The Effect of Energy Policy on Cleantech Venture Capital and Private Equity Investment in Canada: Investors' Perceptions of Risk and Opportunity.

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1) Introduction

As the global temperature continues to rise above pre-industrial levels, cleantech must be deployed at an increased rate and scale (OECD, 2017). Cleantech, including technologies for renewable energy generation, advanced fuels, and energy: storage, software, and efficiency (Gaddy et al., 2016), often have higher initial costs than traditional energy sources. As such, energy policies may be used to lower the associated costs with cleantech innovation, adoption, and diffusion. This has led academics and policymakers to fervently examine which energy policies are the most effective for deploying cleantech and lowering carbon emissions. However, these policies can also impact cleantech venture capital (VC) and private equity (PE) investors' perceptions of risk and opportunity associated with cleantech. The perceptions of these early-stage investors must be understood; it is these investors who allow cleantech to survive the period between research and development and commercial competitiveness, otherwise known as 'the cleantech valley of death' (Weyant, 2011).

This study, focused in Canada, provides insight for policymakers on the preferred policy instruments of those funding cleantech. Of the international cleantech market, Canada's share has decreased 41% since 2005 (Elgie & Brownlee, 2017). As such, this research can be used to inform policymakers on the elements of a favourable policy climate for cleantech financiers, thereby potentially increasing success in the Canadian cleantech industry. This study uses a qualitative method, thus providing insight into the contextual factors that contribute to investors' perceptions of the industry's barriers and risks, which may inhibit VC/PE investment in cleantech.

This research was motivated by a 2009 study, in which VC/PE investors were surveyed on their preference for different energy policies (Bürer & Wüstenhagen, 2009). Feed-in tariffs (FIT) were deemed to be the preferred instrument by VC/PE investors. Since the publication of this article, there has been an increase in literature evaluating innovation policies' impact on VC investment in cleantech. However, much of this research has been focused in Europe. Additionally, there has not been an attempt to confirm Bürer's and

Wüstenhagen's results in a new geographic area, nor to understand the contextual factors that contribute to policy preference. Their survey was performed in 2007, before the financial crisis, and over a large geographic scope. As such, it is worthwhile to evaluate whether these preferences hold true using the elite interviews method with Canadian VC/PE investors in a post-financial crisis, post-Paris agreement climate.

The research questions guiding this study are:

(i) What barriers exist that may impede venture capital and private equity investment in cleantech in Canada?

(ii) Which programs and policies are preferred by Canadian venture capitalists and private equity investors for their effectiveness in incentivizing investment in cleantech?

The conclusions of this research add to the broader realm of energy policy, in which emphasis is often put on which policy is best, rather than why policies are successful. This research also speaks to existing studies on cleantech investment, where academics have called for a transition away from VC/PE (Gaddy et al., 2016). By bringing these two fields together, this study informs policymakers and academics that VC/PE investment in cleantech can be successful, given pragmatic policy design. Specifically, the key findings of this research indicate: that a qualitative method should be used in policy research for its ability to reveal why and when policies are beneficial; and, that the design of policies, and the creation of a policy ecosystem that enables investment, are more important to investors than the choice of policy itself.

2) Background

The relationship between energy policy and cleantech VC/PE investment is an understudied area of energy policy. There is a significant amount of research on the effectiveness of various energy policies, and the combinations of such policies. While this research is invaluable to policymakers, a research gap exists. With a few exceptions (Bürer & Wüstenhagen, 2009; Hofman & Huisman, 2012; Leete et al., 2013), there is a lack of literature on how VC/PE investors perceive energy policy, and how energy policy may be used to incentivize cleantech VC/PE investment. As Masini and Menichetti (2013) state, "…renewable energy policy literature has seldom incorporated the investors' perspective…it has generally focused on the economics of energy systems" (p.511). This research gap is exacerbated due to the lack of focus in Canada, a country more dependent on fossil fuels than most countries in the OECD (OECD, 2017). Given this understudied field, this study utilized a qualitative methodology to identify key themes in regard to the effect of energy policy and VC/PE investors in Canada. In order to inform the design of this study, and the elements to be addressed in the interviews, the following literature was reviewed: (i) Technology Push and Market Pull Policies; (ii) Relationship Between Energy Policy VC/PE investment in Cleantech; (iii) Contextual Considerations.

2.1) Technology Push and Market Pull Policies

Energy policies are often categorized into either: command and control regulation, or market based instruments (MBI). Command and control regulation imposes standards, whereas MBI "…establish an explicit price on the negative externality" (Carraro et al., 2010, p.165). Examples of MBI include cap-and-trade systems and carbon taxes. MBI have also been categorized into price and quantity based systems with, for instance, FIT being the former and renewable portfolio standards being the latter (Bürer & Wüstenhagen, 2009). Given these categories of polices, academics have aimed to determine which type of policy is best. While MBI have become commonplace, there is debate over price versus quantity systems (Carraro et al., 2010; Grubb et al., 2014; Polzin et al., 2015). Given the breadth of

subcategories, this research categorizes energy polices as Bürer & Wüstenhagen (2009) do: technology push and market pull policies.

Technology push and market pull policies follow the technology push and demand-pull theories (Dosi, 1982). Technology push policies aim to incentivize R&D, whereas market pull policies focus on increasing demand for these technologies (Schmookler, 1966; Newell et al., 1999). Technology push policies include: subsidies, R&D grants, and publicly owned equity (Olmos et al., 2012). Market pull policies include command and control regulation, such as building codes and pollution standards, and MBI, such as carbon taxes, cap-and-trade systems, and FIT (Jaffe et al., 2002; UNFCCC, 2017). This dichotomy of technology push and market pull policies has been useful for scholars examining the policies' effect on cleantech innovation (Grübler & Messner, 1998; Rennings, et al., 2000; Bürer & Wüstenhagen, 2009; Hofman & Huisman, 2012; Dou, 2017). There is a lack of consensus amongst researchers as to which of the policies is most effective at incentivizing innovation (Hoffert et al., 2002; Grubb et al, 1995, 2002; Dowlatabadi, 1998). Though, it has become widely accepted that both policy types encourage innovation (Brunnermeier & Cohen, 2003; Taylor et al., 2005; Peters et al., 2012), and that a combination of both policies is best for the inducement of innovation and cost-effectiveness (Mowery & Rosenberg, 1979; Popp, 2006; Carraro et al., 2010; Olmos et al., 2012; del Rio & Bleda, 2012).

This need for multiple policies can be dated back to the "Tinbergen rule," (Tingbergen, 1952) in which the number of policy instruments used matches the number of policy objectives (Carraro et al., 2010). This need for an energy policy network is confirmed by scholars who have examined the effectiveness of coupling these policies, such as R&D subsidies alongside a carbon tax (Fischer & Newell, 2008; Massetti & Nicita, 2010). Nevertheless, there remains an increasing level of research centred around which specific policy is best within the respective technology push and market pull policies. For example, Weyant (2011) and Howell (2017) both support the use of R&D grants for their ability get start-ups past the cleantech valley of death and encourage VC investment in cleantech, respectively. On the market pull side, FIT have been argued to be the best policy for its ability to encourage the deployment of cleantech (Bürer & Wüstenhagen, 2009; Hofman &

Huisman, 2012; Bolkesjø et al., 2014; Couture & Gagnon, 2010; de Jager et al., 2011; Lesser & Su, 2008; Jenner et al., 2013; Butler & Neuhoff, 2008; Mitchell et al., 2006; Polzin et al., 2015; Mormann, 2012).

