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Institutional Determinants of Carbon Financial Accounting Practices

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Abstract

This paper investigates how and why firms affected by Emissions Trading Schemes (ETSs) are financially accounting for carbon in a voluntary setting.

Using institutional theory, the authors seek to identify the determinants of a firm's decision to adopt a particular carbon financial accounting practice. We identify the recognition and measurement practices for carbon-emission allowances using data gathered from the annual reports of ETS-affected firms in Australia. These practices are identified in the five stages of carbon-emission allowance transactions, namely, when these are: (1) received for free, (2) purchased, (3) used, (4) sold and (5) surrendered.

Inconsistencies in carbon financial accounting practices are observed. The findings reveal that carbon-emission allowances are recorded as intangible assets, but most firms provide incomplete information on their carbon financial accounting practices. Firms also exhibit inconsistencies in specifying how they are 'recognising' and 'measuring' carbon-emission allowances. The results provide evidence of coercive (regulation) and mimetic (size, leverage and listing status) pressures being the main determinants of carbon financial accounting practice.

The findings will help accounting policy-makers in understanding *how* and *why* ETS-affected firms financially account for their carbon allowances. This can assist the development of a uniform carbon financial accounting guidance. Given the few studies in the field of financial accounting of carbon emissions under ETSs, this research will also give meaningful insights to academics and researchers.

Introduction

There has been a growing urgency around the world to reduce the negative and harmful impacts of emissions on climate change. This urgency is leading governments to implement new regulations for greenhouse gas (GHG) emissions (Patnaik, 2020), in which limits on emissions are set. Emissions Trading Schemes (ETSs) are one such emission-related regulation that has been implemented by many countries around the world (e.g., China, the European Union, Australia and New Zealand). These schemes have led to carbon (emissions) becoming a material commodity that needs to be financially accounted for by companies in different trading life-cycles (i.e., when carbon is received for free, when purchased, when used, when sold and when surrendered). In the event that the emissions-related regulations are not followed or are violated by companies, there is likely to be a significant financial impact. For example, in the Volkswagen scandal that unfolded in September 2015, the company was fined US$25 billion by the US Government for rigging the emissions test to make their vehicles seem as though they were emitting less than what they actually were (Mansouri, 2016; Alexander & Schwandt, 2020).

Currently, there are no regulations governing the financial accounting of carbon for firms affected under ETSs. The carbon-accounting setting is therefore voluntary. The absence of guidance can lead to inconsistencies in carbon financial accounting practices. This is likely to result in issues in the comparability of financial statements for investors and stakeholders; insufficient information will make it difficult for them to make informed decisions. Thus, given the increasing relevance of carbon financial accounting of ETS-affected firms, research on the ways in which firms affected under ETSs are financially accounting for carbon can provide useful information to accountants, auditors, those setting accounting standards, investors, those preparing financial reports, researchers, governments, regulators and other stakeholders (KPMG, 2008; Elfrink & Ellison, 2009; Haque & Deegan, 2010; Warwick & Ng, 2012).

Given the voluntary setting, ETS-affected firms need guidance on how they should financially account for carbon-emission allowances in each of these life cycles or phases. Thus, knowledge of the carbon financial accounting practices of ETS-affected firms is essential. It will also help enhance the preparation and comparability of financial statements, thus assisting in the decision-making of accountants, auditors, preparers of financial reports, investors and other stakeholders. The findings of this study will also provide empirical evidence on whether there are inconsistencies in the carbon financial accounting practices of ETS-affected firms. This evidence could support the demand for uniform carbon financial accounting guidance. This study is also timely, and of significance to the accounting community and the ETS-affected firms and regulators who are seeking ideas on how to fill the void created by the withdrawal of carbon financial accounting guidance (i.e., the International Financial Reporting Interpretations Committee, Interpretation 3, or IFRIC 3).

In addition to understanding *how* the affected companies are financially accounting for carbon-emission allowances, it is also necessary to understand *why* the affected companies are accounting for carbon. In other words, what institutional pressures, or firm characteristics and market features – classified under coercive, mimetic and normative institutional pressures – influence an ETS-affected firm's carbon financial accounting practices. Despite the lack of a carbon financial accounting standard, many companies are taking a proactive emission-reduction approach and accounting for carbon using IAS 8 (Luo, Lan, & Tang, 2012). This motivates the need to investigate why some of the companies affected under ETSs prefer to incorporate carbon financial accounting as a part of their business operations and strategy, while others do not (Luo et al., 2012). In addition, an understanding of how firms interpret and respond to the three institutional pressures is essential to establishing a regulatory and cultural framework for a low-carbon environment (Luo et al., 2012). As there have also been discussions of enhancing climate-change-related corporate disclosures and accounting practices (Eleftheriadis & Anagnostopoulou, 2014), a contribution can be made to this discussion by outlining the firm characteristics and market features that are most likely to have a positive effect on carbon financial accounting practices. A study on the determinants will help identify the institutional pressures, firm characteristics and market features that drive carbon financial accounting practices. These institutional pressures, firm characteristics and market features can further be considered by policymakers in their strategies to improve the uniformity and comparability of carbon financial accounting.

Thus, the study specifically addresses two research questions. First, *how* are the firms affected under ETSs financially accounting for carbon-emission allowances in the absence of uniform accounting guidance? Second, *what* institutional pressures, in the form of firm characteristics and market features, are influencing the ETS-affected firms' carbon financial accounting practices?

Prior studies in the carbon financial accounting area have attempted to provide empirical evidence of inconsistencies in the accounting practices of the large emitters. At the time of this study, however, there was scant empirical evidence in the carbon financial accounting literature on these inconsistencies, with the exception of Warwick and Ng (2012), Black (2013) and Ayaz (2017). These studies examined the carbon financial accounting practices of firms with significant emission liabilities under the EU ETS, as well as large EU emitters. All these studies reported inconsistencies in the carbon financial accounting approaches of the firms.

The current study supports the demand for uniform carbon financial accounting guidance and provides further empirical evidence on whether inconsistencies in accounting exist. In addition, the study provides guidance based on empirical findings. Compared to prior studies, the present study is timely and specifically focuses on the carbon financial accounting practices of ETS-affected firms (in Australia[1]) in more depth. Further, while prior studies have examined only carbon financial accounting practices, the current study also examines the determinants of the ETS-affected firms' accounting.

