mentioned as Influential for Sustainability During Interviews by Company Size
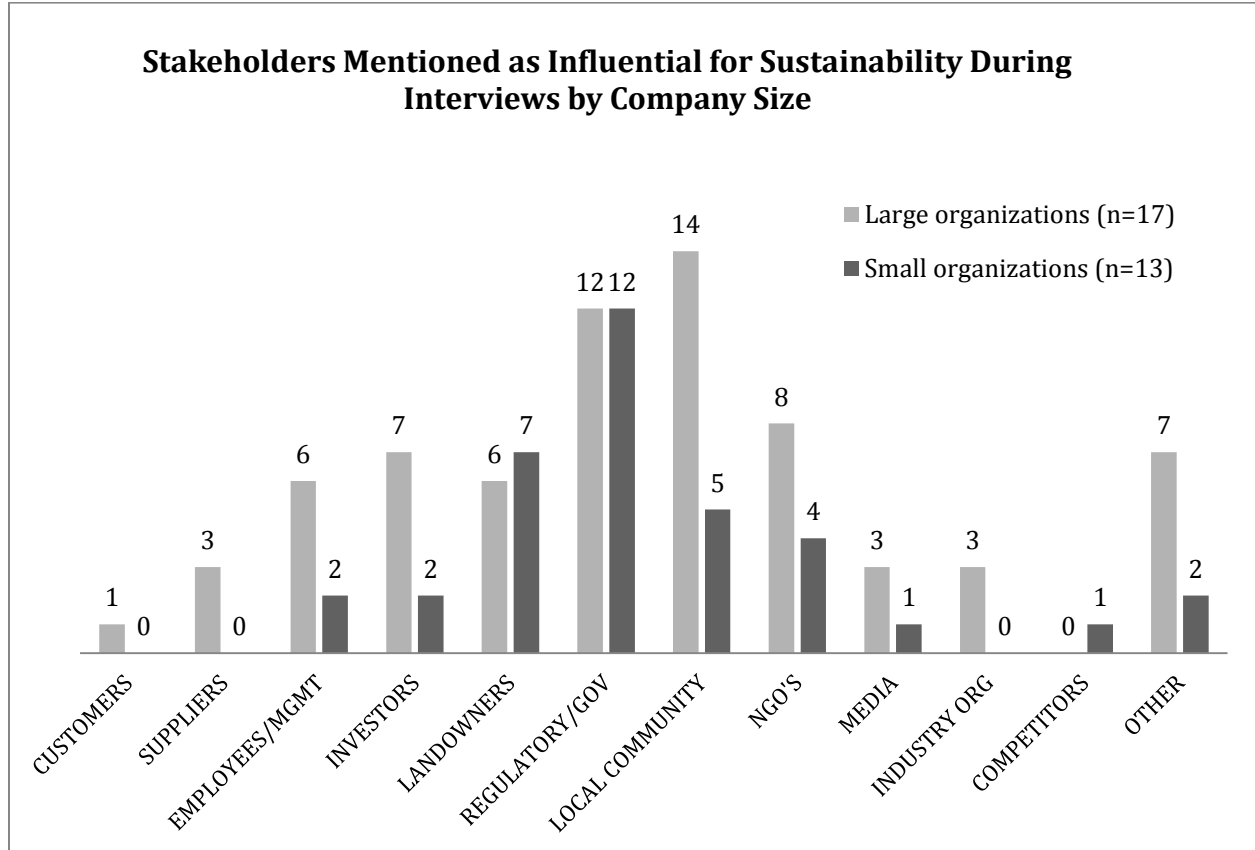
Figure 8. Stakeholders Mentioned in Interviews.

First of all, the larger firms tended to mention more stakeholders, especially more institutional stakeholders, such as local communities, NGOs, media, industry organizations, etc. However, when it comes to economic and regulatory stakeholders, respondents from both small and large firms agreed on the high importance of regulators or government agencies and landowners. Nevertheless, considering that more interview respondents came from larger organizations it appears that these two stakeholder groups are more influential for smaller organizations. Conversely, other economic stakeholders, such as investors, employees/managers,

and suppliers were cited primarily by respondents from the larger organizations. The results of the interviews therefore, contrary to the quantitative analysis, lend some support to the hypothesized increased influence of regulatory and economic stakeholders on sustainability practices of smaller firms. Nevertheless, the qualification has to be made that smaller firms appear to focus on a narrower set of economic stakeholders than larger firms.

Considering the results of the document content analysis, the analysis of the survey responses, and the review of the transcripts from the interviews, there is little evidence to support hypothesis 4.

The goal of hypothesis 5 is to ascertain the drivers behind eco-efficiency practices; are these practices primarily influenced by internal organizational stakeholders or by both internal organizational stakeholders as well as institutional industry stakeholders?
There are two data sources available to test this hypothesis; the survey responses focused on eco-efficiency stakeholder influence as well as the responses from the participants of the interviews. As with the earlier hypotheses the results of the quantitative analysis are presented first, which are then contrasted with the findings from the interviews. An analysis of the eco-efficiency stakeholder variables from the survey is carried out first using principal components analysis. Given the dearth of prior research in this specific area, this method is preferred as it allows the stakeholder categories to "emerge" from the data as opposed to applying a pre-defined notion of how stakeholders impacting eco-efficiency practices need to be categorized. The principal components analysis includes subsequent Varimax orthogonal rotation to simplify the factor structure. This rotation method is chosen as it produces a somewhat clearer representation of the

underlying stakeholder dimensions. Nevertheless, results were very similar to those using

Promax (oblique) rotation, which speaks to the stability of the factor structure (Hamilton, 2009).

As shown in table 14, four factors with Eigenvalues over 1 emerged, which together account for

74.97% of the variance. All factor loadings are at or above 0.59 and every stakeholder loads

primarily on one factor. The factors are labeled according to the primary stakeholders

represented in that group. Cronbach's alpha values for the first three groups were in the

acceptable range, however, the regulatory group with only two stakeholders falls slightly short of

the threshold of 0.7 (Peterson, 1994).