In the growing body of literature within the energy policy realm, studies surrounding the best design of policies further cloud the discussion. Not only must prices and market size effects be considered when designing incentives (Carraro et al., 2010), scholars have determined that policies need to be both stringent (Frondel et al., 2007; Arimura et al., 2007; Horbach et al., 2012), and flexible (Haščič et al, 2009; Carraro et al., 2010). Stringency will promote investment in environmental R&D, whereas flexibility will allow companies to adopt the cleantech best suited to their situation. Though, policy certainty is the paramount element of policy design. A stable policy climate increases cleantech entrepreneurs and investors' confidence in potentially risky cleantech investments (Bosetti & Victor, 2011; Bürer & Wüstenhagen, 2009; Carraro et al., 2010; Held et al, 2006).

2.2) Relationship Between Energy Policy VC/PE investment in Cleantech

The aforementioned literature is mainly focused on closing the financing gap associated with cleantech innovation (Olmos et al., 2012). However, to bring cleantech start-ups out of the R&D and innovation stage, funding must be made available to bring start-ups past the 'cleantech valley of death,' so that they may be scaled to be commercially viable (Weyant, 2011; Murphy & Edwards, 2003). VC/PE investors invest in early-stage, innovative companies, and accelerate the rate of market commercialization for these startup companies (Florida & Smith, 1990; Kortum & Lerner, 2000; Gompers & Lerner, 2004). Consequently, VC/PE investors have an important role to play in ensuring cleantech success. This is especially pertinent, as private markets and investors can make up for limited financial capital in the public sector (Mathews et al, 2010). For instance, just since 2004, "…one fifth of investments in clean energy technology has come from venture capitalists" (Chassot et al., 2014, p.145). Accordingly, energy policies may be used to make cleantech investments attractive to investors (Held et al., 2006). However, this relationship between energy policy and VC/PE investment in cleantech is complex.

First, VC/PE investment in cleantech faces many challenges. Cleantech, particularly hardware technology, is associated with high capital costs, technology uncertainty, and long payback periods (Cárdenas-Rodríguez et al., 2014; Dinica, 2006; Haley & Schuler, 2011). This is often due to manufacturing costs and the controlling incumbents associated with traditional energy sources (Bocken, 2015). While these challenges can be overcome, they directly oppose the traditional VC model. Customarily, VC firms may invest $10 million in Series A and B rounds, and aim to exit within three to five years (Gaddy et al., 2016). Consequently, many VC firms have failed whilst investing in cleantech, as the timeframes associated with scaling were longer than expected, and the capital needed was higher than expected. Over $12 billion has been lost by VC firms by investing in cleantech, leading scholars to state, "We conclude that the VC model is broken for the cleantech sector…" (Gaddy et al., 2016, p.1), and VC investors to state, "cleantech is dead" (Bocken, 2015, p.653). Nevertheless, the majority of these studies do not acknowledge the role that supportive energy policies have in facilitating successful cleantech VC/PE investment.

Given the high capital costs associated with cleantech, both technology push and market pull policies are imperative in lowering the initial capital burden borne by VC/PE investors, and in promoting cleantech markets. As Bürer and Wüstenhagen (2009) state,

> …a particular feature of the energy sector compared to other investment areas is that it is characterized by a high importance of regulatory drivers. Therefore, energy and climate policies have a direct or indirect influence on the performance of venture capital and private equity investments in this area (p.4998).

As such, it is particularly important to understand investors' perceptions of these policies, so private finance may be used to aid the achievement of climate targets. However, the majority of studies on the relationship between policy and VC investment research how governments can aid VC funds through financial policies, such as investment regulations and second-tier stock markets (Baygan & Freudenberg, 2000, Jeng & Wells, 2000; Rigau, 2002; Dubocage & Rivaud-Danset, 2004; Bürer & Wüstenhagen, 2008). On a broader VC scale, scholars have noted the importance of public policy in creating an ecosystem for facilitating investment, including

emphasis on technology systems, entrepreneurship, and increased financial resources from public and private sector partnerships (Kuemmerle, 2001; Bürer & Wüstenhagen, 2008; Mazzucato, 2011; Bocken, 2015; Gaddy et al., 2016).

While some of these studies provide perspectives of cleantech investors, the body of research is lacking (Masini & Menichetti, 2013). Kasemir et al. (2000) found that subsidies and tax exemptions are perceived to be effective by six VC investors in the EU. Bürer and Wüstenhagen (2009) asked VC/PE investors in the EU and US to rank technology push and market pull policies on a scale to 1-5, and found FIT to be the preferred policy, whilst government VC funds were deemed to be the least preferred, potentially due to investors viewing the funds as competition. Leete et al. (2013) interviewed investors on the role policy can play in incentivizing marine renewable energy investment, and found that investors favored a stable policy design, over a certain type of policy. This desire for certainty in policy amongst VC/PE cleantech investors is directly related to regulatory risk associated with the industry.

The counterintuitive adverse relationship between energy policy and VC/PE cleantech investment is a result of regulatory risk. Due to regulatory instability, investors are unable to accurately account for the effect of energy policies in their projected return models. As such, they are unlikely to make investments in cleantech that depend on regulation, thus inhibiting energy policies' facilitation of cleantech investment (Polzin et al., 2015). Regulatory risk was confirmed in a study "…based on choice experiments with 29 venture capital investors from Europe and the United States conducting 1064 investment decisions… [where] high levels of regulatory risk [are shown to] have a negative effect on the likelihood to invest in renewable energy" (Chassot et al., 2014, p.143). The interviews with investors by Leete et al. (2013) and Bürer and Wüstenhagen (2008) also shed light on the impact policy instability has on investors. In both studies, investors note that "…the current level of risk and uncertainty are discouraging them from investing…" (Leete et al., 2013). Given this significant and uncertain effect that energy policy can have on cleantech VC/PE investment, there is a need to recognize investors' perspectives.

2.3) Contextual Considerations

Thus far, there have been no known attempts to confirm Bürer and Wüstenhagen's findings in a post-financial crisis, post-Paris Accord, Canadian context, through the use of elite interviews. While a policy brief (Elgie & Brownlee, 2017) outlines opportunities and risks existing in the Canadian cleantech industry, including the role of energy policy, this research is without the methodological rigour expected in academic research, nor is it focused on VC/PE investment. Accordingly, the following contextual changes from Bürer and Wüstenhagen's study, which may impact investment decisions, were researched to inform the design of the interview questions: (i) financial crisis, (ii) Paris Agreement, (iii) Canada.

(i) Financial Crisis

First, the study in which this research is based took place in 2007, prior to the 2008 financial crisis (Bürer & Wüstenhagen, 2009). As such, it is worthwhile to evaluate whether the financial crisis contributed to changes in investors' perceptions of policy, or to their investment strategy. As VC funds are reliant on the investments of their limited partnerships (LPs), and exit their investments through initial public offerings (IPOs), the likelihood of successful exits is "…sensitive to the overall investment climate in the financial sector" (Chassot et al., 2014, p.144). Following the crisis, there was a 20% decrease in funds raised for VC firms' average funding rounds (Block & Sandner, 2009, p.295). This decrease in available capital was not limited to the private sector: the financial crisis "…forced several European governments using feed-in tariffs to cut their developments. Such developments are likely to influence investor preferences regarding renewable energy and climate policies" (Hofman & Huisman, 2012, p.114). To determine whether investors' policy preferences had changed as a result of the crisis, Hofman and Huisman repeated Bürer and Wüstenhagen's 2009 study with the same investors in the EU and US. Their study found that, despite cases of FIT repeal, FIT remained the favoured policy amongst investors (Hofman & Husiman, 2012). Additionally, investors' strategies may have changed since the financial crisis, as there has been an increased recognition of the need to transition to long-term investments, and away from "quarterly capitalism" (Barton & Wiseman,

2014). Though, Barton and Wiseman (2014) state: "…the shadow of short-termism is continuing to advance – and the situation may be getting worse" (p.1).

