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# **Antecedents and Outcomes of Sustainable Shipping Practices: The Integration of Stakeholder and Behavioural Theories**

## **ABSTRACT**

This paper analyses the drivers and outcomes of sustainable shipping practices through the lenses of stakeholder, planned behaviour, and resource dependence theories. Theoretical models were systematically developed and compared using survey data collected from 186 shipping companies. The results reveal that a shipping company's stakeholder pressure, attitude, and behavioural control directly influence the adoption of sustainable shipping practices, and indirectly influence business performance. Furthermore, stakeholder pressure directly influences attitude, behavioural control, and business performance. This paper contributes to the integration of stakeholder and behavioural theories on sustainable practices. Strategies to improve the adoption of sustainable shipping practices are discussed.

**Keywords:** Sustainable Shipping; Sustainability; Business Performance; Stakeholder Theory; Theory of Planned Behaviour; Resource Dependence Theory

## **1. Introduction**

Shipping is a key facilitator of international trade (Lam, 2015). It is the most efficient mode of transport and is responsible for transporting approximately 90 per cent of world trade. Whilst it is relatively safe and clean, compared to other transport modes, the shipping industry has a significant impact on the society and environment. It accounts for 3 per cent of greenhouse gas emissions globally (Scott, 2014). Additionally, ships' main engines consume heavy fuel oil, the lowest grade of fuel oil, which contributes to global pollution considerably.

Sustainable shipping is recognised as one of the biggest challenges of the 21<sup>st</sup> century (Lirn et al., 2014). This is reflected by increased international regulations such as Energy Efficiency Design Index, Ship Energy Efficiency Management Plan, and Ballast Water Management System to curb greenhouse gas emissions or reduce the impact of invasive marine biological species from ship operations (Albert et al., 2013; Tzannatos and Stournaras, 2015). In addition, self-regulated or market-driven initiatives, technologies and measures, for instance, ISO 14000, ISO 26000, slow-steaming, cold-ironing, biocide-free paints, and renewable fuel alternatives are increasingly being adopted by shipping companies to lower operating cost, differentiate their services, as well as reduce the impact of their operations on the society and environment (Ballini and Bozzo, 2015; Maloni et al., 2013; Woo and Moon, 2014).

Sustainable shipping involves meeting the needs of the present without compromising the ability of future generations to meet their own needs. It requires shipping companies to

achieve a balance in their economic, social, and environmental performances (Cheng et al., 2015). The dimensions underlying sustainable shipping are ‘the environment’, ‘diversity’, ‘safety’, ‘human rights’, and ‘philanthropy’ (Carter and Jennings, 2002). Alternatively, it can be explained from the stakeholders’ perspective which involves satisfying the social and environmental needs or welfare of stakeholders comprising shareholders, customers, employees, suppliers, regulators, the community and environment at large (Yuen et al., 2016b).

Stakeholder theory has been instrumental in the existing literature to explain firms’ motivation for practising sustainability (Lozano et al., 2015). It suggests that the needs of shareholders cannot be met without satisfying, to some degree, the needs of other stakeholders (Sen and Cowley, 2013). Particularly from the institutional perspective, the notion is that stakeholders have the ability to exert mimetic, coercive, or normative pressure on firms to practise sustainability (Lai et al., 2013b; Zhu and Sarkis, 2007). Stakeholders’ ability to punish or reward confers them power to influence the performance outcomes of firms. This compels firms to integrate social and environmental concerns of stakeholders into their business operations while considering or maintaining the economic viability of these integrations (Pagell and Shevchenko, 2014).

Although stakeholder theory or pressure represents a central theme in legitimising the adoption of sustainable management or practices (Touboulic and Walker, 2015), it has not adequately accounted for *non-stakeholder-related drivers* arising from firms’ attitude, strategy or resource constraints. For instance, Philipp and Militaru (2011) revealed that a firm’s ecological purchasing behaviour (i.e. a component in sustainable practices) is motivated by its perceived compatibility between ecological attributes and functional services, the visibility of its ecological actions within the supply chain, and its overall ecological strategy. In another study, Yuen et al. (2017) suggested that the availability of slack resources and the configuration of existing competitive resources predict shipping companies’ decision to implement corporate social responsibility.

In general, sustainable practices can be viewed as an organisational behaviour reflecting the conduct of a firm’s social and environmental activities. Despite such observation, it is to the authors’ knowledge that very few studies have analysed sustainable practices from the behavioural perspective. Therefore, to bridge the gap in the literature, the aim of this study is to complement stakeholder theory with behavioural theories to analyse the drivers of

sustainable shipping, and examine their effects on the adoption of sustainable shipping practices and business performance.