Table 14
Factor Loadings of Eco-Efficiency Stakeholder Influences

Stakeholder	Internal	Industry	Community	Regulatory
Suppliers	**0.60**	0.15	0.17	0.54
Management	**0.92**	0.13	0.01	-0.12
Employees	**0.91**	-0.03	0.13	0.00
Investors	**0.60**	0.27	0.04	0.17
Industry Associations	0.10	**0.95**	0.15	0.05
Industry Coalitions	0.04	**0.91**	0.08	0.20
Competitors	0.36	**0.59**	0.37	0.08
Landowners	-0.02	-0.08	**0.77**	0.46
Media	-0.11	0.47	**0.61**	0.30
Local Communities	0.17	0.24	**0.85**	0.22
Customers	0.34	0.35	**0.65**	-0.23
NGOs	-0.07	0.30	0.23	**0.75**
Regulators and Government	-0.04	0.12	0.25	**0.76**
Eigenvalue	4.93	2.33	1.48	1.01
Cronbach's α	0.78	0.86	0.80	0.63

The results of the principal components analysis indicate that respondents consider suppliers as well as investors together with employees and managers when it comes to internal drivers of eco-efficiency practices; so in other words, when managers feel the influence of one of them, they also feel the influence of the other stakeholders in the group. To assess the relative importance of the groups, the group means from the respective survey items are calculated next (see table 15).

Table 15
Group Means and Standard Deviations

Stakeholder Group	Mean	s. d.
Internal	3.78	0.87
Industry	3.00	0.98
Community	3.44	0.92
Regulatory	3.49	0.98

Overall for eco-efficiency practices, internal stakeholders are considered as most important by survey respondents, followed by regulatory and community stakeholders, whereas industry stakeholders are least important. To evaluate if the difference in means between internal and institutional industry stakeholders is significant, a paired t-test is conducted. The difference between the means is significant $t(43) = 4.98$, $p < 0.001$, meaning the internal stakeholders are considered significantly more important by managers than institutional industry stakeholders when it comes to eco-efficiency practices.

During the interviews, respondents were asked to name and evaluate the main internal or external stakeholders, which are important in influencing eco-efficiency practices. Many respondents, who specifically discussed various stakeholders, mentioned that eco-efficiency practices tend to be driven by internal organizational stakeholders, such as engineers, staff members and management, but that other parties, such as suppliers, industry groups, local communities, regulators or NGOs, also play a vital role in informing these practices. Internally, many organizations develop management systems focused on energy conservation, recycling and other practices, which are subject to continuous improvement. These improvements are sometimes made in response to the specific concerns the local community members have, for example with respect to water usage, or they could be informed by what other operators are doing or by general technological advances that are promoted by industry groups. Improvements respondents discussed include reducing the number of well pads needed with the use of horizontal drilling, powering drilling equipment with natural gas instead of diesel fuel, re-using drill cuttings in the manufacturing of asphalt or bricks, reducing gas emissions from the wells, replacing water trucks with pipelines, and others. Many interviewees mentioned that they engage in these eco-efficiency practices not only for the economic benefits, but that the environmental and community aspects and the overall perception of the industry are also considered when implementing these practices. In summary, the findings from the interviews support the results of the quantitative analysis in that internal stakeholders are the primary force behind eco-efficiency practices, but regulatory, community, and industry stakeholders also influence these practices. With respect to the hypotheses, hypothesis 5a is supported by the results with the qualification

that other stakeholders also play a role, but hypothesis 5b is not supported since institutional

industry stakeholders are viewed as least important based on the survey responses and

considered auxiliary when evaluated by interview participants.

CHAPTER V: SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Chapter Overview

This chapter starts out with a summary of the entire project including the findings, and then moves to the researcher's discussion and conclusions that can be drawn from the results and how they relate to the literature. Finally, the chapter ends with a summary of study limitations and recommendations for future research.

Summary

Scope and Purpose

In recent years, Pennsylvania and contiguous states are experiencing renewed commercial interest in natural gas drilling from the Marcellus and Utica shale formations. While economically welcomed, the development poses environmental risks (Reeder, 2010) along with concerns about the emergence of social problems for local communities (Jacquet, 2009). Due to these risks, the industry is facing considerable scrutiny from stakeholders, such as government regulators, environmental groups, local communities, and the media, and others, to act in a sustainable manner. This study aimed to investigate how these sustainability pressures from stakeholders and institutional actors are received, interpreted and acted upon by organizations and managers of the gas drilling firms. The study integrates both institutional and stakeholder arguments to identify the factors that influence firms to adopt sustainability and eco-efficiency practices.

Literature Review

For development of dependent measures of sustainability, this organizational study builds on the broader framework of sustainable development, which includes economic, social and environmental dimensions (Steurer et al., 2005). This study also investigates stakeholder influence on eco-efficiency practices; these measures involve producing goods or services while at the same time reducing the ecological impact and use of natural resources.

The literature suggests that institutional pressures from government regulators, non-government organizations, the media, and local communities, along with stakeholder influences from the organizational context, such as those from employees, suppliers, customers and others, play a prominent role in influencing organizational sustainable development (Bansal, 2005; Gonzalez-Benito & Gonzalez-Benito, 2010). While institutional pressures affecting all firms suggest homogeneity of firm responses in a single industry context, varying pressures exerted by stakeholders along with varying managerial interpretations of these pressures are thought to lead to variability of environmental or sustainability practices among firms (Murillo-Luna et al., 2008; Sharma, 2000). Theoretical arguments from the institutional literature point to the importance of organizational characteristics, such as a firm's environmental record and its visibility to outside stakeholders in mediating institutional pressures for sustainability (Delmas & Toffel, 2004). Also, prior empirical studies lend support to the importance of managerial interpretation in influencing how institutional and stakeholder pressures are perceived, evaluated and acted upon (Darnall et al., 2010; Sharma & Henriques, 2005).

However, prior empirical studies tend to exclude small firms from the analysis because of limited or complete lack of publicly available data or because they are presumed to lack the resources for sustainable activities. This is a concerning shortcoming of past research, since according to the U.S. Small Business Administration, small firms represent 99.7% of all employer firms in the United States ("How important are small businesses to the U.S. economy? ,"). A review of the literature on smaller firms suggests that they may be influenced by a different set of stakeholders in their sustainability practices (Chrisman & Archer, 1984; Darnall et al., 2010). Finally, prior empirical results point out that eco-efficiency practices are likely self-motivated by firms since they yield economic benefits, but may also be influenced by institutional and stakeholder pressures (Sharma & Henriques, 2005). This study empirically tested these propositions not specifically examined by earlier studies by advancing a research model and developing associated hypotheses.