The findings show inconsistencies in the carbon financial accounting practices of Australian ETS-affected firms. While carbon-emission allowances are treated as intangible assets, most firms provide incomplete information

1. The Australian Carbon Tax came into force in 2012, prompting the use of Australian data for analysis in this study.

on their carbon financial accounting practices. Some firms do not specify how they are recognising carbon-emission allowances and others do not specify how they are measuring carbon-emission allowances. The findings also provide some empirical evidence of institutional pressures, especially coercive (regulation) and mimetic pressures (size, leverage and listing status), as the main determinants of the ETS-affected firms' carbon financial accounting practices.

The remainder of this paper is structured as follows. A background to ETSs (specifically the Australian Carbon Pricing Mechanism) and accounting for carbon emissions is provided. This is followed by a discussion of the current state of carbon-accounting literature. The theoretical framework for the paper is then explained and the research method is outlined. Next, the findings, a summary and conclusion are presented.

Background

This section discusses the ETSs and the Australian Carbon Pricing Mechanism in further detail. In addition, the key carbon financial accounting issues resulting from the ETSs are highlighted, followed by discussion on the studies and guidance on carbon financial accounting practice available at the time of this study.

ETSs AND THE AUSTRALIAN CARBON PRICING MECHANISM

Currently, the carbon markets are made up of two main instruments: Regulatory or Carbon Pricing Mechanisms and Project-based Mechanisms (Cook, 2009). This paper focuses on firms affected by Emissions Trading Schemes (ETSs) that are a regulatory or pricing mechanism. ETSs have been widely adopted by various countries (e.g., the European Union ETS, the New Zealand ETS, the Australian Carbon Pricing Mechanism) and are also known as 'cap-and-trade' schemes.

Australia's clean-energy legislation introduced a price on carbon on 1 July 2012, through its Carbon Pricing Mechanism (Clean Energy Regulator, 2015). The Australian Carbon Pricing Scheme (also known as Australian Carbon Tax) applies to Australia's 347 liable entities (or biggest polluters) accounting for about 60% of Australia's greenhouse gas emissions, who have to report on and pay a price for their carbon pollution, which further creates incentives to reduce emissions (Clean Energy Regulator, 2015; Talberg & Swoboda, 2013). The Australian Carbon Tax requires that any facility emitting beyond an annual threshold of 25,000 tonnes of carbon surrenders the emission permits to the government.[2]

Carbon-emission allowances (or emission permits) were allocated free of cost to firms with activities that were deemed emissions intensive and trade exposed (EITE) in 2012 (Talberg & Swoboda, 2013). These liable entities received free carbon-emission allowances of 94.5% or 66% of the industry average baseline respectively, depending on whether they were highly or

2. See Clean Energy Regulator (2015) and Talberg and Swoboda (2013) "Emission Trading Schemes around the world" for more detail.

moderately emission-intensive (Talberg & Swoboda, 2013). Except for these free carbon-emission allowances, the rest of the carbon-emission allowances were to be auctioned by the government (Talberg & Swoboda, 2013).

CARBON FINANCIAL ACCOUNTING IMPLICATIONS

The ETSs have accounting implications for the affected companies, as a previously costless activity has now become costly, thus creating a carbon market by means of marketable allowances (Cook, 2009). Carbon markets were estimated at a value of US$176 billion in 2012 (Coelho, 2012) and are likely to gain further relevance with the recent adoption of the Paris Agreement (Bodansky, 2016). The ETSs require measurement, financial accounting and reporting of carbon emissions for two important reasons. The first of these is for monitoring the actual emissions and the use and trading of emission allowances, so regulators can ascertain whether or not companies are emitting within their stipulated caps and whether the purpose of ETSs is being served. The second reason is for informing the investors who invest in the emitting companies. The presence, use, and purchase and sale of emission allowances are economic activities that affect the financial performance and net worth of companies. A lack of carbon reduction can be a source of financial risk for a company and, therefore, needs to be monitored by shareholders and debt providers of companies. MacKenzie (2009) points out that carbon allowances may be accounted for as intangible assets, financial instruments and government grants. Supporting MacKenzie and providing further insight on the financial accounting implications, Elfrink and Ellison state:

> if EAs (emission allowances) are recorded as assets, how are they valued and classified? How do the EAs and GHG emissions affect the profit and loss statement? When and how are liabilities reported? When and how are government grants recognised? Is revaluation of the related assets and liabilities appropriate? How does a participant account for sales of EAs? (2009, p. 30)

Firms should financially account for their carbon in five different situations: when received for free; when purchased; when used; when sold; and when surrendered. Official guidance on these (accounting) issues is limited, and still to be developed; as a result of which, accounting for carbon-emission allowances in practice lacks consistency. Some firms use IAS 8, which allows them to develop their own accounting policies for ETSs, as long as they are consistent with underlying International Financial Reporting Standards (Warwick & Ng, 2012). With the globalisation of ETSs on the horizon (Warwick & Ng, 2012), the carbon financial accounting of the ETS-affected firms is expected to have increasing international relevance. This paper considers ETS-affected firms to be different from other firms – i.e., the emitters, large emitting firms and firms from the Kyoto Protocol-ratifying countries, all of which have been the focus of most studies in the carbon literature. The ETS-affected firms are not just emitters irrespective of their size, but are also directly obliged to participate in carbon trading and are therefore more likely to be under public scrutiny. The other, non-ETS-affected firms may or may not choose to voluntarily participate in the carbon market

and therefore may not be involved in carbon trading. This paper focuses on the current state of financial accounting for carbon activities by Australian firms affected under the ETS.

CARBON FINANCIAL ACCOUNTING PRACTICE STUDIES AND GUIDANCE

The International Accounting Standards Board (IASB) released IFRIC 3 (Emission Rights) in December 2004 (Deloitte, 2016). The purpose of IFRIC 3 was to provide guidance on accounting for a cap-and-trade emission rights scheme (EFRAG, 2005). IFRIC 3 made the following recommendations:

- Carbon-emission allowances are intangible assets irrespective of whether they have been purchased or provided free of cost by the government.
- Subsequent to initial recognition, carbon-emission allowances should be accounted for in accordance with IAS 38 (Intangible Assets).
- When a participant produces emissions, provisions for emissions-related liabilities should be recorded at market value in accordance with IAS 37 (Provisions, Contingent Liabilities and Contingent Assets).

IFRIC 3 also recommended that where allowances were issued by governments for less than the fair value, the difference between the fair value and the amount paid, if any, was a government grant. Such a grant should have been immediately recognised as deferred income in the balance sheet and thereafter as income on a systematic basis. IFRIC 3 also recommended that changes in the value of revalued allowances (i.e., Intangible Assets) be recognised in equity, and movements on the provision for emissions be recognised in the income statement (PwC, 2007; KPMG, 2008).