The first objective of this paper is to introduce the theory of planned behaviour to examine the drivers influencing the adoption of sustainable practices in shipping companies. In this context, the theory asserts that a firm's (1) attitude, (2) perceived norms or pressure, and (3) perceived behavioural control influence the practice of sustainability (Montano and Kasprzyk, 2008). It encompasses the premise of stakeholder theory by considering the pressure exerted by stakeholders and their expectations of sustainability practices, reflecting the perceived norms of a firm. In addition, the theory also recognises the firm's instrumental and experiential beliefs (i.e. attitude) as well as its capacity or ability to practise sustainability (i.e. behavioural control).

The second objective of the paper is to examine the effects of a firm's attitude, perceived norms, behavioural control, and sustainable shipping practices on business performance. According to Carter and Rogers (2008), if a practice has a negative impact on the economic bottom line, it is not *sustainable*, regardless of its contribution to the environment or societies. Therefore, it is crucial that sustainable practices and their drivers are linked to business performance. Existing studies anchoring on stakeholder theory mainly analysed the relationships at the dyadic level (i.e. drivers-practice or practice-performance) rather than at the triadic level (i.e. drivers-practice-performance) (Lai and Wong, 2012; Lun et al., 2014; Yang et al., 2013; Yang, 2012; Zhu et al., 2016). In addition, this disconnection seems to suggest that the drivers of sustainable shipping practices have no direct effects on business performance (Pagell and Shevchenko, 2014). The current paper queries this assumption by drawing on resource dependence theory, a behavioural theory that links the motivations of a firm to business performance.

The remaining parts of the paper are organised as follow. First, three theoretical models were systematically developed, with each extending from its predecessor with the introduction of a theory. This incremental, hierarchical approach to model development allows the network of relationships posited by each theory to be empirically validated. Next, scales were developed to operationalise the constructs in each model. Thereafter, a survey questionnaire was developed and administered on shipping companies with business offices in Singapore. The data were then analysed and the results are presented and discussed. Finally, conclusions are drawn based on the results.

## 2. Theories, Theoretical Models and Hypotheses

The current paper proposes three theoretical models. Each model introduces a unique theoretical lens i.e. stakeholder theory, theory of planned behaviour, and resource dependence theory to identify the drivers of sustainable shipping practices and examine their effects on sustainable shipping practices and business performance. Figure 1 depicts the models and their anchoring theories.

*<Insert Figure 1 here>*

As shown in Figure 1, Model 1 serves as a baseline model which reflects the premise of stakeholder theory, and its views on the relationships between stakeholder pressure, sustainable shipping practices, and business performance. Herein, in this context, stakeholder pressure is referred to the degree of accountability an organisation perceives for the actions and decisions it has taken to address the sustainability needs of its stakeholders (Parmigiani et al., 2011). Model 2 addresses the first objective of the paper by introducing the theory of planned behaviour which expands the drivers of sustainable shipping practices with the introduction of two additional latent constructs, namely, attitude and behavioural control. Finally, Model 3 addresses the second objective by introducing resource dependency theory which specifies the connections between the drivers of sustainable shipping practices as well as their effects on business performance.

### 2.1 Stakeholder Theory

Stakeholder theory holds that managers should partake in sustainable practices since they have a moral obligation to satisfy a variety of constituents who have a legitimate (e.g. shareholders, customers and employees) or silent (e.g. the environment and community) interest on a firm (Freeman, 2010).

Stakeholder theory has been frequently used to explain firms' motivation for practising sustainability (Meixell and Luoma, 2015). Particularly, the motivation can be explained from the institutional perspective. In general, stakeholders such as the public, employees, customers, suppliers, and shareholders can exert coercive, normative, or mimetic pressure to influence firms to implement certain sustainable practices (Zhu and Sarkis, 2007).

In the context of shipping, coercive pressures could manifest from large shippers which are increasingly using ISO 14000 or ISO 26000 as a criterion for the award of shipping tenders (Pawlik et al., 2012). Similarly, such pressure could be exerted by regulators requiring ships to

comply to certain environmental targets such as low sulphur emission while trading in environmental sensitive areas. Normative pressure may arise from social norms and expectations of the public. This could vary across geographical locations, and increase in cultures where societies are environmental conscious and tend to prioritise environmental preservation over economic growth. Finally, mimetic pressure may result from industry-wide implementation of sustainable shipping practices helmed by first-movers such as Maersk line, COSCO, and Evergreen (Drobetz et al., 2014; Shin and Thai, 2015). As a result, the rest must follow suit to avoid a competitive disadvantage.