Methods

The methodology employed to conduct the study involves a quantitative epistemology aimed at investigating paths and mediating factors of institutional and stakeholder pressures for sustainability. Both primary and secondary data sources were utilized for this study. 30 semi-structured interviews were conducted to investigate sustainability issues in the shale gas industry. An online survey was distributed to all companies in the industry active in Pennsylvania, West Virginia, and Ohio, of which 44 responses were received. Assessments of institutional and stakeholder pressures and a comparative industry evaluation of sustainability practices were

obtained from individual managers' responses on the survey, but are also operationalized and measured by conducting a document content analysis of publicly available annual reports, sustainability reports, or firm websites. Violations data collected from the various State Departments of Environmental Protection, along with the number of media reports from a number of regional media sources, served as measures for the environmental record and firm visibility variables.

Results

Analysis of the hypothesized relationships was carried out primarily through multiple regression, but also included structural equation modeling, as well as principal components analysis. Table 16 provides a summary of the findings by hypothesis. Hypothesis 1 investigates whether firms with an inferior environmental record perceive increased institutional pressures for sustainability. The projected relationship was supported when environmental record is measured by the number of negative media articles, but not when it is measured using violations data from the state departments of environmental protection. Hypothesis 2 was supported; firms with higher public visibility (measured by the number of media articles), also showed signs of perceiving increased institutional stakeholder pressures as they recognized more institutional stakeholders in their public documents.

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Table 16

Summary of Hypotheses and Results

No.	Hypothesis	Result
1	As firm environmental record declines, firms perceive increased institutional pressures for environmental sustainability.	Supported when environmental record is measured by negative media articles
2	Firms with higher public visibility perceive increased institutional pressures for sustainability.	Supported
3	Firms, which are subject to increased institutional and stakeholder pressures from the organizational context, and who employ managers with supportive values and beliefs with respect to sustainability, will adopt higher levels of sustainability practices.	Supported by sample data, but could not be replicated for overall study population
4	As firm size decreases, firms are increasingly influenced by regulators and economic stakeholders in their sustainability practices.	Not supported
5a	Eco-efficiency sustainability practices are primarily influenced by internal organizational stakeholders.	Supported, but regulatory, community and industry stakeholders also influential
5b	Eco-efficiency sustainability practices are influenced by both internal organizational stakeholders as well as institutional industry stakeholders.	Not supported since industry stakeholders much less influential than internal, regulatory or community stakeholders

Hypothesis 3 examines the mediating influence of managerial values and beliefs between stakeholder pressures and sustainability practices firms undertake. The analysis of the survey data set augmented by the document content data showed a moderate mediating influence of managerial values and beliefs. However, attempts to extrapolate these results to the larger data set were not successful.

Hypothesis 4, stipulating that smaller firms are to a larger extent influenced by regulators and economic stakeholders in their sustainability practices, was not supported. Neither the document content analysis nor the results of the survey data analysis showed a difference in the way these types of stakeholders are impacting smaller firms. Nevertheless, the perceptions

gained from the interviews seem to support the increased influence of regulatory and economic stakeholders on smaller firms.

Finally, hypothesis 5 studies the primary drivers from a stakeholder perspective of eco-efficiency practices. The results indicate that these practices tend to be primarily influenced by internal stakeholders, but that regulatory, community, and industry stakeholders also play a role.

Discussion and Conclusions

In this research of the shale gas industry in the Northeastern United States, I examine the role organizational characteristics, such firm environmental record, public visibility or size, play in either influencing the level of institutional stakeholder pressure placed on these firms or in the type of stakeholder most relevant to them. Furthermore, this study investigates how managerial characteristics, such as values and beliefs with respect to sustainability, act as a conduit between stakeholder pressure placed on the firms and sustainability practices companies engage in. Finally, this research also aims at identifying the main stakeholder group(s) influential in driving eco-efficiency practices in this industry.

In general, supported by comments made by many of the participants of the interviews, it appears that institutional stakeholders play a prominent role in the natural gas producing industry, especially given the environmental and social concerns that come with this kind of development. With a relatively new and per some perhaps unproven technology and sustainability practices still in emergence, the industry does face increased scrutiny from

regulators and other institutional stakeholders, which is in line with prior research focused on the role of institutional industry actors early in an industry's development (Delmas & Montes-Sancho, 2010; Hoffman, 1999).

Findings from an analysis of public documents, negative media articles, and fines data from state environmental regulatory agencies show mixed results attempting to answer whether firms with an inferior environmental record perceive increased institutional pressure for environmental sustainability. Using negative articles as a way to measure a firm's environmental record show the expected positive relationship; firms with more negative media coverage also acknowledge more institutional stakeholders. However, while not significant statistically, the opposite is the case when using violations data from the state environmental regulators to measure environmental record; more violations mean fewer institutional stakeholders are recognized. The differing results from these two measures of environmental record may have to do with the nature of these measures; the number of negative articles may be more of an indicator of the level of environmental indiscretions a company has on its record, which may entice the firm to more broadly inform and recognize institutional stakeholders, whereas the number of violations may not. Companies may view those as a by-product of doing business similar to the way BP showed little concern for the number of OSHA violations prior to the gulf oil spill in 2010 (Thomas, Jones, & Ryan, 2010). Nevertheless, it is likely that those firms with a poor environmental or violations record have a narrower stakeholder focus, which more often than not may exclude the more tangentially related institutional stakeholders. The study by Buysse & Verbeke (2003), although focusing on stakeholders relevant for more closely defined

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environmental strategies, did find a similar pattern: firms with a lower level, more reactive environmental strategy tend to display a narrower stakeholder orientation.

The results obtained from an analysis of public documents and media articles indicate that more visible companies recognize more institutional stakeholders in their public documents, meaning that they acknowledge the importance or possibly even the leverage these stakeholders have over the company (Frooman, 1999). More visible natural gas operators cover a broader range of institutional stakeholders including regulators, local communities, environmental or social groups, the media, industry organizations, or competitors, than less visible firms. The more highly visible firms therefore not only recognize stakeholders, which have an immediate or direct financial impact on their organizations, but also those that are more concerned with environmental or social issues. This empirical finding is in line with the theoretical notion that public visibility is mostly relevant for stakeholders that are only loosely coupled with the firm (Delmas & Toffel, 2004). Also, since visibility was moderately to strongly positively related to firm size, it indicates that organizations in this industry just based on their size may be subject to increased institutional stakeholder pressures.