(ii) Paris Agreement

The second major contextual change since Bürer and Wüstenhagen's is the increase in climate change awareness, advocacy, and treaties. One particularly monumental treaty is the Paris Agreement implemented at COP-21 in 2015 (Viñuales, 2015). As a result of the Paris Agreement, countries indicated nationally determined contributions to climate change mitigation. Thus, cleantech innovation, investment, and diffusion were promoted on an international scale. This recognition was not limited to the public sector. Following the 2015 Paris Agreement, a group of investors led by Bill Gates pledged to fund early-stage cleantech companies (Gaddy et al., 2016). Schnellhuber et al. (2016) refer to this investment trend "…transpiring from Paris… as the bursting of the 'carbon bubble'" (p.649). Due to governments' signalled commitment to renewable energies, it appears that international treaties, such as the Paris Agreement, may incentivize investors to invest in cleantech (UNFCCC, 2017).

(iii) Canada

Canada, the location of this study, "…is the fourth largest emitter of greenhouse gases in the OECD and emissions show no sign of falling yet. Fossil fuels remain the dominant energy source" (OECD, 2017, p.15). This statistic speaks volumes, as OECD countries have accounted for approximately 50% of global carbon emissions (Müller et al., 2011; Polzin et al., 2015). To lower emissions, it is essential for Canada to become a leader in progressive energy policy, and cleantech innovation and deployment. Canada has been considered successful in its facilitation of cleantech innovation, with R&D programs like the Sustainable Development Technology Fund (SDTC). SDTC provides funding for development, demonstration, and collaboration with potential partners (OECD, 2008). Additionally, Canada's investment policy system is noteworthy: 50% of VC investments come from government-sponsored VC funds, whereas 5% of VC investments in the US are government-sponsored (Brander et al., 2010). However, Canada's "…performance drops increasingly as potential clean innovation moves towards

commercialization" (Elgie & Brownlee, 2017, p.1). This phenomenon indicates a need for market-pull policies to be improved in Canada. While the Canadian government implemented the Pan-Canadian Framework on Clean Growth and Climate Change, which requires provincial governments to develop carbon pricing policies (OECD, 2017; Elgie & Brownlee, 2017), governance remains fragmented between provinces. Given this geographic area of relevance, an evaluation of energy policies' effectiveness in incentivizing VC/PE investment in cleantech is essential. After all, context plays a critical role in the success of policy instruments (Perez, 2012). Policies must "…leverage all the drivers of the investment decision process and …[must] fit the broader socio-economic context in which they are deployed" (Masini & Menichetti, 2013, p.511).

3) Methods

3.1) Qualitative Method

This study was conducted using a qualitative research method, an underrepresented method in policy analysis (Edin & Pirog, 2014). Qualitative methods are often inductive, with a focus on identifying common themes for the development of new theories and areas for research (Merriam, 2015). Unlike quantitative methods, qualitative methods do not aim to test a hypothesis. Rather, qualitative methods aim to address "why?" a phenomenon exists, and for contextual variables to be considered. As this study aims to evaluate the relationship between energy policy and early stage investment in cleantech, the focus of the research is to examine why certain policies may be preferred for an investment climate. This allows for key themes to be identified across interviews to inform policymaking in a variety of contexts, as the underlying reasons for policy preferences may be revealed.

This research is interpretive; as such, various approaches may be used for data collection and analysis (Krefting, 1991). The most common methods for data collection are focus groups and interviews (Gill et al., 2008). As this research is guided by past findings, with the aim of elaborating on the existing understanding of investor preferences, a semi-structured interview approach is utilized. This approach consists "…of several key questions that help to define the areas to be explored, but…the interviewer or interviewee [may]…diverge in order to pursue an area in more detail…" (Gill et al., 2008, p.291). As this research is based on Bürer and Wüstenhagen's study (2009), which quantitatively measured investors' preferences for certain energy policies, this study's semi-structured approach allows for probing to understand if and why these policies are preferred.

3.2) Elite Interviews

In order to go into further detail with interviewees, a specific type of semi-structured interview is used: elite interviews. While there is a lack of consensus in the literature as to what constitutes an "elite" (Zuckerman, 1972; McDowell, 1998; Smith, 2006; Stephens, 2007), this

study follows Harvey's definition of elites: "…those who occupy senior management and Board level positions within organizations…these people have significant decision-making influence within and outside the firm and therefore present a unique challenge to interview" (2011, p.5). Due to this difficulty in attaining an interview, the data collected allows for an inimitable perspective to be understood. In addition to rich data resulting from the exclusive sample of participants, this method permits for reference to be made to interviewees' past experience for a deeper understanding of responses. Elite interviews allow researchers to collect:

> …information from a sample of officials in order to make generalizable claims about all such officials' characteristics or decisions… [and inform] work that uses other sources of data…elite interviews can and should also be used to provide much needed context…for journal articles (Goldstein, 2002, p.669).

To provide this context for policymakers, this study collected data through interviews with cleantech VC/PE investors in Canada. Specifically, each participant is a managing partner at his/her respective firm. This approach allows for flexibility so that technological, political, societal, and economic factors may be accounted for in the relationship between energy policy and cleantech VC/PE investment.

3.3) Data Collection

In order to collect the data for this research, elite interviews were conducted over the telephone with managing partners at Canadian VC/PE firms with cleantech companies in their portfolio. To ensure comparability with Bürer & Wüstenhagen's 2009 study, only one partner was interviewed from each firm. The sample was identified through the Canadian Venture Capital and Private Equity Association (CVCA). The CVCA website provides a membership directory of VC/PE firms in Canada, and their portfolio interests. This directory was used to filter firms with a cleantech industry preference. This process resulted in thirty-one potential firms that could participate in the study.

As stated, data collection in elite interviews can pose a challenge to researchers as there is difficulty associated with securing an interview with elite participants. This was especially apparent "…as private equity and venture capital investors are a time-constrained population that is notoriously difficult to access…" (Bürer & Wüstenhagen, 2009, p.5000). With a small pool of thirty-one participants to sample from, this challenge was amplified. Accordingly, interview requests were sent out to managing partners in February 2018, three months prior to the expected time of interviews. This ensured time for scheduling conflicts, follow-up emails, and phone calls. However, after emailing firms, it was revealed that many of these firms no longer invest in cleantech. Therefore, the sample pool of participants was reduced to under twenty-five. Due to this small sample pool, snowball sampling was utilized alongside follow-up emails. Snowball sampling is when "…interviewees offer to help set up or gain access to other people and organizations" (Goldstein, 2002, p.671). Thirteen interviews were conducted, thereby confirming fifty percent of the population is represented. It should be noted that one investor, a CEO and founder of one of the VC firms, is located in the United States, though the firm has a focus in Canadian cleantech investments. Another interviewee is a cleantech sector manager for an incubator in Canada. While the participant does not invest capital, the interviewee screens companies as a VC/PE investor would, and connects startups to investors. As such, the participant answered the same questions as the other twelve participants.

Prior to the interview, interviewees were asked permission for the interview to be recorded. To ensure that the recorded nature of the interview did not act as a barrier to truthful answers, the interviews started "…with innocuous questions about the person's background…" (Aberbach & Rockman, 2002, p.675) to promote comfort. Additionally, to encourage honest answers, "…questions focused on general views and not information that might jeopardize the respondents' personal interests" (Aberbach & Rockman, 2002, p.675). The average interview length is 45 minutes, totaling nearly ten hours of audio. Following the interviews, this audio was transcribed verbatim to allow for rigorous data analysis.

3.4) Data Analysis

This study evaluated the interview data using the grounded theory strategy. The two primary aspects of grounded theory are: "(1) simultaneous involvement in data collection and analysis phases of research; [and] (2) creation of analytic codes and categories developed from data, not from preconceived hypotheses" (Charmaz, 1995, p.28). This inductive approach allows researchers to make sense of qualitative data, and to identify common themes across interviews. All of the interviewees responses are examined for "significant patterns of consistency and variation in them" (Talja, 1999, p.466). To identify these themes and patterns, the transcriptions were first reviewed at a macro-level, followed by coding and re-coding. The first stage of the coding process consisted of "…organizing large quantities of text into much fewer content categories" (Hsieh & Shannon, 2005, p.1285), followed by the identification of relationships between categories. This can also be considered to be themes and subthemes, respectively.