IFRIC 3 was withdrawn in June 2005 for a number of reasons, including that the accounting requirements would result in mismatches in both measurement and reporting, particularly the valuation of assets and the valuation of liabilities, which would lead to income volatility (EFRAG, 2005; MacKenzie, 2009).

A joint project between the Financial Accounting Standards Board (FASB) and the IASB on Emission Trading Schemes (in 2009) aimed to address the carbon financial accounting issues arising due to ETSs by revising either IAS 38 (Intangible Assets) or IAS 39 (Financial Instruments) and IAS 20 (Accounting for Government Grants) (Deloitte, 2016). The project was deferred then rescoped in 2015 but no guidance has been issued to date.

The Big Four auditors (Deloitte, PricewaterhouseCoopers, Ernst & Young and KPMG) conducted a number of surveys to understand and guide carbon-accounting practice. Two of PwC's publications on the debate on climate change and emissions deal with accounting for carbon-emission allowances (PwC, 2004; PwC, 2007) and suggest the full market value approach and the cost of settlement approach. Their recommendations as to which financial statement elements to recognise are the same under both approaches. KPMG has provided guidance on accounting for carbon-emission allowances. Its most prominent document in this area, "Accounting for carbon – the impact of carbon trading on financial statements" (KPMG, 2008), is adapted from IFRIC 3.

Using a sample of 29 United States firms, Ernst & Young (2010) evidence a diversity in carbon financial accounting practices, with most firms adopting either an intangible asset model or an inventory model. Under the intangible asset model, the firms accounted for both free and purchased carbon-emission allowances at cost. The carbon-emission allowances were not amortised. Under the inventory model, the firms measured the emission allowances at weighted average cost, with the free emission allowances recorded at cost, and purchased emission allowances recorded at the purchase price. The weighted average cost of used emission allowances was charged to the cost of sales and the carbon-emission allowances were subject to impairment. The emission allowances were classified as inventory, with the relevant cash inflow/outflow classified as operating activities in the statement of cash flows. The emission allowances held for sale were accounted for at fair value at each reporting date.

In their research report "Accounting for carbon," for ACCA, Lovell, Sales de Aguiar, Bebbington and Larrinaga (2010) attempted to investigate how large emitters in the EU ETS accounted for their emission allowances and why their accounting practices varied. For this, they carried out a detailed survey of the financial statements of the largest greenhouse-gas emitters (i.e., 26 companies) in the EU ETS, followed by telephone interviews with accountants at five of these 26 companies to investigate in detail why accounting practices differed. The findings produced by this research indicate that the majority of the companies did not adopt IFRIC 3's recommendation of accounting for granted emissions allowances at fair value. Instead, these companies treated both granted and purchased emissions allowances as intangible assets at cost. Interestingly, the findings also reveal that the companies measured their obligation to surrender allowances on a 'cost with the balance at market value' basis. In other words, the valuation was based on the carrying value of granted or purchased allowances, while valuing at market value the allowances that were yet to be purchased in order to cover emissions. This practice is not supported by IFRIC 3 and is in contrast to its recommendation of treating assets (allowances) independently to the liabilities arising under the EU ETS.

Warwick and Ng (2012) attempted to provide some understanding of how companies in the EU are accounting for carbon-emission allowances. They found no uniformity in accounting for emission allowances, especially amongst large emitting companies operating in the EU ETS. Interestingly, they found that these companies generally departed from IFRIC 3 and preferred to report granted carbon-emission allowances as intangible assets, with a nil value recorded upon receipt (as compared to IFRIC 3's recommendation of using fair value). This is also consistent with the findings of Lovell et al. (2010).

Black (2013) examined the disclosed carbon financial accounting policies of firms with significant emission liabilities under the EU ETS and reported diversity in their carbon financial accounting approaches. The findings of the study identify three common approaches; namely, a net liability approach, an approach based on IFRIC 3's classification, and an approach based on inventory classification. The net liability approach classifies carbon-emission allowances as intangibles, but only shows an emission liability when it exceeds the free allocation. The IFRIC 3-based approach recognises free carbon-emission allowances at fair value and a corresponding gross liability

under the EU ETS. Finally, the inventory-classification approach recognises free carbon-emission allowances at nil value.

Ayaz (2017) conducted a study to obtain knowledge about the carbon financial accounting practices of EU ETS companies for carbon-emission allowances in 2009. The findings of the study suggest a multiplicity of accounting treatments for carbon-emission permits by the firms. Consistent with Warwick and Ng (2012) as well as Lovell et al. (2010), and in contrast to IFRIC 3, the study highlighted that most of its sample firms recognised allocated emission allowances as intangible assets in their financial statements at zero value upon initial recognition and recorded traded (purchased) emission allowances at purchase price on initial recognition. With respect to the carbon-emission allowances that were to be surrendered, the entities recorded them as provision or liability in their accounts at either net book value or at costs remaining at the balance sheet date, and any remaining allowances at the fair value at the balance sheet date.

While the surveys undertaken by Ernst & Young (2010), Lovell et al. (2010), Warwick and Ng (2012), Black (2013), Ayaz (2017) and, to some extent, PwC (2007) focus on the carbon-emission accounting practices of participants in US emission programmes, large EU emitters and firms with significant emission liabilities under EU ETS, this paper focuses on the carbon-emission accounting practices of ETS-affected Australian firms in more depth. In addition, the paper identifies the process of recognition of carbon-emission allowances prior to disclosure. The process of recognition sheds light on the way carbon-emission allowances are measured and recorded prior to their disclosure in annual reports.

Theoretical framework and hypotheses

Institutional theory is used in this paper to explain the determinants of carbon accounting by the ETS-affected firms in the study. There does not appear to be any prior research on carbon financial accounting that has used this theory to explain carbon financial accounting practices (as distinct from the broader carbon *non-financial* disclosures). Prior studies have either used positive accounting theory (Rahman, Perera, & Ganesh, 2002; Waweru, Prot Ntui, & Mangena, 2011) to explain financial accounting practices, or have adopted a costly contracting-theory approach (Astami & Tower, 2006) to explain why firms voluntarily account. This paper posits that carbon financial accounting practices are influenced by the ETS-affected firms' institutional pressures; namely, coercive, mimetic and normative pressures.