Most of the evidence of this study shows that smaller firms in this industry are comparable to larger size firms when it comes to the influence of regulatory and economic stakeholders on sustainability practices. This is somewhat unexpected in light of a number of prior studies emphasizing firm size as a key characteristic in stakeholder influence on sustainability (Darnall et al., 2010; Gonzalez-Benito & Gonzalez-Benito, 2010). The result of the survey analysis indicating that managers of larger size firms viewed management and employees

as more important may have to do with the critical role managers and staff play in implementing systems and processes to support sustainable activities in larger organizations. Due to agency factors, the larger firms may need to delegate more of the responsibilities to managers and employees whereas in smaller firms the owners may take on more of these responsibilities. However, at least in this industry, if company size does not appear to play a prominent role in the influence regulatory and economic stakeholders have, the difference may lie in the firms' orientation with respect to sustainability. The type of organizational approach, or organizational strategy, chosen with respect to sustainability may be more relevant than size in determining whether regulatory or economic stakeholders are deemed more important as some earlier studies have shown (Buysse & Verbeke, 2003; Henriques & Sadorsky, 1999). Possibly, as suggested by Darnall et al. (2010), firm size is a moderating variable between stakeholder pressures and adoption of proactive environmental sustainability practices. However, considering the level of complexity involved in organizational settings like this, factors like industry structure, regulatory environment, geographical location, organizational history and culture, stage of industry maturity, managerial values and beliefs, and others are likely to be important as well in influencing the prominence of certain types of stakeholders. In many ways, the question which stakeholders are important at a given point in time may largely be an empirical question as suggested by Buysse and Verbeke (2003).

The investigation of the role values and beliefs play in mediating between the combined influence of institutional and organizational stakeholders and company sustainability practices highlight the importance of attitudes and beliefs of managers when it comes to sustainability.

Manager's attitudes with respect to sustainability help explain how firms in this industry translate external stakeholder pressures into actual sustainability practices. If stakeholder pressures for sustainability are not met with a favorable perspective on the side of the managers, the stakeholder influence is not likely to result in an actual change in the sustainable development behavior of the firm. What is more is that in this industry, managers are very much aware of the risks and environmental issues associated with development. Earlier work by Gonzalez-Benito and Gonzalez-Benito (2010) emphasizes that an awareness of environmental issues is likely to be a requirement that managers perceive the stakeholder pressures as legitimate and ultimately act upon them. So, managers have to be sensitized to these issues in order for the stakeholder influence to find fertile ground and grow to increasingly higher levels of sustainability. Since this part of the study looks at interactions in a more systemic way including control variables, an interesting fact emerging from the modeling is that whether a company is public or private appears to influence the level of stakeholder pressure, but not the level of sustainability activities the firm engages in as suggested by Darnall et al. (2010). An explanation may be that practices with respect to sustainability are already so widely diffused in this industry that this organizational characteristic has little effect on sustainable development actions or perceptions thereof.

When it comes to the primary drivers from a stakeholder perspective behind eco-efficiency practices, the finding that those practices are primarily driven by company-internal stakeholders is in line with prior research from the natural resources sector (Sharma & Henriques, 2005). What are considered internal stakeholders, or possibly organizational

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stakeholders, may not only include employees and management, but also suppliers and investors. The latter two stakeholders may be viewed as extensions of the same stakeholder dimension, which is also a finding of an earlier study by Henriques and Sadorsky (1999). Similarly, the finding that regulators and NGOs are viewed as a single dimension of stakeholder influence on eco-efficiency practices is supported by stakeholder theory. Since NGOs themselves tend to have insufficient resources and means to discipline firms they are likely to choose an indirect pathway through regulatory organizations to influence industry practices (Frooman, 1999). Considering the large number of individual stakeholders, earlier studies investigating their influence on sustainability practices show a high correlation of sustainability demands across stakeholders (Buysse & Verbeke, 2003; Murillo-Luna et al., 2008), which appears to also be the case for eco-efficiency practices. However, the relatively high importance assigned by managers to the role regulatory and community stakeholders play in informing these practices was somewhat of a surprise. The former highlights how closely engaged regulatory agencies are with firms in this industry when it comes to these practices; nevertheless, some of this influence may be more coercive than collaborative as evidenced by the mandate issued by the Pennsylvania Department of Environmental Protection in April 2011 that operators are to cease delivering their wastewater to municipal sewage plants (DEP, 2011), which led to a rapid increase in recycling of wastewater since then (Urbina, 2011b).

Limitations

This study has a number of limitations. A limitation inherent in the non-experimental cross-sectional study design is its inability to infer causality, since the time dependence requirement is lacking (Hamilton, 1992). For example, it is possible that firms engaging in sustainability practices attract a certain stakeholder, in which case the hypothesized causal influence from the stakeholder on the firm's sustainability practices would be spurious. It is possible that a firm engaged in the sustainability practice first and then engaged with the stakeholder instead of reacting to stakeholder pressure by engaging in a certain sustainability practice. Nevertheless, the time dependence is taken into account to some extent for the secondary measures of firm visibility and environmental record. Also, the multivariate analytical methods utilized can aid by ruling out possible spuriousness. Another limitation of the study's design is that it does not take into account how institutional or stakeholder influences and sustainability practices change over time, but only provides a "snapshot" of these influences and outcomes at the time of study.

Since this study relies to some extent on the survey instrument and public documents for both the independent and dependent measures, another limitation includes the risk of common method variance. Also, the study relies quite extensively on count measures derived from public documents to measure institutional and overall stakeholder pressures and a quantitative document content analysis to evaluate public documents in order to assess the extent of firm sustainability efforts. With respect to the count measures, since public companies have to adhere to certain institutional guidelines when it comes to addressing stakeholders in their public

documents, such as those issued by the Securities and Exchange Commission and others with respect to reporting, it is possible that stakeholders may be recognized as a result of institutional guidelines, but not because those stakeholders are viewed as having significant leverage over the firm. The common method risks for the survey were addressed in two ways: First, the questions on the survey instrument are reordered so that the items measuring the dependent construct appear after the questions representing the independent variables (Podsakoff & Organ, 1986). Second, institutional and stakeholder pressures as well as sustainable development were also measured using a secondary method by utilizing publicly available information from annual reports, sustainability/corporate responsibility reports, and websites (where available) as suggested by Podsakoff et al. (2003). Furthermore, the survey instrument includes questions to evaluate the respondent's perceptions with respect to sustainability. These sustainability issues may be subject to social desirability bias.

Moreover, given that this study investigates sustainability practices and stakeholder influences in a single industry context and the dependent variable was inductively developed from the sample and pertinent oil and gas industry literature, the generalizability of the findings to other industries is limited. Also, as an evaluation of the survey responses showed, the surveys and interviews overemphasize large, publicly traded organizations. Hence, findings derived from those sources may not be representative of the shale gas industry in the Northeastern United States overall and may only apply to large, publicly traded organizations in similar contexts.