Due to the large quantity of data, NVivo software was used to code the data. This software allows material to be stored in a single location, and has "…the ability to handle large amounts of data with consistent coding schemes" (Bergin, 2011, p.6). Unlike manual coding, NVivo allows for data to be sorted into a hierarchical structure. The categories, referred to as nodes, "…move from a general category at the top – the parent node – to more specific categories or child nodes" (Bergin, 2011, p.8). For example, a parent node in this study was "Barrier," followed by multiple child nodes, such as "Financial Risk," and "Regulatory Risk." These child nodes could also have even more micro-level child nodes. For instance, under the financial risk node, the child nodes included "High Capital Costs," and "Long Timelines." This software allowed the relationship between categories to be visualized, the coded transcriptions to be viewed in aggregation under each theme, and allowed for the numerical quantity of references within nodes to be identified.

3.5) Ethical Considerations

As this study required interaction with executives, and some opinions revealed were classified, steps were taken prior to the interviews to ensure research was performed in an ethical manner. First, a Research Ethics proposal was approved by the University of Cambridge and thereby adhered to the guidelines established by the ethics committee. Next, all participants

gave oral consent for the interview to be recorded and transcribed prior to participating in the interview. Each participant's identity has remained secure and anonymous in the study through the assignment of a pseudonym. Lastly, transparency was upheld throughout the study: each participant was offered a copy of his/her interview's transcription for fact checking and statement withdrawal.

3.6) Limitations

The thorough data collection and analysis processes, alongside the sample's large representation of the population, validates that this study is without significant limitations. Additionally, the credibility of data is impacted by the researcher's experience in conducting interviews and performing qualitative research (Gustafsson et al., 2008). The researcher has experience in qualitative research and semi-structured interviews, thus reducing the potential for researcher bias and subjectivity.

Nonetheless, a notable limitation associated with elite interviews is that of the difficulty associated with gaining access to elite participants. This results in time-consuming follow-up emails, calls, and snowball sampling. As such, should further research be conducted in this field, timing constraints may be restrictive. Additionally, university affiliation has a significant impact on the may impact response rate for this method. As Harvey (2010) states,

> I found that being a researcher from the University of Cambridge … enabled me to gain access to elite members...Researchers should be aware that their institutional affiliations will be received differently which in turn will affect their experiences of gaining access to this group" (p.199).

This study underwent a similar experience, as the response rate increased when the initial and follow up email subjects included "University of Cambridge." This may limit the study's repeatability, and the nature of participant pools future research. Finally, the interview's open-ended nature can heighten the degree to which "elite members… [may] try to dictate the conditions of an interview" (Harvey, 2010, p.200). For example, if an interviewee's response

deviates from the initial topic, and the interview is limited in time, the interviewer must strategically keep rapport high, whilst directing the conversation back to the relevant question. Nonetheless, an interviewer may prepare for such events with pilot surveys, as in the case of this research.

4) Results

The results of the study will be reported in two sections. Section 4.1) addresses the first research question: What barriers exist that may impede venture capital and private equity investment in Canada? Section 4.2) addresses the second research question: Which programs and policies are preferred by Canadian venture capitalists and private equity investors for their effectiveness for incentivizing investment in cleantech?

4.1) Barriers to VC/PE Investment in Cleantech

4.1a) Risk Aversion

The first of the four main themes that were identified by the investors as barriers to VC/PE investment in cleantech in Canada is that of risk aversion. Risk aversion was found to be a result of the (i) Canadian culture, (ii) the prominent oil and gas industry, and (iii) regulatory risk.

(i) Canadian Outlook

Risk aversion within the Canadian culture was one barrier to cleantech investment identified by investors. One investor stated, "I think Canadians are less entrepreneurial than some… culturally we are just a bit more risk averse…we don't have as many role models here of successful exits" (Investor #1, Personal Communication, 2018). This was echoed by another investor, who stated that Canadians have been observed to be "…reluctant to embrace any kind of entrepreneurial risk" (Investor #5, Personal Communication, 2018). A lack of successful exits may promote this risk aversion, thereby further inhibiting cleantech investment (Investor #3, Personal Communication, 2018). While it is unlikely that a culture of risk aversion is a barrier to cleantech specifically, it may act as a factor for why the VC/PE investment climate is scarce in Canada, as detailed in Section 4.2d.

(ii) Oil and Gas Industry

The powerful presence of the oil and gas industry in Canada, and the industry's obvious competition with cleantech, emerged as another theme amongst investors. Pipeline development was referred to as a reason for investors' confidence in cleantech investments to waiver. For instance, Investor 12 stated,

> [There is] confusion around signalling from the federal government…[specifically,] continued investment in the Kinder Morgan pipeline. If [Canada is] genuinely committed to decarbonizing the economy, why [make] additional investments in oil infrastructure? [It] creates a climate of uncertainty …around what our infrastructure plan is going to look like… [Why make] large capital investments in energy infrastructure that potentially may not pay off? (Personal Communication, 2018)

Due to this conflict of interests, investors ready to fund cleantech startups may become more risk-averse, and unlikely to invest in renewables, as there is an unclear commitment to the sector by the government.

(iii) Regulation

As with risk-aversion resulting from pipeline development, energy policy can be regarded as a risk to investors. Uncertainty in the repeal of regulations was cited by the vast majority of investors. This uncertainty was given as the main reason for investors to avoid start-ups that incorporate government incentives in their revenue projections. The following statements portray risk aversion resulting from regulation: "Ontario is a great example of absolute chaos in terms of policy…companies have seen what happened with the repeal of FIT and MicroFIT, and they are…gun-shy" (Investor #12, Personal Communication, 2018); "The [Ontario] government killed the program just at the time it was actually working…they bungled the file" (Investor #3, Personal Communication, 2018); "Companies [are] being jerked around and [cannot]…build solid plans going forward, and investors [are] becoming more gun-shy because of that" (Investor #7, Personal Communication, 2018); and "We can't depend on the assistance of FIT…they can go away in a heartbeat with a change of government" (Investor #13, Personal Communication,

2018). As a result of this history of uncertainty, the energy policies that are in place to spur innovation, and investment in innovation, do the opposite. Instead, investors are hesitant to consider investing companies reliant on such policies.

4.1b) Push to Software

Another theme identified by investors is that of VC/PE investors being partial to software technologies. While this is not necessarily a barrier to cleantech investment, this transition does inhibit the likelihood of hardware technologies attracting early stage investment. Each of the thirteen investors recognized this transition to software, stating that software technologies allow for investors to benefit from lower capital costs, faster development times, scalability, recurring revenue, and higher gross margins (Investor #1; Investor #7; Investor #2; Investor #6; Investor #2, Personal Communication, 2018). Investor #4 explained that software is more appealing for its repeatable model (Personal Communication, 2018). Investor #12 expanded on this outlook, citing the financial crisis as a contributing factor: "[Investors are] more reticent to invest in hardware. Everybody wants more flexibility, from a liquidity perspective" (Personal Communication, 2018). Nearly all investors noted this lack of liquidity flexibility in hardware technologies, due to the (i) high capital costs and (ii) long timeframes associated with hardware technologies.