Coercive pressure is a formal or informal pressure exerted on an organisation by a superior organisation upon which that organisation depends, and can also result from the cultural environment in which an organisation operates (Antwi, 2010). Such pressures might be perceived as force, persuasion or an invitation to adopt a particular policy, in most cases to increase that organisation's legitimacy (Antwi, 2010). Regulations from the government, accounting bodies and stock exchanges are coercive in nature,

as they impose restrictions and suggest the ways in which accounting can be conducted (Rahman, Perera, & Ganesh, 2002). This implies that firms with regulations imposed on them are likely to be under a greater level of scrutiny and will have a higher adoption of carbon financial accounting practice as compared to firms that are not subject to regulations. Thus:

> *H1: The adoption of carbon financial accounting practice is higher for firms with stringent regulations.*

Mimetic pressure stems from standard responses to uncertainty, which can be a powerful force that encourages imitation. In the event of uncertainty, an organisation might elect to model itself on, mimic or copy the accounting practices of successful or similar organisations to increase legitimacy and survival prospects (Antwi, 2010; DiMaggio & Powell, 1983; Deegan, 2011). This paper identifies characteristics such as firm size, leverage, industry and listing status as mimetic pressures, which lead firms affected under ETSs to adopt certain accounting practices.

Large firms are more flexible on experimentation and gain economies of scale in new experiments. Large firms will be under public, investor or stakeholder scrutiny of their carbon emissions and therefore will be under pressure to financially account for carbon. Large firms will elect to model, mimic or adopt the carbon financial accounting practices of successful or similar large-sized firms. Thus:

> *H2: The adoption of carbon financial accounting practice is higher for large-sized firms than for small-sized firms.*

Leverage is an important determinant of accounting policy choice (Watts & Zimmerman, 1990; Rahman et al., 2002). The higher the leverage, the more a firm may feel the need to financially account for carbon-emission allowances in a way that prevents them from having a debt contract that defines a breach in terms of accounting numbers. Therefore, owing to uncertainty in financially accounting for carbon permits, these highly leveraged firms will model their carbon financial accounting practice on that of successful or similar highly leveraged firms. Thus:

> *H3: The adoption of carbon financial accounting practice is higher for firms with high leverage than for firms with low leverage.*

Rahman et al. (2002) and Astami and Tower (2006) found a significant association between financial accounting and industry. Listed companies have public accountability, as their listing status places them in the spotlight (Zeng, Xu, Yin, & Tam, 2012; Gonzalez-Gonzalez & Zamora-Ramirez, 2016) and, therefore, similar to large-sized firms, they too may be scrutinised for their carbon financial accounting practice (Luo et al., 2012). Given the uncertainty surrounding the financial accounting practice of carbon-emission allowances, the firms with listing status may feel the need to mimic the carbon financial accounting practices of similar listed firms to increase their legitimacy and survival prospects. Thus:

> *H4: The adoption of carbon financial accounting practice is higher for firms with listing status than for firms that are not listed.*

The firms affected under ETSs all belong to different industries. These industries have a huge impact on carbon emissions and can be highly or moderately intensive. The highly intensive industries face greater business risk and are likely to generate greater public and regulatory concern (Rankin, Windsor, & Wahyuni, 2011). Thus, depending on the emission intensity of the industry, the ETS-affected firms may have similar carbon financial accounting practices. Thus:

> *H5: The adoption of carbon financial accounting practice is dependent on industry.*

Normative pressure is attributable to professionalisation. This is basically a pressure arising from group norms to adopt particular practices (DiMaggio & Powell, 1983; Deegan, 2011). Auditors are considered to be a normative pressure. Generally, auditors do not encourage their clients to financially account for or report data in excess of the standard requirements (Alsaeed, 2006). However, to discourage litigation, auditors can influence the scope of voluntary carbon financial accounting practices by encouraging their client firms to comply with voluntary recommendations and adopt more carbon financial accounting practices (Berthelot & Robert, 2011). The risks pertaining to climate change can be highly significant for a number of firms and therefore Big Four auditors are likely to encourage these firms to adopt carbon financial accounting practices as per their recommendations (Berthelot & Robert, 2011). Thus:

> *H6: The adoption of carbon accounting practice is higher for firms with Big Four auditors than for firms with non-Big Four auditors.*

Therefore, this study investigates the Australian ETS-affected firms' carbon financial accounting practices and also examines the determinants of institutional pressures behind these practices.

Research method

This section details the sample-selection process and also highlights the research model used for the study. The dependent and independent variables used for the study are also discussed.

SAMPLE SELECTION

We analysed the annual reports of the Australian firms affected under the Australian Carbon Tax for the year 2012–2013.[3] Annual reports were used, as these represent the most important channel for the firms to communicate their corporate strategy to investors and stakeholders (Song, Wang, & Cavusgil, 2015). The Australian Government's Clean Energy Regulator website was used as a source for the list of Australian firms affected under the Australian Carbon Tax. The website has a database known as Liable Entities Public Information Database (or LEPID), which provided a list of 347 (at the

3. The year the Australian Carbon Tax came into force was 2012.

time of the study) Australian entities considered liable under the Australian Carbon Tax. Due to a few issues encountered (i.e., the website of selected firms not existing or accessible, or some Australian firms in the database being subsidiaries with the same annual reports), the sample of 347 Australian firms was further narrowed down to 65 Australian firms. Finally, as this paper seeks to examine carbon financial accounting practices, a total of only 46 firms could be selected from the 65 Australian firms. These 46 firms had some information in their annual reports pertaining to their carbon financial accounting practices, compared to the remaining 19 firms that did not have this information in their annual reports.

Content analysis was used to identify and record the relevant information. This has been widely used as a consistent, structured and valid method to examine disclosures in annual reports and other media (Hooks & van Staden, 2011). The content analysis in this paper was validated by a second analyst, a PhD (Accountancy) student. For the purpose of examining the adoption of carbon financial accounting practices by the Australian firms, a coding framework (the IFRIC 3 template) was developed on the basis of recommendations from the carbon financial accounting proposals and surveys that were discussed earlier. This template (see Table 1) provides the double entries taken from the carbon financial accounting proposals and surveys. The double entries relate to the five different stages of a carbon-emission allowance life cycle: (1) on receipt of free allowances; (2) on purchase of allowances; (3) on use of allowances (when making emissions); (4) on surrender of allowances (when used allowances are delivered); and (5) when sold. This enabled the recording of the information presented in annual reports into accounts to be debited and credited during the different stages of carbon allowance acquisition and use.