Finally, the research model employed for this study may exclude important institutional, stakeholder, or organizational variables that explain firm sustainability practices. In order to

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mitigate this risk, the study design included personal interviews, utilized firm documents, included secondary data, and took advantage of the quite extensive literature on institutional and stakeholder influence. Nevertheless, the managers partaking in the interviews may not be willing to share their perceptions with respect to stakeholders or may be not the best contact to evaluate the role of these stakeholders play in influencing sustainable development.

Future Research

Stakeholder influence is a complex issue and should provide many more avenues for researchers to investigate. This study exclusively assessed these issues from the perspective of the industry firms, which is quite common in this branch of organizational research. Additional studies should also focus on the (external) stakeholder side of the coin and attempt to incorporate their perspective to obtain a more balanced understanding of their motivations and means in influencing industry organizations to act in a sustainable manner. One way to accomplish this may be to have various stakeholders evaluate each industry firm on a number of dimensions, such as responsiveness, transparency, willingness to change processes, etc. Such an assessment could then be compared with the perceptions of the firms themselves, which could yield some valuable insight.

Much of prior research including this study covers the breadth of stakeholder influence quite well, i.e. which stakeholders matter to firms, but lacks in evaluating the depth of stakeholder engagement. We do not understand enough about how companies are assessing stakeholder concerns and how they incorporate those concerns into their operations and systems.

Work in this area could be more along the lines of case studies, which then could be used as a starting point to more comprehensively assess the depth of stakeholder engagement in an industry or across industries.

Neither stakeholders nor firms exist in a vacuum. This study conceptualized the influence of stakeholders as an independent or exogenous variable, which through the values and beliefs of their manager ultimately impacts the sustainable activities these companies engage in. The reality is much more complex, especially given that stakeholders not only influence firms; they also influence each other and are influenced by the broader institutional norms of the particular industry environment as well as the overall societal changes with respect to sustainability.

To address the shortcoming of studies like this, which assess stakeholder influence only at a certain period of industry evolution; more longitudinal studies like the one from Hoffman (1999) are needed to better understand how institutional and stakeholder influences change over time. Longitudinal studies would also be able to better address the limitations cross-sectional studies have with respect to establishing causation.

This study did not conclusively show that the organizational characteristics of firm environmental record and size are key variables in determining stakeholder influence. Future research should attempt to clarify the role these factors play in organizational contexts.

Finally, additional studies such as the one by Bansal (2005) would help to extend our knowledge of sustainable development as a combination of environmental, social and economic dimensions. This may pose some measurement challenges based on the breadth of this concept,

such as the ones I encountered with this study, but it will help build a better understanding of

how sustainable development is broadly perceived and implemented in various settings.

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CONTACT INFORMATION

Contact Name: _____

Title: _____

Phone Number: _____

Email Address: _____

COMPANY INFORMATION

Company Name: _____

Interview Date: _____

Small Enterprise (Y/N)?   _____

Questions to be addressed by a manager tasked with environmental, health and safety responsibilities (or similar):

1) **Many organizations today engage in sustainability efforts; how would you define sustainability?**

2) **How has sustainability or sustainable development affected your industry and your company?**

3) What are some of the reasons why your firm supports sustainability practices?

4) What internal or external parties or sources of pressure do you see that had/have an influence on your organization's sustainability practices?

5) Who are some of the main internal or external parties or stakeholders, which are important in influencing your *eco-efficiency practices?

* Eco-efficiency includes: recycling, reuse or reclaiming of materials otherwise considered wastes, energy conservation/efficiency improvements, etc.

6) Is there anything else with respect to sustainability you feel is important to you or to your company, which we did not cover?

<u>If the interviewee is from a smaller organization, the following additional question applies:</u>

7) How to you evaluate the importance of the following parties in influencing your sustainability practices:
   a. Regulators, such as the department of environmental protection (DEP)?
   b. Economic stakeholders, such as customers, suppliers, or employees?
   c. Others?

Shale Gas Firm Survey

CONTACT INFORMATION

Contact Name: _____

Title: _____

Phone Number: _____

Email Address: _____

COMPANY INFORMATION

Company Name: _____

Range of Operations: (*Please select __all__ that apply and add additional comments in case list does not capture all of your company's activities*):
<Exploration of Natural Gas>
<Drilling and Production of Natural Gas>
<Provider of Drilling Services and Products>
<Provider of Drilling Consultation Services>
<Distribution and Marketing of Natural Gas>
<Oil Exploration and Development>
<Refining Facilities>
<Distribution and Marketing of Oil>
<Other activities your firm engages in (please specify_____)

Multinational Organization: Y/N

Publicly Traded Firm (Y/N): Y/N (*If "Y" is selected – next 2 questions are __not__ shown*)

*Last Full Year Annual Sales: Ranges (select one):
<$0 - $1 Million USD>
<$1 Million - $5 Million USD>
<$5 Million - $10 Million USD>
<$10 Million - $50 Million USD>
<$50 Million - $100 Million USD>
<$100 Million - $500 Million USD>
<$500 Million - $1 Billion USD>
<Over $1 Billion USD>

*Number of Employees:	Ranges (select one):
	<5 or Less>
	<6- 10>
	<11 - 50>
	<51 - 100>
	<101 - 500>
	<501 - 1,000>
	<1,001 - 10,000>
	<10,001 or More >
Environmental Quality ISO 14000 Certified	Y/N (*If "Y" is selected – next question is <u>not</u> shown*)
Environmental Quality ISO 14000 Cert. in Process	Y/N

* As outlined in the Informed Consent Form, all information including sales and number of employee ranges is treated as strictly confidential.

SUSTAINABILITY PARTIES / STAKEHOLDERS

Please answer the following questions as they relate to sustainability efforts at your company. Please consider the following broad definition of sustainability in your response:

"Sustainability encompasses the pursuit of environmental integrity, economic prosperity, and social equity. Besides environmental issues, sustainability therefore also considers the long-term financial viability of organizations along with social issues, such as for example improvement of social conditions for employees and local communities."

1) **How important do you consider each of the following parties or stakeholders in influencing your company's sustainability practices overall?**

STAKEHOLDER	Not Important	Somewhat Important	Moderately Important	Important	Very Important
Suppliers	1	2	3	4	5
Non-governmental organizations (Environmental groups)	1	2	3	4	5
Landowners or landowner groups	1	2	3	4	5
The media	1	2	3	4	5
Regulators or government agencies	1	2	3	4	5
Local communities	1	2	3	4	5
Customers	1	2	3	4	5
Industry and trade associations	1	2	3	4	5
Industry coalitions	1	2	3	4	5
Competitors	1	2	3	4	5
Management employees	1	2	3	4	5
Non-management employees	1	2	3	4	5
Investors/shareholders	1	2	3	4	5
Other_____ (please specify any additional important stakeholder)	1	2	3	4	5

2) How important do you consider each of the following parties or stakeholders in influencing your company's ***eco-efficiency** practices?