(i) High Capital Costs

First, the most common risk that investors identified as inhibiting VC/PE investment in cleantech, especially hardware cleantech, is that of high capital costs. The costs associated with manufacturing plants were stated to be too high for the VC/PE model, and that the financial risk associated with scaling hardware products can be immense. For example, Investor #8 stated, "We had an investment…for energy storage…and they failed. We lost two million… We were an early investor and they carried on… they weren't able to raise the money necessary to go all the way (Personal Communication, 2018). Due to high capital costs, hardware technologies pose a greater financial risk to investors. This view was repeated by investors with both hardware and software investments: "In the past, we have done deals in wind turbines…but we are shying

[away]…we don't have the cash it takes" (Investor #1, Personal Communication, 2018); "If you're going to build a 500-million-dollar waste to energy plant, most of that is concrete, land acquisition, piping, and boilers. There is no margin on that" (Investor #3, Personal Communication, 2018); "A plant that requires a 50 or 100-million-dollar investment, we would not go near that" (Investor #11, Personal Communication, 2018). While this risk is inherent to the requirements of the hardware technologies, it does pose a question as to what role VC/PE can play in financing such companies.

(ii) Timeframes

Alongside the high capital costs associated with cleantech, the long timeframes required for technology development were recognized as a barrier for VC/PE investment. Cleantech companies have much longer times to realization than traditional VC/PE industries. In regard to hardware, investors stated, "…it takes time to develop the technology and [to] develop the market… biofuels will take a couple years to even build a plant" (Investor #10, Personal Communication, 2018); and, "…transportation, infrastructure sectors, and energy, are more difficult to disrupt because there is a large install base, [with] long-term contracts in place" (Investor #3, Personal Communication, 2018). While this extensive amount of time may be seen as a hindrance to an investor of any type, it is especially a barrier to VC/PE investors. As Investor # 5 stated, "In venture capital, more than anything else, time is money" (Personal Communication, 2018). This perspective is common in the VC/PE space, which leads VC/PE investors to the industry with unrealistic expectations for the time it will take to exit. Investor #7 acknowledged this phenomenon: "…timeframes and capital intensity are significantly higher than the traditional tech space. That led to poor returns… [and led to] people dropping out of the space" (Personal Communication, 2018). As such, investors have shifted towards software technologies, which are more closely aligned to the traditional VC/PE model.

4.1c) Scaling

The third frequently identified major barrier to cleantech VC/PE investment in Canada is difficulty in scaling companies. Canada's relatively small population was recognized by nearly

every investor as an impediment to cleantech companies. The small, domestic market limits the companies' ability to scale to a profitable level (Investor #10; Investor #1, Personal Communication, 2018). As a result, investors stated that the size of the market does not allow technologies to reach a commercial level. For example, Investor #12 stated, "[Canada is] very good at funding research and development, we're very bad at commercializing technologies… because we're a small, domestic market" (Personal Communication, 2018). As a result of this inability to scale and commercialize technologies in Canada, an emphasis is put on technologies that can be sold in global markets (Investor #11, Personal Communication, 2018).

4.1d) Access to Capital

The final major barrier to Canadian cleantech VC/PE investment is the limited access to capital in Canada (Investor #1, Personal Communication, 2018). For instance, investors stated, "I think the biggest challenge in Canada is just the lack of capital. It is hard to find co-investment partners in Canadian deals…companies are getting drawn into the U.S ecosystem" (Investor #11, Personal Communication, 2018); "It is very hard to raise money here. Most of our companies do have to go to the US to raise money…[they] take their money and grow abroad" (Investor #12, Personal Communication, 2018); "The biggest risk is co-investors. I have nobody to co-invest with in Canada" (Investor #13, Personal Communication, 2018). This phenomenon not only promotes the transition to software technologies, which have lower initial costs, it also increases the likelihood for companies to move to larger markets abroad. While Canadian companies benefit greatly from Canada's healthy R&D financing climate, this financing is uneconomical if Canadian companies move their operations elsewhere to commercialize.

4.2) Policy Preferences

4.2a) Policy Detachment

The first theme regarding investors' preferred energy policies is rather counterintuitive. Nearly every investor made a point of detaching their business decisions from policy. This policy detachment was reasoned to be a result of (i) regulatory risk, and (ii) a lack of preference.

(i) Regulatory Risk

Due to regulatory risk, many investors were hesitant to give credence to energy policies' ability to incentivize cleantech investment. In fact, most investors went so far as to say businesses dependent on energy policies are a deterrent. Investor #9 stated, "[We] look at our portfolio without the impact of any subsidy…Carbon tax is not even on our radar screen… [If a company] depends on government…that's not the business we want to be in" (Personal Communication, 2018). Another reason for investors' detachment from policy is the localized nature of energy policies. Investor #7 detailed, "There are very few local high growth businesses… Therefore, more local policies are somewhat less important than the…global [market]" (Personal Communication, 2018). This view on scalability to the global market was consistent amongst the investors.

(ii) Lack of Preference

Perhaps the most uniform opinion is that the investors had a lack a preference as to which energy policies are implemented. The following statements exhibit this perspective: "…companies can live with different types of policy" (Investor #1, Personal Communication, 2018); "…the specifics of the system are less important than getting on with it" (Investor #7, Personal Communication, 2018); "I don't care about the type of policy, I just want to make sure it is well-designed" (Investor #10, Personal Communication, 2018); "[Different policies] can work…but, as a venture capitalist, I don't really care" (Investor #11, Personal Communication, 2018); and, "…just tell me what [the policy] is, and let me build by business around that. Then do not change it." (Investor #13, Personal Communication, 2018). Unlike studies that have quantified VC/PE investors' preferences for certain energy policies with Likert ratings, this study's results imply that these past ratings may have been ambivalent.

4.2b) Policy Design

Whilst the second research question is concerned with *which* policy is preferred by investors for incentivizing cleantech VC/PE investment, *how* a policy is designed was found to be a larger concern for investors. Six key design elements were identified by investors: (i) certainty and transparency; (ii) flexibility, (iii) consistency, (iv) simplicity, (v) stringency and generosity, and (vi) stakeholder involvement.

(i) Certainty and Transparency

First and foremost, investors stated that energy policies need to be both certain and transparent so that startups, and their investors, may incorporate such policies into their business plans. Policies need to have a long-term perspective, hold true when political parties change, and have clear objectives. The "… private sector is hesitant to actually do too many things without having any clear insight into what's actually going to happen" (Investor #2, Personal Communication, 2018). As a result of these conditions, various policies were stated as being preferred compared to others. Investor #12 stated that a carbon tax is preferred because "…it operates in a very predictable way" (Personal Communication, 2018). Whereas Investor #13 stated that a command and control style of policy is preferred: "Building codes are more predictable… [with] a longer term, sustained impact." (Personal Communication, 2018). For the same reason, Investor #7 stated that a FIT regime is "…by far the superior policy measure. It is extremely transparent…you know what your revenue stream is going to be over a twenty-year period" (Personal Communication, 2018). Therefore, despite the discrepancies between the preferred energy policies, the reasoning for the preferred policies uniformly indicates that policymakers need to ensure policies will be immutable over the long-term.

(ii) Flexibility

Investors emphasized the importance of flexibility in policy design. Specifically, flexibility in how a policy changes over time, as well as the qualification standards for a policy. In regard to the former, Investor #7 discussed FIT and cap and trade policies as preferential for their flexibility in incorporating price changes. A FIT regime allows for "…an ever-increasing tariff on…emissions, and an ever-decreasing incentive on making it happen. That would be the

fundamentals of good policy…Trading systems…[have] some market mechanisms…[and] allow the market to find a price" (Investor #7, Personal Communication, 2018). Investor #8 also preferred cap and trade "…because it gives flexibility for how you implement it" (Personal Communication, 2018). Investors desire policies with a transparent objective and design, and with flexibility to react to changes in the market.