Table 1: Accounting and measurement practices for carbon-emission allowances (IFRIC 3 template)

Recognition and measurement practices for carbon-emission allowances under different stages of dealing with these allowances (IFRIC 3 template)				
Free	*Used*	*Purchased*	*Surrendered*	*Sold*
Dr Intangible assets (Allowances) Cr Government grant (Deferred income) **Recognition / Measurement**	Dr Intangible assets (Allowances) Cr Equity Dr Government grant (Deferred income) Cr Income Dr Emissions expense Cr Liability to deliver allowances **Recognition / Measurement**	Dr Intangible assets (Allowances) Cr Cash / A/c payable **Recognition / Measurement**	Dr Liability to deliver allowances Dr Loss due to impairment Cr Intangible assets (Allowances) Cr Profits or loss **Recognition / Measurement**	Dr Cash / A/c receivable Cr Revenue Dr Cost of goods sold Cr Intangible assets Cr Profit or loss **Recognition / Measurement**

RESEARCH MODEL

An empirical model was constructed to identify the coercive, mimetic and normative variables influencing the carbon financial accounting practices of the 46 ETS-affected firms in the study. The model was based on the assumption

that the firms' carbon financial accounting practices are a function of the three institutional pressures; namely, coercive, mimetic and normative.

The theoretical model of the study is described in the following form:

$$\text{Carbon financial accounting practice} = \int (\textit{coercive pressure}, \textit{mimetic pressure}, \textit{normative pressure})$$

Where 'Carbon financial accounting practice' is the adoption of carbon financial accounting practice; and where the coercive pressure is regulation; the mimetic pressures are firm size, leverage, listing status and industry; and the normative pressure is auditors.

The model was empirically tested by using a logistic regression equation specifying the dependent and independent variables. In other words, to investigate the determinants of the adoption of voluntary carbon financial accounting practice, a logistic regression analysis of the carbon financial accounting practice against the firm characteristics and market features was conducted. The logistic regression equation is stated below, followed by a description of the dependent and independent variables.

$$CACCP_t = \beta_0 + \beta_1 REG + \beta_2 SIZE + \beta_3 LEV + \beta_4 LIST + \beta_5 INDUSTRY + \beta_6 AUD + \varepsilon \ldots\ldots\ldots (1)$$

Where CACCP is used as a proxy for the Carbon Accounting Practice score and the independent variables include a set of proxies for coercive (REG), mimetic (SIZE, LEV, LIST, INDUSTRY) and normative (AUD) pressures.

These variables are further defined as follows:

Dependent variable

To address the determinants of the 46 ETS-affected firms' adoption of carbon financial accounting, a dichotomous indicator variable was used in the study ($CACCP_t$). The data for this variable were obtained from the annual reports of the firms and scored in the carbon financial accounting (IFRIC 3) template (Table 1). The carbon financial accounting policies of the 46 firms were noted. A score of 1 or above was allocated where the firms appeared to adopt carbon financial accounting practice for each of the different stages of the carbon-emission allowance life cycle. For example, where a firm reported a carbon financial accounting practice for both free and purchased carbon-emission allowances, a score of 2 (out of 5) was used, as it was inferred that the firm was adopting carbon financial accounting practice for two stages of the carbon-emission allowance life cycle. Likewise, where a firm reported a carbon financial accounting practice for all stages of the carbon-emission allowance life cycle (i.e., free, used, purchased, surrendered and sold), a score of 5 was used. Using this approach, a firm's adoption of carbon financial accounting practice was evaluated. A high or low score was then determined by comparing the firm's score against the mean score of the sample firms. 'Above the mean' is referred to as a high score and 'below the mean' as a low score. CACCP was then coded as 1 (high score) or 0 (low score).

Independent variables

The regression model includes different proxies to capture the effect of coercive, mimetic and normative pressures. We used regulation as coercive pressure. To capture the effect of mimetic pressure we used firm size, leverage, listing status and industry sensitivity. Finally, control for normative pressure was undertaken using the proxy of auditor quality.

All the previous carbon financial accounting and carbon disclosure-related regulations were used as a proxy for REG. The proxy was coded as 1 if the firm was affected by the respective regulations, and 0 otherwise.

To capture the effect of mimetic pressure, we used four different proxies:

- Firm Size (SIZE) – The natural logarithm of total assets was used as a proxy for SIZE.
- Leverage (LEV) – Debt-to-equity ratio was used as a proxy for LEV.
- Industry (INDUSTRY) – INDUSTRY was the dichotomous variable of 1 if the firm belonged to an environmentally sensitive industry, otherwise 0.
- Listing status (LIST) – Firms that were listed on the stock exchange were assigned a value 1, otherwise 0.
- Auditors (AUD) – Firms with Big Four auditors (normative pressure) were assigned a value of 1, otherwise 0.

Results

This section discusses the findings on the most preferred carbon financial accounting practices of the 46 ETS-affected Australian firms, especially when carbon is received for free or is used, purchased, surrendered or sold. In addition, the results on the determinants of the firms' carbon financial accounting practices are discussed, followed by further discussions on the regression results.

MOST PREFERRED CARBON FINANCIAL ACCOUNTING PRACTICES OF THE 46 ETS-AFFECTED FIRMS

The summary of the content analysis indicates inconsistencies in the carbon financial accounting practices, and that some of the adopted practices are contrary to the recommendations of IFRIC 3. Most firms did not provide any information on how they were recognising and measuring carbon-emission allowances.

Free carbon-emission allowances

Of the 46 firms in the study, 6.5% accounted for free carbon-emission allowances by recognising them as 'intangible assets,' with the difference between fair value and nominal amount recognised as a 'government grant.' These practices are similar to the recommendations of IFRIC 3 and prior studies, that free carbon-emission allowances be recognised as intangible

assets and government grants (KPMG, 2008; Ernst & Young, 2010; Lovell et al., 2010; Warwick & Ng, 2012).

Other firms in the study (8.7%) preferred to measure free carbon-emission allowances at nil value or cost, contrary to the recommendations of IFRIC 3, which recommends measuring free carbon-emission allowances at fair value.

Used carbon-emission allowances

A total of 4.3% of firms in the study recorded used carbon allowances as a 'provision,' consistent with the recommendation of IFRIC 3. Firms also accounted for recognition of used carbon-emission allowances in several other ways. Some firms in the study (4.3%) accounted for used carbon-emission allowances by recognising the used emissions as expenses under other operating costs and as a provision. Other firms (4.3%) recognised the carbon-emission liabilities when the emissions were generated, and recorded the carbon expense and deferred income from carbon-emission allowances as part of the cost of inventory. Finally, some firms (4.3%) treated used carbon-emission allowances as a provision, with the expenses incurred for the recognition of the provision reported under cost of materials.

With respect to measurement practice, the firms in the study used either an estimated amount (2.2%) (also recommended by KPMG, 2008); or purchase cost (2.2%), fair value (2.2%) or present value (2.2%) needed to extinguish the liability.