To comply with or alleviate the pressure exerted by stakeholders, shipping companies are compelled to practise sustainability, either proactively to satisfy future stakeholders' needs or reactively to comply with regulations. Therefore, the following hypothesis is proposed.

*H<sub>1</sub>: Stakeholder pressure has a positive effect on sustainable shipping practices*

Instrumental stakeholder theory suggests a positive link between practising sustainability and achieving corporate goals such as profitability or efficiency (Donaldson and Preston, 1995). The basic premise of instrumental stakeholder theory is that the needs of stakeholders must be managed and satisfied for firms to maximise their profits and ultimately, returns to shareholders. In that regard, instrumental stakeholder management can be viewed as 'a means to an end' (i.e. to maximise profits or value for the firm by practising sustainability) (Vallaster, 2017) and may not necessarily be implemented with the full interest on the welfare of stakeholders.

This strategic, non-altruistic view of managing sustainability resonates with Lin and Wong (2013) who reported that shipping companies favoured the adoption or implementation of certain greenhouse mitigation strategies such as optimising trim and ballast, and reducing speed that were perceived to generate sizable business value i.e. cost-savings. Apart from monetary benefits, sustainable ship practices were implemented with the intention to satisfy internal stakeholders i.e. employees (Sampson and Ellis, 2015). In light of a huge projected shortage in the supply of seafarers, shipping companies are adopting measures to retain seafarers. These measures include improving seafarers' living and working conditions, increasing their salaries, providing training opportunities, and engaging them through career progression plans (Thai et al., 2013). Finally, practising sustainability also improves the image and reputation of shipping companies. According to Yuen et al. (2016a), sustainable shipping

practices create functional, social, and emotional values that could lead to shippers' satisfaction, and subsequently, loyalty, and willingness to pay more for a shipping service.

Based on the above discussion, instrumental stakeholder theory suggests that sustainable shipping practices are implemented based on causal rules. As such, a sustainable practice is often adopted by shipping companies with the objective to either avoid negative consequences (e.g. service boycott by shippers or ship detention by port state controls) or to facilitate positive outcomes such as increased reputation and shippers' loyalty, employees' productivity, or financial investments from shareholders. Therefore, the following hypothesis is proposed.

*H<sub>2</sub>: Sustainable shipping practices have a positive effect on shipping companies' business performance*

## *2.2 Theory of Planned Behaviour*

Both hypotheses, H<sub>1</sub> and H<sub>2</sub>, are encapsulated in Model 1 which depicts the central tenet of stakeholder theory. However, the impetus to practising sustainable shipping practices may not necessarily originate from stakeholders (Wolf, 2014). The current paper extends stakeholder theory by anchoring on the theory of planned behaviour. According to the theory, an entity's likelihood to exhibit a specific behaviour, which in this context, refers to practising sustainable shipping, is influenced by its (1) *subjective norms associated with the behaviour*, (2) *attitude towards performing the behaviour*, and (3) *perceived control over the behaviour* (Ajzen, 1991).

An entity's subjective norms are influenced by its normative beliefs which refer to the approval or disapproval of significant referents in relation to performing a behaviour (Glanz et al., 2008). In a business-to-business (B2B) context such as shipping, significant referents can be referred to as a shipping company's key stakeholders. A shipping company which believes that its stakeholders approve (or disapprove) with its involvement in sustainable practices will hold a positive (or negative) subjective norm. The current paper argues this approval or disapproval of a shipping company's involvement of sustainable practices to be equivalent to pressure exerted by stakeholders on the shipping company (H<sub>1</sub>), which forms the basis of stakeholder theory.

In addition to stakeholder pressure or subjective norms, the theory of planned behaviour suggests that the attitude of a shipping company influences the adoption or performance of sustainable shipping practices. In this context, attitude reflects the shipping company's beliefs about the outcomes of performing sustainable shipping practices (behavioural beliefs),

weighted by the shipping company's evaluations of those outcomes. In a B2B context, the current paper argues that a shipping company's attitude is, to a large extent, underpinned by its management's vision and philosophy towards sustainability. For instance, Hargett and Williams (2009) revealed that Wilh. Wilhelmsen Shipping Company is proactive in implementing corporate social responsibility and sustainable shipping practices because they are viewed to be consistent with its company's values, goals and objectives. In addition, Yuen et al. (2017) noted that shipping companies are more likely to engage in sustainable activities when they are perceived to be congruent rather than trade-off with their existing competitive strategies, capabilities, and resources.