Investors also prefer policies that are flexible in terms of qualification requirements. Investor #1 stated, "Flexibility obviously helps…[otherwise] there are fewer… companies that fit into it" (Personal Communication, 2018). Similarly, Investor #8 stated, "…when the government brings something out, it gets so stringent that no one really fits into the box…flexibility should be a part of it" (Personal Communication, 2018). Investors made it clear that policies reflect changes in the market, with inclusive qualification standards.

(iii) Consistency

Energy policies in Canada are fragmented between provincial jurisdictions. While the federal government has directed provincial governments to implement carbon pricing schemes, provincial governments design schemes on a local level. Investors stated that this fragmentation hinders companies' ability to scale within Canada (Investor #6, Investor #9, Personal Communication, 2018). Policies designed to be consistent across provinces promote: collaboration between companies and investors across the country, an increased ability to scale within Canada, and a predictable revenue stream (Investor #10, Personal Communication, 2018). An emphasis on consistent policy design was indicated by all investors. The following statements indicate this frequency: "…for a bigger market, consistent schemes are helpful" (Investor #1, Personal Communication, 2018); "Do things nationally" (Investor #3, Personal Communication, 2018); "…standardization at a national level would be much more helpful in terms of…a carbon pricing perspective" (Investor #6, Personal Communication, 2018); "…[it is] beneficial to have a single type of policy…consistency is a good planning tool for business" (Investor #7, Personal Communication, 2018); "…one national policy would have been better…[and] more productive…" (Investor #8, Personal Communication, 2018); and, "…we are only 30 million people...[from an] investment perspective, it certainly would be a whole lot

easier if things were more unified (Investor #13, Personal Communication, 2018). While it is unlikely that a national policy can be implemented in the near future, this call for consistency may act as a catalyst for provincial policymakers to collaborate across jurisdictions.

(iv) Simplicity

Another element of policy design highlighted by investors was simplicity: policies need to be clear in their requirements and functions, low-cost, and timely. In regard to policies' clarity, investors with a preference for carbon tax over cap and trade acknowledged the tax regime's simplicity as the driving cause for this inclination (Investor #1, Investor #2, Personal Communication, 2018). Investor #12 stated, "…people prefer a carbon tax, it is simpler. It is much easier for people…to factor into their investment calculations." (Personal Communication, 2018). However, an investor who disliked the tax regime stated this opinion to result from the tax's lack of simplicity: "The challenge with the carbon tax is knowing how it works" (Investor #9, Personal Communication, 2018). As with the discrepancy in policy preferences in part (i), the elements in the design of the policy appear to be where the true preference is located, rather than the choice of policy itself.

In addition to the clarity of policies, investors indicated that policies need to be low-cost and timely. Investors stated that transaction costs can be high, which deters companies and investors from taking part in programs. For example, Investor #9 detailed, "…the paperwork to qualify for SR&ED credits is significant, costly, and time consuming... Leakage to specialty advisors… can be as much as thirty percent" (Personal Communication, 2018). Investor #3 preferred FIT for the same reason: "Standardize the contracts…[and] reduce the friction costs… [FIT is] simplifying things…there is one contract that everybody knows about" (Personal Communication, 2018). Accordingly, policies that are timely and clear ensure increased involvement and lowered transaction-costs. As Investor #1 stated, "…make these systems as easy and simple for the company, and cut through the red tape" (Personal Communication, 2018).

(v) Stringency and Generosity

Investors detailed that the monetary level of policy can alter the policy's effectiveness, both in regard to stringency and generosity. This opinion held true for market pull and technology push policies, with the former needing more stringency and the latter needing more generosity. First, investors claimed that the current levels of carbon taxes in Canada are too low to incentivize innovation and investment. Investor #1 stated, "Carbon taxes tend to be very, very low, so it doesn't really move the needle that much" (Personal Communication, 2018). Investor #8 reiterated this, "The carbon tax definitely gives the signal to explore new technologies…[but] it needs to be a lot higher than it is now" (Personal Communication, 2018). Both investors argued that carbon taxes can be an effective tool in incentivizing the transition to cleantech, but the low level of the tax hinders the policy's effectiveness. In this regard, market pull technologies need to be more stringent to incentivize cleantech investment.

In terms of generosity, investors indicated that technology push policies would benefit from increased levels of funding. Investor #4 stated that R&D funds should be redesigned to give higher levels of grants to fewer companies: "Instead of 100 million dollar funds, you need 500 million dollar funds…Put more money into fewer opportunities" (Personal Communication, 2018). This opinion was similar to that of Investor #1, who stated, "[There is] too little money going into too many different start-ups" (Personal Communication, 2018). The monetary level associated with a policy will impact its effectiveness: investors prefer increased stringency in the design of market pull policies, and increased generosity in the design of technology push policies.

(vi) Stakeholder Involvement

The final element of policy design that was consistent amongst investors is stakeholder involvement. Many investors discussed that, despite cleantech innovation and adoption being the goal of many energy policies, and VC/PE providing finance to achieve that goal, VC/PE investors are not looked to by policymakers. Investor #5 stated, "It's been amazingly hard for me to get a meeting with someone in the Canadian government" (Personal Communication, 2018). Investor #3 said, "I think policymakers should be talking to more people like ourselves when

they're designing these [policies], put their foot in the real world, as opposed to the academic and theoretical world" (Personal Communication, 2018). Investor #1 confirmed this outlook, and said policies should incorporate: "discussion with industry…we have a pretty broad view of what policies do, and how they affect different stakeholders" (Personal Communication, 2018). Stakeholder involvement may prevent regulatory risk, lower the prevalence of investors' policy detachment, and increase the likelihood of energy policies incentivizing investment.

4.2c) Government Involvement

The third policy preference consistent amongst investors is government involvement. Specifically, investors argued that policies that ensure increased levels of (i) government procurement and (ii) public finance are ideal for cleantech VC/PE investment.

(i) Procurement

As detailed in Section 4.2, the small Canadian market is a risk to cleantech startups. Accordingly, in order to scale companies, investors indicated that government procurement of cleantech is needed. The following statements exemplify this perspective: "What the companies need is…a government that requires the buying of technologies" (Investor #4, Personal Communication, 2018); "[We are looking for] more early adoption and procurement…have government departments as the first customer for these technologies" (Investor #8, Personal Communication, 2018); "…the big opportunity is procurement into government real estate" (Investor #9, Personal Communication, 2018); "Procurement would obviously be the simplest thing…I've just never seen it happen" (Investor #11, Personal Communication, 2018); and, "Procurement is an excellent tool to help Canadian companies. It's hard to go international and have somebody say 'Well, why isn't your own government buying your product?'" (Investor #13, Personal Communication, 2018). Government procurement would help investors' companies get reach commercialization and thereby promote the Canadian cleantech VC/PE ecosystem.

(ii) Public Finance

Public finance was identified as an effective means for incentivizing cleantech VC/PE investment. Investors indicated that the current design of public finance funds for cleantech is too similar to traditional VC/PE investors. Rather than cover the areas with financing gaps, such as early-stage, large-scale hardware technologies, public funds compete with VC/PE investors. For example, Investor #9 stated, "…government capital should be focusing where private capital has a challenge. That tends to be in longer term, big capital type projects…Focus on areas where private capital and venture capitalists typically won't invest, as opposed to competing with us in areas where we do invest" (Personal Communication, 2018). Investor #12 confirmed this occurrence: "If you look at [funds] like BDC, EDC, and other government affiliated financing groups…they operate with the same risk return profile as a traditional investor… Leave the VCs to do the kind of deals that make sense [for them] …don't compete with them" (Personal Communication, 2018). Rather than have public finance organizations operate with the same strategy as other VC/PE investors in Canada, the investors argued that the public sector should finance the projects that are higher risk, early stage, and capital intensive.