Purchased carbon-emission allowances

Of the 46 firms in the study, 17.4% initially recognised the purchased emission allowances as intangible assets. This approach is similar to the recommendation of IFRIC 3. Measuring purchased carbon-emission allowances initially at cost was the most preferred approach (6.5% of the firms) and is also recommended by most of the prominent proposals and surveys on carbon financial accounting practice (KPMG, 2008; Ernst & Young, 2010; Lovell et al., 2010; Warwick & Ng, 2012). A variety of methods was used by firms who measure purchased carbon-emission allowances.

Surrendered carbon-emission allowances

Some firms in the study (4.3%) classified carbon units on hand as financial assets, which, when surrendered to the government, resulted in the (financial) asset along with the corresponding emissions liability being derecognised from the balance sheet. This is inconsistent with the recommendations or findings of the prominent proposals and surveys on carbon financial accounting practice (IFRIC 3; Lovell et al., 2010; Warwick & Ng, 2012; Ayaz, 2017).

With respect to measurement practice, some firms (2.2%) preferred to measure surrendered carbon-emission allowances at weighted average cost of carbon-credit units.

Sold carbon-emission allowances

Some firms in the study (4.4%) recognised proceeds from the sale of carbon units from the relevant facility as income (not tabulated).

Table 2 provides a summary of the most preferred carbon financial accounting practices of the 46 ETS-affected firms.

Table 2: Summary of most preferred carbon financial accounting practices by the ETS-affected firms in the study

Recognition and measurement practices of Australian firms under different stages of carbon-emission allowances	
Carbon-emission Allowances: When received for **free** from the government	
Recognition	Received allowances are recognised in the balance sheet as intangible assets. The difference between fair value and the nominal amount paid for the rights is recognised in the balance as a government grant (deferred income)
Measurement	At nil (zero) value or cost
Carbon-emission Allowances: When emitted and **used**	
Recognition	(1) The emissions realised are expensed under 'other operating costs' and 'expenses' in the income statement and presented as a provision in the balance sheet **OR** (2) To the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision is recognised
Measurement	At the estimated amount of expenditure required to settle the obligation
Carbon-emission Allowances: When **purchased** from third party or from government	
Recognition	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets
Measurement	Initially at cost
Carbon-emission Allowances: When **surrendered** to government at year end	
Recognition	Carbon Units on hand are classified as financial assets. When Carbon Units are surrendered to the government, the asset, along with the corresponding emissions liability, is derecognised from the balance sheet
Measurement	Nil
Carbon-emission Allowances: When **sold** to third party	
Recognition	Income is recognised based on the sale of production output (Carbon Units) from the relevant facility
Measurement	Nil

DETERMINANTS OF THE 46 ETS-AFFECTED FIRMS' CARBON FINANCIAL ACCOUNTING

Descriptive analysis (and T-tests)

Table 3 presents the descriptive statistics for all the relevant variables of this study and also shows that adoption of carbon financial accounting practices is higher for 28% of the 46 ETS-affected Australian firms in the study. The minimum regulation (REG) score for the firms is 4, with the maximum being 7. On average, large-sized firms have a lower adoption of carbon financial accounting. For 'leverage,' there is a high variation in the debt-to-equity ratio, which ranges from 0.16 to 20.08. This implies that on average the firms are all low-leverage firms. The means for 'listing status' indicate that 61% of the firms are listed firms. Finally, Table 3 indicates that 76% of the firms in the study had Big Four firms as their auditors.

Table 3: Descriptive analysis

Descriptive analysis of Australian firms in the study (N = 46 firms)					
	Mean	Median	Std Deviation	Minimum	Maximum
CACCP	0.28	0.00	0.45	0	1
REG	5.46	5.50	0.98	4	7
SIZE	5.12	5.16	1.10	3.25	7.20
LEV	1.98	1.42	2.88	0.16	20.08
LIST	0.61	1.00	0.49	0	1
AUD	0.76	1.00	0.43	0	1

REGRESSION RESULTS

Logistic regression models and goodness of fit test

Apart from using the Pearson correlation matrix in Table 4, the collinearity assumption for logistic regression was further tested using the collinearity diagnosis. Both the tolerance values (not tabulated) and VIF values (not tabulated) that were observed for the logistic model were found to be well within the acceptable ranges of greater than 0.10 and less than 10 respectively, thus indicating absence of multicollinearity in the tested logistic models (Dewberry, 2004; Field, 2005; Rankin et al., 2011).

Table 4: Correlation

Correlations									
	1	2	3	4	5	6	7	8	9
1. CACCP	1								
2. REG	0.301*	1							
3. SIZE	-0.282*	-0.180	1						
4. LEV	-0.190	-0.027	0.037	1					
5. LIST	0.009	0.789**	-0.374**	0.001	1				
6. INDENERGY	-0.172	-0.222	0.303*	-0.059	-0.233	1			
7. INDMANF	0.160	0.197	-0.362**	0.105	0.311*	-0.876**	1		
8. INDPRI	0.030	0.057	0.109	-0.088	-0.149	-0.276*	-0.222	1	
9. AUD	0.125	0.368**	-0.403**	0.002	0.490**	-0.129	0.160	-0.058	1
**, * Indicates that correlation is significant at the 0.05 and 0.10 level (1-tailed).									

CACCP is the adoption of carbon financial accounting practice. *REG* is Regulation, *SIZE* is Firm Size, *LEV* is Leverage, *LIST* is Listing Status, *INDENERGY* is Energy and Utilities industry, *INDMANF* is Manufacturing and Industrial Process industry, *INDPRI* is Primary Industry and *AUD* is Auditors. All the recommended, withdrawn and mandatory carbon financial accounting- and carbon disclosure-related regulations were used as a proxy for REG. Natural logarithm of total assets was used as a proxy for *SIZE*. Debt-to-equity ratio was used as a proxy for *LEV*. Debt-to-equity ratio was calculated as (total liabilities of firms in $NZ to total equity of firms in $NZ). A firm's listing status was used as a proxy for *LIST*. Listed firms were coded as 1 and firms not listed, or whose listing status was not specified, were coded as 0. Each of the industry sectors was coded as 1 if a firm was a member of that sector and as 0 if the firm did not belong to that sector. Big Four and non-Big Four auditors were used as a proxy for *AUD*. Firms with Big Four auditors were coded as 1 and with non-Big Four were coded as 0.

A logistic regression model (equation) was used to examine the determinants of carbon financial accounting for the firms in the study. Table 5 shows the regression results.