Apart from stakeholders' pressure, the aforementioned examples show that a shipping company's decision to implement sustainable shipping practices is also influenced by its attitude or management philosophy towards sustainability. Therefore, the following hypothesis is proposed.

*H<sub>3</sub>: Shipping companies' attitude towards sustainability has a positive effect on sustainable shipping practices*

Perceived behavioural control is determined by control beliefs concerning the presence or absence of facilitators and barriers to behavioural performance, weighted by their perceived power or the impact of each control factor to facilitate or inhibit the behaviour. In this context, a control factor could be the availability of slack resources in a shipping company. According to Brammer and Millington (2008), implementing sustainable activities generally requires a substantial amount of financial investments, and could increase the non-operating cost of a firm. As a result, shipping companies with limited financial resources will have less capacity to practise sustainability. To some extent, this argument aligns with Drobetz et al. (2014) and Pawlik et al. (2012) who found that shipping companies characterised by large firm's size, low financial leverage, and public ownership structure are more inclined to disclose or practise corporate social responsibility due to greater availability or access to financial resources. Therefore, the following hypothesis is proposed.

*H<sub>4</sub>: Shipping companies' perceived behavioural control on sustainability has a positive effect on sustainable shipping practices*

### *2.3 Resource Dependence Theory*



Resource dependence theory proposes that a firm's survival relies on its ability to acquire critical resources from the external environment (Pfeffer, 1972). It explains a firm's behaviour in terms of its context which views firms as open systems, dependent on contingencies in the external environment (Hillman et al., 2009). The term 'resources' refers to finance, knowledge, time, effort, materials, and capability that are valuable to a firm while 'dependence' denotes the firm's reliance on other parties to gain access to these valuable resources. 'Dependence' confers a certain amount of power held by other firms (e.g. suppliers, customers, and labour union), individuals (e.g. employees and shareholders), and institutions (e.g. government, public, and media) that held possession of the resources required by the firm. Hence, a firm's objective is to reduce its resource dependencies and increase its control over their resources by being less reliant on the external environment.

Applying resource dependence theory to this context, the resources that shipping companies require reside in their stakeholders. For instance, employees possess valuable knowledge, skills, and abilities to plan and manage their shipping companies' strategies and daily operations. Respectively, shippers and investors offer cash to shipping companies in exchange for their services and earnings/dividends. Business partners such as port operators or freight forwarders provide logistics services for shipping companies to complete their hinterland transportation. Finally, authorities such as flag states and port states sanction ships to fly their national flags and the freedom to navigate on international and territorial seas.

To ensure continual access and long-term availability of the resources, which are increasingly threatened by scarcity, overconsumption, and pollution, shipping companies can reduce their dependencies by implementing sustainable shipping practices. Apart from mergers and acquisitions which allow shipping companies to gain legitimate access to the resources of the acquired firms (Yuen and Thai, 2017a), sustainability shipping practices can be viewed as a relationship mechanism which focuses on enhancing stakeholders' satisfaction and building trust and commitment (Lun et al., 2016). This binds stakeholders to the firm and therefore, granting the shipping companies' long-term access to their resources. This is particularly pertinent to shipping companies whose stakeholders have high expectations of or exert strong pressures on the companies' involvement in sustainability, which aligns with resource dependence theory proposing that the extent of a company's behaviour (i.e. practising sustainability) is influenced by its environment (i.e. stakeholder pressures), as reflected in H<sub>1</sub>.

The current paper further posits that stakeholder pressure has impact on shipping companies in two aspects: (1) attitude and behavioural control, and (2) business performance.

Firstly, pressure exerted by stakeholders to practise sustainability is likely to transform shipping companies' attitude and behavioural control. Resource dependence theory views firms as open systems which dynamically adjust to *stimuli* in the external environment (Pfeffer, 1972). This adjustment to stimuli resonates with learning theories, in particular, stimulus-response theory which suggests that individuals or organisations are not static, and *learn* to perform a behaviour in response to a stimulus (Staats, 2013). In addition, there are suggestions that a stimulus first shapes attitude and behavioural control, which subsequently leads to the encouragement or discouragement of a behaviour (Chaiklin, 2011). According to stimulus-response theory, shifts in attitude and behavioural control resulting from a stimulus can be achieved through learning such as operant conditioning or cognitive dissonance (Vogel and Wanke, 2016).