Additionally, investors welcomed public finance in other forms. For example, Investor #6 stated, [Government can] co-invest…into deals that have been determined by the private market to be viable" (Personal Communication, 2018). Similarly, Investor #3 said that government could match capital of investors (Personal Communication, 2018). Meanwhile, Investor #5 recommended, "…the best way to help cleantech companies, at the least risk to the government, would be to establish a loan guarantee program" (Personal Communication, 2018). As such, public finance was recognized by investors as a preferred form of policy in various forms: early-stage investments, co-investments, and loan guarantee programs.

4.2d) Ecosystem

Finally, rather than focus on a specific energy policy, investors argued that policymakers should ensure that the general Canadian policy climate is conducive to cleantech investment. Specifically, (i) immigration policies, (ii) investment requirements, (iii) capital flow, and a (iv)

technology push and market pull balance are viewed as more effective at creating an investment ecosystem than specific energy policies.

(i) Immigration Policy

First, immigration policy was brought forth by investors as a regulatory. Many of the investors' start-ups have had issues bringing in the right talent from abroad, due to immigration restrictions. For example: "Bringing in employees is always an issue…it's not easy to bring people in" (Investor #7, Personal Communication, 2018); "There are barriers to immigration…the field hasn't been cleared to allow it to happen" (Investor #8, Personal Communication, 2018). Consequently, investors recommended: "The ability to expedite visas and working papers for executives in cleantech companies" (Investor #4, Personal Communication, 2018); and to "…streamline bringing in talent from outside, specifically for cleantech" (Investor #8, Personal Communication, 2018). Correspondingly, Investor #13 said, "I'm standing in [the U.S.], so I know that people are not necessarily well received… [immigration] gives us a competitive advantage" (Personal Communication, 2018). Thus, despite innovative energy policies, bottleneck issues arise. So, to promote VC/PE investment and innovation in cleantech, policies must enable immigration.

(ii) Investment Requirements

Next, investors recognized investment requirements as a hindrance to the investment ecosystem. As discussed in Section 4.2, Canadian investors have difficulty finding co-investors. As such, many VC/PE firms look to the U.S. for partners. However, startups must have a certain percentage of Canadian ownership to remain certified as a Canadian company. This puts Canadian investors, and investors abroad looking to invest in Canadian cleantech, at a disadvantage. Investors asserted that investment requirements limit global collaboration. Investor #1 stated,

> [Ontario]… has rules about control of corporations …its easier for us to actually invest in companies outside of Ontario…Venture teams [must]… be located in a certain area, and

> have to have a certain amount of investments in certain areas. So, the more restrictions…the more you [decrease] the number of investors that are eligible (Personal Communication, 2018).

Investor #7 confirmed that investment requirements provide disincentives for international collaboration:

> [While] we have [supportive programs like] SDTC… When companies start to be successful, and an investor in New York State looks at a company…we remove the incentives, because of the foreign ownership. Therefore, you provide this additional incentive for those companies to move out of Canada (Personal Communication, 2018).

Canada's R&D financing climate is ineffective if Canadian companies move abroad to access VC/PE financing.

Additionally, when companies do remain in Canada, VC/PE investors are put at a disadvantage. Investor #13 detailed that Canadian VC firms are needed for Canadian startups to keep their CCPC status, which allows SR&ED financing: "[this] makes the opportunity attractive to our U.S co-investors. Canada is a much lower cost regime to develop a product than the U.S" (Personal Communication, 2018). Consequently, while Canadian VC firms need to collaborate internationally to access financing and scale the company, their ability to do so is hindered by investment requirements. Therefore, to incentivize VC/PE cleantech investment, investors argued that companies should benefit from SR&ED as long as the company is located in Canada.

(iii) Capital Flow

Also related to the development of an international investment ecosystem, capital flow between jurisdictions was identified as an effective policy measure to promote cleantech investment. Investors advocated for removing tariffs and taxes associated with transferring money across borders to allow: increased investment from abroad to flow into Canada; for Canadian investors to bring money from VC/PE investments abroad into Canada; companies to

sell to international markets; and, collaboration with international corporations (Investor #1, Investor #4, Personal Communication, 2018). Facilitating capital flow will increase certainty, productivity, and investment (Investor #12, Investor #13, Personal Communication, 2018). Investor #7 gave an example to illustrate the impact of capital flow: "The flow of capital…[is] clearly beneficial … the Canadian tax code [has] made it extraordinarily difficult to take money out of Canada for start-up companies… [That is] an anti-incentive for people to invest in Canada" (Personal Communication, 2018). Thus, to ensure Canadian policies promote cleantech investment, capital flow must be recognized as an integral component to the policy ecosystem.

(iv) Technology Push and Market Pull Balance

Finally, investors recognized that a balance between technology push and market pull energy policies is imperative. For example, Investor #1 detailed how policies can be integrated: "…you need an ecosystem…the carbon taxes tend to generate revenue and can go towards R&D…" (Personal Communication, 2018). To exemplify this balance, a successful policy balance in Ontario was provided by Investor #10:

> [Ontario]…has increased the amounts of biofuels that have to be contained in transportation fuels... [and] is now targeting some very big grant programs for low carbon fuel. They just started the first round of the LCIF: low carbon infrastructure fund… You've got the market pull through legislation and you've got the driver of the technology through the funding program, and they're all focused on that one specific area (Personal Communication, 2018).

Unlike the policy detachment discussed in Section 4.3a, investors are incentivized and impacted by the policy climate. However, this effect is not on a piecemeal basis: one type of energy policy is not going to greatly incentivize cleantech VC/PE investment over another. Rather, investors solicit an integrated policy ecosystem, with pragmatic policy design, and with consideration of regulatory bottlenecks outside the energy policy realm.

5) Discussion and Conclusions

This section will discuss the study's results in light of the literature in which this study is based.

5.1) Insights from a Qualitative Approach

The main studies informing this research are Bürer and Wüstenhagen's (2009) and Gaddy et al. (2016). While Bürer and Wüstenhagen's (2009) study has a qualitative component, their conclusions were based off of the quantitative survey distributed to VC/PE investors, and investors' rankings of energy policies. Gaddy et al.'s (2016) research also utilized a quantitative method and, based on an analysis of cleantech VC investment returns, concluded that VC is the wrong model for cleantech. However, neither study attempted to acknowledge the contextual variables that play a role in the nexus between energy policy and cleantech VC/PE investment. This study used the elite interviews method to fill this gap and examine what role context has in shaping investor preferences of policy, and in the success of VC cleantech investment. This research aimed to discover whether policy preferences have changed since the 2008 Financial Crisis, the 2015 Paris Accord, and in a Canadian setting. The qualitative coding analysis allowed for the impact of these variables to be understood, and elite interviews allowed investors to provide explanations for why they have certain policy preferences.

First, coding the interviews allowed connections to be made across responses to determine the impact that contextual variables had on the relationship between energy policy and cleantech. Specifically, investors outlined that after the 2008 financial crisis, there was a push for increased entrepreneurship in Canada. This push is evident, as investors made it clear that Canada has a healthy R&D financing climate (Elgie & Brownlee, 2017). This increase in R&D led to innovation of both hardware and software cleantech. However, whilst the crisis acted as a catalyst for the government to incentivize innovation, VC/PE firms took a different approach. While grants and funding became available for early-stage startups, the financial industry was still recovering, and capital was scarce (Block & Sandner, 2009). Subsequently, this led some VC/PE firms to reevaluate their investment thesis, and to lower their appetite for risk by investing in startups with lower capital requirements. As outlined in Section 4.2, software

technologies have higher returns, require less capital than hardware, and are able to scale earlier (Gaddy et al., 2016). As such, VC/PE firms transitioned towards a focus on software, leaving a financing gap for hardware companies. Therefore, despite the strong technology-push policy environment in Canada, the financing climate transformed, leaving many of the new hardware startups to collapse. This change in the VC/PE climate also validates the recommendation made by investors for government procurement and public finance as a means to support higher risk, earlier stage, capital-intensive hardware companies. Unlike the Bürer & Wüstenhagen (2009) study, atypical policies were identified as being preferential to incentivizing cleantech. These changes to the cleantech investment climate, and to policy preferences, verify the need for qualitative methods. This method allowed the connections between context, investment strategies, and policy preferences to be made, and supports that policies must adapt to the socio-economic context (Masini & Menichetti, 2013).