Table 5: Regression results

Variables	**Hypothesis**	**Expected Sign**	**Coefficients**
Coercive pressure	-		
REG	*H1*	+	12.687** (4.248)
Mimetic pressure	-		
SIZE	*H2*	+	-3.448** (3.669)
LEV	*H3*	+	2.587* (3.517)
LIST	*H4*	+	26.517** (4.166)
INDUSTRY	*H5*		
INDENERGY		+	-6.972 (2.467)
INDMANF		+	8.392* (2.835)
Normative pressure	-		
AUD	*H6*	+	-2.599 (1.374)
Constant			-52.866** (3.918)
Observations			46
Log-likelihood			19.718
Degree of freedom			7
% Correctly predicted			91.3%
Psuedo R^2			0.766

Notes: The logistic regression model is used in the study to examine the determinants of carbon financial accounting and carbon disclosure practice levels of ETS-affected firms.

*, ** Significant at 0.10 and 0.05 levels respectively. Wald Statistics are reported in parentheses. *CACCP* is the adoption of carbon financial accounting practice. *REG* is Regulation, *SIZE* is Firm Size, *LEV* is Leverage, *LIST* is Listing Status, *INDENERGY* is Energy and Utilities industry, *INDMANF* is Manufacturing and Industrial Process industry and *AUD* is Auditors. All the recommended, withdrawn and mandatory carbon financial accounting- and carbon disclosure-related regulations were used as a proxy for *REG*. Natural logarithm of total assets was used as a proxy for *SIZE*. Debt-to-equity ratio was used as a proxy for *LEV*. Debt-to-equity ratio was calculated as (total liabilities of firms in $NZ to total equity of firms in $NZ). A firm's listing status was used as a proxy for *LIST*. Listed firms were coded as 1 and firms not listed, or whose listing status was not specified, were coded as 0. Each of the industry sectors was coded as 1 if a firm was a member of that sector and as 0 if the firm did not belong to that sector. Big Four and non-Big Four auditors were used as a proxy for *AUD*. Firms with Big Four as auditors were coded as 1 and with non-Big Four were coded as 0.

Goodness of fit tests were also conducted to determine whether the model significantly predicted the likelihood of the institutional pressures being the driving forces behind the firms' carbon financial accounting. The Pseudo (Nagelkerke) R^2 for the first logistic model, for the firms, is 0.766.

LOGISTIC REGRESSION RESULTS – DETERMINANTS OF ADOPTION OF CARBON FINANCIAL ACCOUNTING PRACTICES

Presentation of results

The variables of regulation (*REG*) (coefficient = 12.687, $p<0.05$), leverage (*LEV*) (coefficient = 2.587, $p<0.10$), listing status (*LIST*) (coefficient = 26.517, $p<0.05$) and manufacturing industry firms (*INDMANF*) (8.392, $p<0.10$) have positive coefficients and are significantly associated with the adoption of carbon financial accounting practice (*CACCP*). Firm size (*SIZE*), on the other hand, is negatively associated (coefficient = -3.448, $p<0.05$) and significant. This implies that while the adoption of carbon financial accounting practices is high for the firms in the study with stringent regulations and high leverage, that are listed on a stock exchange and belong to a manufacturing industry, the adoption of carbon financial accounting practices was low for the large-sized firms.

Regression results discussion – institutional theory perspective

Coercive (regulation) and mimetic (leverage and listing status) pressures were found to be positively associated with the adoption of carbon financial accounting practice for the firms, whereas size was found to be negatively associated. This implies that the adoption of carbon financial accounting practice is higher for firms that are governed by stringent regulations, for high-leverage firms and for firms that are listed on the stock exchange.

Coercive pressure, as one of the institutional determinants of the carbon financial accounting practices of the firms in the study, is evident in regulation having a significant and positive relationship with the adoption of carbon financial accounting practice. This finding is also consistent with prior financial accounting studies that found a significant and positive relationship between regulation and financial accounting practice (Rahman et al., 2002). Coercive pressure suggests that, in order to increase their legitimacy in the eyes of the public, the firms are being coerced into having similar and homogeneous carbon financial accounting practices and therefore the adoption of carbon financial accounting practices is greater for ETS-affected firms with more stringent regulations.

Mimetic pressure is evident in firm size having a significant but negative association with the adoption of carbon financial accounting practice for the firms in the study, contrary to most prior studies in the financial accounting area, which found a significant but positive association between firm size and financial accounting level (Bae Choi, Lee, & Psaros, 2013; Ieng Chu, Chatterjee, & Brown, 2013; Eleftheriadis & Anagnostopoulou, 2014; Peng, Sun, & Luo, 2015; Gonzalez-Gonzalez & Zamora-Ramirez, 2016). This indicates that firm size is one of the significant determinants of carbon financial accounting for the ETS-affected firms in this study. The adoption of carbon financial accounting practices is higher for small-sized firms. This could be due to the fact that large-sized firms are likely to have more public visibility due to their emission levels, and therefore may be reluctant to financially account for carbon, in order to avoid political, regulatory or social costs. This is supported by Jensen and Meckling (1976) and Alsaeed (2006). Small-sized firms, on the other hand, might benefit from financially accounting for carbon as this may give them increased transparency in the eyes of their stakeholders, and

a competitive advantage. Thus, from an institutional theory perspective, the large-sized ETS-affected firms are mimicking other large-sized ETS-affected firms' carbon financial accounting practices, and therefore have low carbon financial accounting levels. Similarly, the small-sized ETS-affected firms are choosing to model themselves on other small-sized ETS-affected firms and therefore their adoption of carbon financial accounting practices is higher.

The firms with high leverage may be motivated to financially account for carbon-emission allowances in a way that prevents them from having a debt contract that defines a breach in terms of accounting numbers. Owing to uncertainty in financially accounting for carbon permits, these highly leveraged firms mimic the carbon financial accounting practices of successful or similar highly leveraged firms.

Listed companies have public accountability, as their listing status makes them more visible and accountable. The firms in the study with listing status mimic the carbon financial accounting practices of similar listed firms.

Thus, the overall results for the firms in the study are consistent with institutional theory – coercive and mimetic pressures drive their carbon financial accounting practices. The results are also consistent with prior studies in financial accounting and indicate that regulation, leverage, listing status and firm size drive carbon financial accounting, whereas other factors, such as auditors, do not appear to be significant determinants.

We did not find any evidence of normative institutional pressure (i.e., auditors) being a determinant of the carbon financial accounting practice, as an insignificant negative association was found between auditors and carbon financial accounting practice. This result could be due to the auditor's role being restricted to the boundaries of mandatory information, as a result of which, the auditors, in general, do not require their clients to financially account for or report data in excess of the (carbon financial) accounting standard requirements (Alsaeed, 2006).