*eco-efficiency may include recycling, reuse or reclaiming of materials otherwise considered wastes; water recycling; and energy savings through conservation and efficiency improvements.

STAKEHOLDER	Not Important	Somewhat Important	Moderately Important	Important	Very Important
Suppliers	1	2	3	4	5
Non-governmental organizations (Environmental groups)	1	2	3	4	5
Landowners or landowner groups	1	2	3	4	5
The media	1	2	3	4	5
Regulators or government agencies	1	2	3	4	5
Local communities	1	2	3	4	5
Customers	1	2	3	4	5
Industry and trade associations	1	2	3	4	5
Industry coalitions	1	2	3	4	5
Competitors	1	2	3	4	5
Management employees	1	2	3	4	5
Non-management employees	1	2	3	4	5
Investors/shareholders	1	2	3	4	5
Other_____ (please specify any additional important stakeholder)	1	2	3	4	5

SUSTAINABILITY STATEMENTS

3) Please indicate your level of agreement or disagreement with the statements made below.

STATEMENT	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainability has the potential to provide significant benefits to our company.	1	2	3	4	5
I am likely to gain rather than lose by actions to support sustainability.	1	2	3	4	5
Any actions I take to enhance sustainability are not constrained by others in the organization.	1	2	3	4	5

SUSTAINABILITY PRACTICES

4) Please assess the extent of your firm's <u>environmental sustainability</u> efforts by answering the 10 items below (circle one for each item).

ENVIRONMENTAL SUSTAINBILITY					
ITEM	Much less than other firms in industry	Less than other firms in industry	Same as other firms in industry	More than other firms in industry	Industry leader
Reduction of greenhouse gas (CO_2, methane) emissions	1	2	3	4	5
Reduction of flared and vented gas emissions	1	2	3	4	5
Prevention of spills to the environment	1	2	3	4	5
Reduction of discharges to water	1	2	3	4	5
Use of non-toxic fracturing chemicals and agents	1	2	3	4	5
Use of alternative energy sources, such as solar, wind, geothermal, methane, etc. to reduce use of traditional fuels	1	2	3	4	5
Assessment and management of biodiversity and ecosystem services risks and opportunities of terrestrial, fresh water and marine environment and local communities	1	2	3	4	5
Recycling, reuse or reclaiming of materials otherwise considered wastes	1	2	3	4	5
Reduction of fresh water usage and level of water recycling	1	2	3	4	5
Energy savings through conservation and efficiency improvements	1	2	3	4	5

5) **Please assess the extent of your firm's <u>social sustainability</u> efforts by answering the 3 items below (circle one for each item).**

SOCIAL SUSTAINBILITY					
ITEM	**Much less than other firms in industry**	**Less than other firms in industry**	**Same as other firms in industry**	**More than other firms in industry**	**Industry leader**
Level of equity, i.e. more equal distribution of income within organization	1	2	3	4	5
Improvement of social conditions within the organization (employee education and training, employee health and safety)	1	2	3	4	5
Improvement of social conditions outside the organizations (local communities)	1	2	3	4	5

6) **Please assess the extent of your firm's <u>economic sustainability</u> efforts by answering the 3 items below (circle one for each item).**

ECONOMIC SUSTAINBILITY					
ITEM	**Much less than other firms in industry**	**Less than other firms in industry**	**Same as other firms in industry**	**More than other firms in industry**	**Industry leader**
Financial performance	1	2	3	4	5
Long-term competitiveness	1	2	3	4	5
Level of positive economic impact on employees, landowners, suppliers, and creditors	1	2	3	4	5

Thank you for taking the time to complete this survey.

INTERVIEW INFORMED CONSENT FORM:

Informed Consent Form
Indiana University of Pennsylvania

<u>PART 1: Research Description</u>

You are invited to participate in a research study that investigates the importance and influence of stakeholders on firm sustainability practices. The following information is provided in order to help you to make an informed decision whether or not to participate. Your company has been purposefully selected because of its activity in shale gas drilling and based on geographical proximity to the Pittsburgh region. If you have any questions please do not hesitate to ask.

Your participation in this study requires an interview during which you will be asked to identify and evaluate the important stakeholders influencing sustainability at your firm. Furthermore, you will be asked to describe how sustainability is affecting the industry and your firm. Finally, you will be requested to review a questionnaire in order to assess its clarity and reliability for the next phase of this research project. The duration of the interview will be approximately 30 minutes to 1 hour and reviewing the questionnaire about 5 minutes.

Besides the information gathered through interviews and the questionnaire, this study also utilizes the following sources and materials:
1) Publicly available documents or sources, such as annual reports, sustainability reports, and company websites
2) Media coverage in terms of number of articles associated with a particular company
3) Data from to the Pennsylvania/West Virginia/Ohio Department of Environmental Protection.

Research Title: Stakeholder and Institutional Influences on Sustainable Development in the Shale Gas Extraction Industry

Principal Researcher: Simon Hauser, Ph.D. Student, Administration and Leadership Studies, Department of Sociology, email: s.hauser@iup.edu, Phone: (412) 242-3457

Faculty Sponsor: Dr. David Yerger, Associate Professor, Department of Economics, McElhaney Hall 213, Indiana, PA 15705, Office Phone: (724) 357-4775

Risks and Benefits:

There are no known risks or discomforts associated with this research. The study will hopefully contribute to understanding stakeholder influence in a shale gas industry environment or similar contexts. Should you choose to participate in the study, you may request a summary from the principal researcher, indicating how your organization compares to all participants on aggregate with respect to stakeholder importance and sustainability practices. There is no financial remuneration for your participation in this study.

Data Storage to Protect Confidentiality:

Under no circumstances whatsoever will you or your organization be identified by name in the course of this research study, or in any publication thereof. Your response will be considered only in combination with those from other participants. Every effort will be made that all information provided by you will be treated as strictly confidential. Your responses will be coded and the key connecting your company name to the response will be securely stored and not shared with any third party.