Second, the qualitative method allowed investors to provide explanations for their policy preferences. Unlike past studies (Bürer & Wüstenhagen, 2009; Hoffman & Huisman, 2012), investors were able to expand on why certain policies are preferred. In a quantitative survey, these preferences may be given a numerical ranking, and valued as such. While this allows for clear comparisons to be made, it does not take account of the reasons for such preferences, or whether these preferences exist at all. As discussed in Section 4.3, investors did not have strong preferences for one policy over another. This indicates that the rankings for policies in the quantitative studies were capricious, as there was not a clear preference for one policy over another, and that investors' preferences for policies were dictated by policy design. For example, as exhibited in Section 4.3b part (i), investors ranked carbon taxes, building codes, and FIT as the top energy policies. While each of these investors preferred different policies, once asked for the reasoning for the preference, each stated the same reason: consistency and transparency. As such, while specific policy preferences may differ due to investors' experience with the policies where portfolio companies are located, the elements of a preferred policy design are consistent. This further shows how context provided through qualitative research is essential for policy research, as this insight cannot be gained from a simple Likert scale survey.

Therefore, while this research was initially set out to examine how a post-financial crisis, post-Paris, Canadian setting affected VC/PE investors' perceptions of energy policy, this study shed light on the importance of context in policy research. Not only did the elite interviews method allow for information to be provided on how these contextual variables influenced the shift to software in VC/PE investment in cleantech, they also indicated that quantitative policy rankings may be a haphazard means of informing policymaking. Rather, investors' policy rankings are informed by the elements of policy design. Specifically, investors prefer policies designed pragmatically over specific energy policies.

5.2) A Call for Pragmatic Policymaking

As made clear throughout the interviews, investors are not incentivized to invest in cleantech by energy policies. This is due: to regulatory risk; fragmented, local policies that do not facilitate scaling; and, a lack of preference for specific energy policies. However, investors recognize that well-designed energy policies are essential to the creation of a healthy investment ecosystem, which is essential to the success of the Canadian cleantech industry. Investors emphasized that policies need to be pragmatic and cohesive. The preferred policy design can be interpreted on a micro level, regarding policies themselves, and on a macro level, regarding the interaction between policies.

On a micro level, investors stressed the importance of a pragmatic policy design. Policies need to be: certain and transparent, flexible, consistent, simple, designed with increased stringency and generosity, and designed with the input of stakeholders. These components of policy design were presented as being more important than the choice of policy. Investors stated that pragmatic policy will decrease regulatory risk, increase participation in policies, and will ensure policy objectives are achieved in a timely manner. This aspect of policy preferences, specifically in regard to the requirement for flexibility, certainty, and transparency, is consistent with the literature (Haščič et al., 2009; Bosetti & Victor, 2010; Leete et al., 2013). As Held et al. (2006) stated, "It must be guaranteed that…regardless of which instrument is implemented, [policies persist] …for a specified planning horizon. Otherwise the uncertainty for potential investors is too high and it is likely that no investments will take place at all" (p.865).

In addition to pragmatism within policies, investors stressed the need for pragmatism between policies and jurisdictions to ensure the policy ecosystem promotes investment. Specifically, this policy ecosystem consists of: a balance between technology push and market pull policies; government procurement; public finance for early-stage capital intensive projects; progressive immigration policies; ridding inhibitory investment requirements; and promoting capital flow between jurisdictions. These regulatory components are not necessarily in the realm of energy policy, but are perceived as more effective at incentivizing investment than energy policy itself.

The major barriers to VC/PE cleantech investment in Canada are the financial and market risks associated with the small Canadian market, and capital-intensive cleantech. As such, a balance of technology push and market pull policies, government procurement, and public finance for early-stage, capital intensive projects will promote the market for cleantech within Canada. This balance is in line with the literature, in which there is a recognition for the need to combine policies together to induce innovation (Mowery & Rosenberg, 1979; Carraro et al., 2010), and for public finance to be increased to overcome the financing gap (Olmos et al., 2012). Bürer & Wüstenhagen (2009) hypothesized that investors view government backed VC funds as competitors. While the results from this study confirm this, the investors do not dislike public finance, as found in the 2009 study. Rather, public finance must be directed towards the firms that the traditional VC model avoids.

Policies regarding immigration, investment requirements, and capital flow address the inherent barrier of Canada's small, domestic market. These policies facilitate international collaboration and investment, which ensure startups have the ability to scale. As such, the aforementioned micro versus macro perspective also holds true when creating a healthy investment ecosystem. Rather than focus solely on the choice, and design, of energy policies, policymakers must ensure: policies interact cohesively within Canada, public procurement and finance, and that international collaboration is not hindered by regulatory bottlenecks.

5.3) Conclusions and Recommendations

This research was intended to evaluate and gain a deeper understanding of the relationship between energy policy and early stage investment in cleantech, specifically VC/PE. This study explored investors' perspectives of risk and opportunity by examining: the barriers that may impede VC/PE investment in cleantech in Canada; and the programs and policies that are preferred by Canadian VC/PE investors.

Through the use of elite interviews with managing partners of VC/PE firms in Canada, the key results of the research indicated that the major barriers to VC/PE invest are: risk aversion; the high capital costs and long timeframes associated with hardware cleantech investment; the inability to scale in Canada; and the lack of access to capital in Canada. The results of the interviews indicated that the preferred energy policies in incentivizing cleantech VC/PE investment are not categorical. Rather, investors: have a tendency to detach their investments from policy; focus on policy design over policy choice; desire government procurement and public finance; and need a balanced investment ecosystem without regulatory bottleneck issues. These results, and the subsequent analysis of these results in light of existing literature, led to two key themes: the importance of context and policy pragmatism. These themes reveal the need for qualitative methods and stakeholder involvement in policy research, as well as the importance of a pragmatic, macro-level perspective in policymaking.

Academics must incorporate qualitative methods to ensure contextual variables are considered in policymaking. Without this method, this study would not have considered the effect of policy design, or the need for an investment ecosystem which incorporates policies outside of the field of environmental policy. Policymakers must be pragmatic and take into account the aforementioned elements of preferred policy design. Additionally, rather than give energy policy unjustified weight in its ability to promote cleantech investment, policymakers must collaborate across fields to ensure all policies work cohesively to promote investment. On a global scale, this research elucidates elements of successful cleantech investment. Public and private finance must work together, with hardware technologies primarily funded by governments and institutional investors, and software technologies by VC/PE.

These conclusions suggest opportunities for further research. Further research may explore how to increase the likelihood of government procurement and public finance, as well how to facilitate effective interaction between policymakers to prevent regulatory bottlenecks. Moreover, further research may examine successful VC/PE cleantech exits, and whether the locations of these companies have policies with common themes. This could act as a source of information for policymakers and investors alike. Finally, this study could be repeated, in the EU and US, where the financial and market risks associated with inhibiting cleantech are not as amplified as in Canada. This would shed light on whether the barriers associated with cleantech in Canada act as a limit for the impact of policy for investors, and whether specific policies may be preferred once these market risks are overcome.

Canada is a small country, but given its significant amount of R&D funding available for cleantech, it has the capacity to benefit from first mover advantages. To do so, Canadian policymakers must cater to the market. As VC/PE investors are experts in this market, their insight is invaluable: policies must be long-term, transparent, integrated, and with the ability to promote international collaboration and investment. Should policymakers look to the real world as much as the theoretical world, Canada may salvage its emigrating startups, and become a global leader in cleantech.

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