Robustness tests

The robustness of results was determined by transforming some of the independent variables used in the study. The logistic model was rerun using different measures for firm size, leverage and industry, as prior research proxied these variables with different measures. Before using the logarithm of total assets in the study, the 'total assets (NZD)' was used as a measure for firm size. These results (not tabulated) showed a minor change in that the firm size became positively associated but insignificant. Likewise, as a proxy for leverage, the liabilities-to-assets ratio was used (Brammer & Pavelin, 2008; Stanny & Ely, 2008; Clarkson, Li, Richardson, & Vasvari, 2008) instead of the debt-to-equity ratio. The result (not tabulated), on using this measure, was slightly different in that it became negatively associated but was insignificant. In addition, the industry variable was also tested for robustness. The 46 firms in the study were initially classified into their respective industries using the SIC classification. This classification resulted in 13 industries, then the firms were further grouped and reclassified into a total of three dummy industry variables (i.e., Energy and Utilities, Manufacturing and Industrial, and Primary) that were finally used in the main model and coded as 0 or 1 depending on whether the firms belonged to these industries. However, as per Chitambo

and Tauringana (2014), and Cho, Freedman and Patten (2012), variations in industry classifications can affect the outcome, and therefore careful attention as to how industry variables are included in the model becomes essential. The firms were further reclassified into a single dummy industry variable and coded from 1 to 3 (i.e., 1 if the firm belonged to 'Energy/Utilities sector,' 2 if the firm belonged to 'Manufacturing and Industrial sector' and 3 if the firm belonged to 'Primary Industry sector'). The results from the rerun of the main model using this measure of industry indicated a minor change to the results (not tabulated) in that the industry dummy was negative but significant for the CACCP.

Summary and conclusion

This paper investigates the carbon financial accounting practices of 46 ETS-affected firms in Australia, and whether institutional pressures – coercive, mimetic and normative – play a role in determining their financial accounting for carbon. The paper investigates whether firm characteristics and market features such as regulation (coercive pressure); firm size, leverage, listing status and industry (mimetic pressure); and auditors (normative pressure) drive carbon financial accounting.

The ETSs have financial accounting implications, such as whether emission allowances are assets, how they should be valued and classified, how they affect the profit and loss statement, and how and when liabilities pertaining to emission allowances are recognised (Elfrink & Ellison, 2009). The accounting implications may be material in nature and financial amount and, therefore, research on the way in which the firms affected under ETS are financially accounting for carbon activities can help provide useful information to accountants, auditors, setters of accounting standards, investors, preparers of financial reports, researchers, government, regulators and other stakeholders (Warwick & Ng, 2012). In addition, accounting firms and professional accounting bodies have noted that various stakeholders require information pertaining to carbon emissions (KPMG, 2008; Haque & Deegan, 2010).

Only 28% of the 46 Australian firms in the study are financially accounting for carbon. For those who do account, the overall findings suggest that there is a lack of uniformity, consistency and transparency in their carbon financial accounting. This can lead to difficulties for stakeholders and investors in comparing the financial statements and other carbon-related information.

The lack of comparability is caused by the absence of a uniform accounting standard to guide the ETS-affected firms on how to financially account for carbon-emission allowances: these firms are adopting IAS 8, which allows them to have their own carbon financial accounting practices.

Some voluntary proposals provide recommendations on how a firm should financially account for carbon-emission allowances. However, these proposals have either been withdrawn (e.g., IFRIC 3); or have not provided recommendations on how to financially account for *all* stages (or life cycle)

associated with carbon-emission allowances; or have not included disclosure of the carbon financial accounting practice in their recommendations. This study thus adds to the carbon financial accounting literature by providing empirical evidence on the inconsistencies in carbon financial accounting practices, and highlights the need for uniform carbon financial accounting guidance. It is noted that disclosure of financial information pertaining to the impact of carbon emissions is arguably crucial for the operation of ETSs, and remains topical for standard setters and report users (Lovell, Bebbington, Larrinaga, & de Aguiar, 2013; Bebbington, Unerman, & O'Dwyer, 2014).

The majority of firms in the study measure free carbon-emission allowances at nil value or cost, which is contrary to IFRIC 3's recommendation that fair value be used. Generally, firms in the study did not disclose information about used or emitted carbon-emission allowances. The majority who did disclose recorded an expense and corresponding provision. The few firms in the study (17.4%) who disclosed purchased carbon-emission allowances recognised them as intangible assets and initially measured them at cost. Most firms (93%) did not provide information on surrendered carbon-emission allowances. Those who did recorded the surrendered units as a financial asset, along with the corresponding emissions liability being derecognised in the balance sheet. Where disclosed, sold carbon-emission allowances were mainly recorded as income.

In addition to the knowledge of *how* the affected companies are financially accounting for carbon-emission allowances, it is also necessary to know *why* the affected companies are financially accounting for carbon – what institutional pressures could be driving the ETS-affected firms' carbon financial accounting practices.

The results for the firms in the study indicate that coercive (regulation) and mimetic (size, leverage and listing status) pressures are influencing their carbon financial accounting practices. Regulation, leverage and listing status were found to be positively associated, whereas size was found to be negatively associated. This implies that the adoption of carbon financial accounting practice is higher for firms that are governed by stringent regulations, for high-leveraged firms and for firms that are listed on the stock exchange. Small-sized firms are keener to financially account for carbon compared to large-sized firms, possibly because financially accounting for carbon may give them increased transparency in the eyes of their stakeholders and further provide them with a competitive advantage. Both the small- and large-sized firms in the study chose to model (or mimic) their carbon financial accounting practices on similar-sized ETS-affected firms. Overall, the results suggest that institutional pressures do determine carbon financial accounting practice for Australian firms affected under Australian Carbon Tax (ETS).

The study has two limitations. First, the sample size is small, due to limited access to data given the voluntary setting in the carbon financial accounting area. In addition, the study does not consider the potential influence of corporate governance on the adoption of carbon accounting practice by the ETS-affected firms, and focuses only on size, leverage, listing status, regulation, auditors and industry as the potential determinants. Future research could replicate this study and explore a larger sample of ETS-affected firms from different countries with ETSs (for example, China). Future research

might also consider corporate governance as one of the determinants that may influence the carbon financial accounting practices of ETS-affected firms.

The paper contributes to discussions about how to provide climate-change-related corporate disclosures and accounting practices (Eleftheriadis & Anagnostopoulou, 2014) by outlining the corporate characteristics and market features that are most likely to have a positive effect on a firm's carbon financial accounting practice.

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