How the Results Will Be Used:

This research study is to be submitted in partial fulfillment of requirements for the degree of Doctor of Philosophy at Indiana University of Pennsylvania, Indiana, Pennsylvania. The results of this study will be published as a dissertation. Also, the information obtained in the study may be published in scientific journals or presented at scientific meetings but your identity and the identity of your organization will be kept strictly confidential.

PART 2: Participant's Rights

- I have read and discussed the research description with the researcher. I have had the opportunity to ask questions about the purposes and procedures regarding this study.
- My participation in this research is **voluntary**. I may refuse to participate or withdraw from participation at any time without any loss of benefits to which I am otherwise entitled. I may withdraw at any time by notifying the principal researcher. Upon my request to withdraw, all information pertaining to me or my organization will be erased.
- If, during the course of the study, significant new information that has been developed becomes available that may relate to my willingness to continue to participate, the principal investigator will provide this information to me.
- If at any time I have any questions regarding the research or my participation, I can contact the principal researcher, Simon Hauser, who will answer my questions. I may also contact the researcher's faculty sponsor, Dr. David Yerger.
- **This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Phone: 724-357-7730).** If I at any time I have comments or concerns regarding the conduct of the research, questions about my rights

as a participant, I can contact the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects.

Voluntary Consent Form:

I have read and understand the information on the form and I consent to volunteer to be a participant in this study. I understand that my responses are completely confidential and that I have the right to withdraw at any time. I have received an unsigned copy of this Informed Consent Form to keep in my possession.

Participant's signature:_____ Date: ____/____/_____

Name (please print):_____

Investigator's Verification of Explanation:

I, Simon Hauser, certify that I have carefully explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participating in this research study. He/she had the opportunity to discuss it with me in detail. I have answered all his/her questions and he/she provided the affirmative agreement (i.e., assent) to participate in this research.

Researcher's signature:_____ Date: ____/____/_____

SURVEY INFORMED CONSENT FORM:

Informed Consent Form
Indiana University of Pennsylvania

PART 1: Research Description

You are invited to participate in a research study that investigates the importance and influence of stakeholders on firm sustainability practices. The following information is provided in order to help you to make an informed decision whether or not to participate. Your company has been selected because of its activity in shale gas drilling.

Your participation in this study requires the completion of a questionnaire, which will take approximately 15 minutes.

Besides the information gathered via the questionnaire, this study also utilizes the following sources and materials:
1) Interviews of selected firms active in shale gas drilling
2) Publicly available documents or sources, such as annual reports, sustainability reports, and company websites
3) Media coverage in terms of number of articles associated with a particular company
4) Data from to the Pennsylvania/West Virginia/Ohio Department of Environmental Protection.

Research Title: Stakeholder and Institutional Influences on Sustainable Development in the Shale Gas Extraction Industry

Principal Researcher: Simon Hauser, Ph.D. Student, Administration and Leadership Studies, Department of Sociology, email: s.hauser@iup.edu, Phone: (412) 242-3457

Faculty Sponsor: Dr. David Yerger, Associate Professor, Department of Economics, McElhaney Hall 213, Indiana, PA 15705, Office Phone: (724) 357-4775

Risks and Benefits:

There are no known risks or discomforts associated with this research. The study will hopefully contribute to understanding stakeholder influence in a shale gas industry environment or similar contexts. Should you choose to participate in the study, you may request a summary from the principal researcher, indicating how your organization compares to all participants on aggregate with respect to stakeholder importance and sustainability practices. There is no financial remuneration for your participation in this study.

Data Storage to Protect Confidentiality:

Under no circumstances whatsoever will you or your organization be identified by name in the course of this research study, or in any publication thereof. Your response will be considered only in combination with those from other participants. Every effort will be made that all information provided by you will be treated as strictly confidential. Your responses will be coded and the key connecting your company name to the response will be securely stored and not shared with any third party.

How the Results Will Be Used:

This research study is to be submitted in partial fulfillment of requirements for the degree of Doctor of Philosophy at Indiana University of Pennsylvania, Indiana, Pennsylvania. The results of this study will be published as a dissertation. Also, the information obtained in the study may be published in scientific journals or presented at scientific meetings but your identity and the identity of your organization will be kept strictly confidential.

PART 2: Participant's Rights

- I have read the research description. My participation in this research is **voluntary**. I may refuse to participate or withdraw from participation at any time without any loss of benefits to which I am otherwise entitled. I may also withdraw after completing the questionnaire. Upon my request to withdraw, all information pertaining to me or my organization will be erased.
- If, during the course of the study, significant new information that has been developed becomes available that may relate to my willingness to continue to participate, the principal investigator will provide this information to me.
- If at any time I have any questions regarding the research or my participation, I can contact the principal researcher, Simon Hauser, who will answer my questions. I may also contact the researcher's faculty sponsor, Dr. David Yerger.
- **This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Phone: 724-357-7730).** If I at any time I have comments or concerns regarding the conduct of the research, questions about my rights as a participant, I can contact the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects.

Voluntary Consent Form:

I have read and understand the information on the form and I consent to volunteer to be a participant in this study. I understand that my responses are completely confidential and that I have the right to withdraw at any time.

Participant's signature:_____ Date: ____/____/_____

Name (please print):_____

APPENDIX D – SEM EQUATION LEVEL COEFFICIENTS

Model 1:

```
Structural equation model                    Number of obs      =        39
Estimation method  = ml
Log likelihood     = -322.47191

 ( 1)   [Values]Pressure = 1
```

	OIM					
Standardized	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Structural						
Values <-						
Pressure	.41074	.1365155	3.01	0.003	.1431745	.6783054
_cons	.2074547	.1618419	1.28	0.200	-.1097495	.5246589
SustainabilitySurvey <-						
Values	.3677406	.1384735	2.66	0.008	.0963376	.6391437
_cons	6.408634	.7558806	8.48	0.000	4.927135	7.890133
Measurement						
Economic <-						
Pressure	.7468518	.0878267	8.50	0.000	.5747148	.9189889
_cons	3.067711	.3824825	8.02	0.000	2.318059	3.817362
Regulatory <-						
Pressure	.7145178	.0912096	7.83	0.000	.5357502	.8932854
_cons	2.607681	.3358876	7.76	0.000	1.949354	3.266009
Institutional <-						
Pressure	.9814608	.0640888	15.31	0.000	.8558492	1.107073
_cons	2.215117	.29757	7.44	0.000	1.63189	2.798343
Variance						
e.Values	.8312927	.1121447			.638151	1.08289
e.SustainabilitySurvey	.8647668	.1018446			.6865181	1.089296
e.Economic	.4422123	.131187			.2472367	.7909497
e.Regulatory	.4894643	.1303418			.290436	.8248815
e.Institutional	.0367346	.1258012			.0000447	30.20628
Pressure	1	.			.	.

```
LR test of model vs. saturated: chi2(5)   =      6.75, Prob > chi2 = 0.2399
```

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Model 2:

```
Structural equation model                        Number of obs      =         39
Estimation method  = ml
Log likelihood      = -331.21003

 ( 1)  [Values]Pressure = 1
```

Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf. Interval]	
Structural						
Values <-						
Pressure	.3928072	.1336131	2.94	0.003	.1309303	.654684
_cons	-.7447818	.3936337	-1.89	0.058	-1.51629	.0267261
SustainabilitySurvey <-						
Values	.2441037	.1477336	1.65	0.098	-.0454489	.5336562
Employees	.3425763	.1400927	2.45	0.014	.0679996	.617153
_cons	4.823801	1.058387	4.56	0.000	2.7494	6.898203
Pressure <-						
Public	.7598533	.0910549	8.34	0.000	.5813889	.9383177
Employees	.295545	.1029284	2.87	0.004	.0938089	.497281
Measurement						
Economic <-						
Pressure	.8510938	.0436693	19.49	0.000	.7655036	.9366841
_cons	1.004503	.4206248	2.39	0.017	.1800931	1.828912
Regulatory <-						
Pressure	.5546379	.108512	5.11	0.000	.3419583	.7673175
_cons	1.263137	.5052307	2.50	0.012	.2729027	2.253371
Institutional <-						
Pressure	.859426	.0441979	19.44	0.000	.7727997	.9460523
_cons	.1317096	.4118206	0.32	0.749	-.6754439	.9388631
Variance						
e.Values	.8457025	.1049684			.6630812	1.07862
e.SustainabilitySurvey	.7690202	.1122816			.5776399	1.023807
e.Economic	.2756393	.0743334			.1624771	.4676166
e.Regulatory	.6923768	.1203697			.4924488	.973473
e.Institutional	.261387	.0759696			.1478735	.4620378
e.Pressure	.0238033	.0578566			.0002031	2.789812
Covariance						
e.Regulatory						
e.Institutional	.5282503	.1246092	4.24	0.000	.2840207	.77248

```
LR test of model vs. saturated: chi2(11)  =      12.10, Prob > chi2 = 0.3563
```

Model 3:

```
Structural equation model                    Number of obs     =        39
Estimation method  = ml
Log likelihood     = -330.73793
```

(1) [Values]Pressure = 1

		OIM				
Standardized	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Structural						
Values <-						
Pressure	.3915085	.1335559	2.93	0.003	.1297437	.6532733
_cons	-.7423307	.3930954	-1.89	0.059	-1.512784	.0281222
SustainabilitySurvey <-						
Values	.2711963	.1486997	1.82	0.068	-.0202497	.5626424
Pressure	-.2514835	.2596622	-0.97	0.333	-.760412	.257445
Employees	.5410139	.2387086	2.27	0.023	.0731537	1.008874
_cons	4.499836	1.101712	4.08	0.000	2.34052	6.659151
Pressure <-						
Public	.76198	.0899918	8.47	0.000	.5855994	.9383606
Employees	.2953222	.1025594	2.88	0.004	.0943095	.496335
Measurement						
Economic <-						
Pressure	.8500292	.0440177	19.31	0.000	.7637561	.9363024
_cons	1.00557	.419151	2.40	0.016	.1840493	1.827091
Regulatory <-						
Pressure	.5513197	.1077861	5.11	0.000	.3400629	.7625765
_cons	1.270199	.5041164	2.52	0.012	.2821495	2.258249
Institutional <-						
Pressure	.857312	.0436332	19.65	0.000	.7717925	.9428315
_cons	.1353083	.4099244	0.33	0.741	-.6681287	.9387454
Variance						
e.Values	.8467211	.1045766			.6646767	1.078625
e.SustainabilitySurvey	.7534303	.1124106			.5623997	1.009348
e.Economic	.2774503	.0748327			.163532	.4707254
e.Regulatory	.6960466	.1188492			.4980771	.9727024
e.Institutional	.2650162	.0748145			.1523971	.460859
e.Pressure	.020062	.056584			.0000797	5.048364
Covariance						
e.Regulatory						
e.Institutional	.5325897	.1215389	4.38	0.000	.2943778	.7708016

```
LR test of model vs. saturated: chi2(10)  =     11.15, Prob > chi2 = 0.3456
```

Model 4:

```
Structural equation model                    Number of obs      =         96
Estimation method  = ml
Log likelihood     =    -707.727

 ( 1)   [Values]Pressure = 1
```

Standardized	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Structural						
Values <-						
Pressure	.5160687	.0761786	6.77	0.000	.3667613	.6653761
_cons	-.8037493	.1841767	-4.36	0.000	-1.164729	-.4427695
SustainabilityDoc <-						
Values	.0237675	.0713943	0.33	0.739	-.1161628	.1636979
Employees	.7439251	.0470791	15.80	0.000	.6516517	.8361985
_cons	-1.313303	.1941635	-6.76	0.000	-1.693856	-.9327494
Pressure <-						
Public	.686493	.071573	9.59	0.000	.5462125	.8267735
Employees	.3096496	.0818718	3.78	0.000	.1491837	.4701155
Measurement						
Economic <-						
Pressure	.8926925	.0274664	32.50	0.000	.8388592	.9465257
_cons	.6881661	.2237934	3.08	0.002	.2495391	1.126793
Regulatory <-						
Pressure	.6423945	.0610251	10.53	0.000	.5227876	.7620014
_cons	.524191	.2345427	2.23	0.025	.0644956	.9838863
Institutional <-						
Pressure	.8435588	.0322427	26.16	0.000	.7803643	.9067534
_cons	.1242648	.2312711	0.54	0.591	-.3290183	.5775479
Variance						
e.Values	.7336731	.0786268			.594676	.9051589
e.SustainabilityDoc	.4314116	.0563368			.3339918	.5572471
e.Economic	.2031002	.0490382			.1265288	.3260104
e.Regulatory	.5873293	.0784043			.4521185	.7629764
e.Institutional	.2884085	.0543972			.199279	.4174021
e.Pressure	.1291946	.0420455			.0682695	.2444906
Covariance						
e.Regulatory						
e.Institutional	.4750073	.0895769	5.30	0.000	.2994399	.6505748

```
LR test of model vs. saturated: chi2(11)  =    71.51, Prob > chi2 = 0.0000
```