Applying the above literature to this context, the current study posits that the stakeholder pressure is a stimulus that motivates shipping companies to implement sustainable shipping practices through shaping their attitude and behavioural control. To reduce resource dependencies, stakeholder pressure can compel shipping companies to learn via operant conditioning or cognitive dissonance, which results in a positive shift in attitude and behaviour control towards practising sustainability (Staats, 2013). For instance, with regards to operant conditioning, constant negative feedback or pressure from stakeholders on a shipping companies's lack of involvement in sustainability could cause its management to change their opinion and attitude towards practising sustainability with the objective of avoiding negative consequences or punishments. As for cognitive dissonance, conflicting beliefs concerning practising sustainability e.g. positive beliefs formed by stakeholders and existing negative beliefs formed by management concerning sustainability can result in a positive shift of attitude especially when the impetus or pressure from stakeholders is high. Based on the above arguments, stakeholder pressure can positively influence shipping companies' attitude towards practising sustainability and be viewed as a facilitator of their control beliefs. Therefore, the following hypotheses are proposed.

*H<sub>5</sub>: Stakeholder pressure has a positive effect on shipping companies' attitude towards sustainability*

*H<sub>6</sub>: Stakeholder pressure has a positive effect on shipping companies' perceived behavioural control on sustainability*

Secondly, there are instances where stakeholders can directly influence corporate goals or business outcomes of shipping companies. Resources possessed by stakeholders confer them power i.e. the ability to directly influence the performance of shipping company. In general, there are two sources of power that stakeholders can draw on: non-mediated and mediated (Liu et al., 2015). Whilst the former approach adopts a more reasoned, amicable approach to influence shipping companies' decisions using referent, expertise and information power, the latter adopts a more confrontational, transactional approach through exercising reward, coercive, and legitimate power.

Accordingly, mediated power confers stakeholders the ability to reward or punish shipping companies for their involvement (or lack of involvement) in sustainability. For instance, addressing pressure exerted by shippers to comply with their sustainability requirements could result in the award of shipping tenders and subsequently increased revenue for a shipping company (Pawlik et al., 2012). In a similar vein, ignoring pressure exerted by investors or employees could result in punishment such as the withdrawal of investors' funds or employees' loyalty and commitment leading to declined business performance (Yuen and Thai, 2017b). Lastly, port authorities may exercise legitimate power such as detention of ships for non-compliance of environmental regulations resulting in the loss of revenue for a shipping company. Based on the provided examples, the following hypothesis is proposed.

*H<sub>7</sub>: Stakeholder pressure has a positive effect on shipping companies' business performance*

### **3. Research Methodology**

#### *3.1 Measures*

Since this research involves the analysis of latent constructs, measures were developed to operationalise each construct (Table 1). For operationalising stakeholder pressure on sustainable shipping practices, pressures from five key stakeholders were measured (Sarkis et al., 2010). Accordingly, they are pressures from shippers (or customers), employees, shareholders, society, and regulators. A seven-point scale with 1 – extremely low to 7 – extremely high was used.

*<Insert Table 1 here>*

To measure shipping companies' attitude towards practising sustainability, five measures were adapted from Glanz et al. (2008) and Kim and Han (2010) to reflect both experiential (i.e. how it feels to perform sustainable shipping practices) and instrumental dimensions (i.e. whether performing sustainability shipping practices achieves something) of shipping companies' attitude. For each measure, bipolar adjectives (e.g. irrelevant vs. relevant) were used as endpoints in the response anchor to capture shipping companies' overall evaluation of their attitude towards performing sustainable shipping practices.

Five measures were adapted from Glanz et al. (2008) and Kim and Han (2010) to operationalise shipping companies' behavioural control on practising sustainability. As shown in Table 1, the first three measures (BC1 – BC3) reflect shipping companies' self-efficacy (i.e. capacity) in relation to implementing sustainable shipping practices. Accordingly, self-efficacy is measured by shipping companies' ability, resources, and confidence. The remaining two measures (BC4 – BC5) reflect shipping companies' autonomy or controllability in implementing sustainable shipping practices.

To measure sustainable shipping practices, seven measures were directly adopted from the studies of Lu et al. (2009), Lai et al. (2013a), Shin and Thai (2015). The measures were chosen to reflect facets of sustainable shipping practices targeted at various stakeholders such as shippers (SS1), employees (SS2), shareholders (SS3), society (SS4), regulators (SS5), and the environment (SS6 – SS7). The selected measures have been shown to be valid and reliable in the context of shipping and are therefore chosen in this study. The approach of segmenting sustainable shipping practices into facets which address the sustainability concerns of various stakeholders is commonly adopted by previous studies in the context of shipping (Lu et al., 2009; Yang et al., 2013; Yuen et al., 2016b). An alternative approach is to operationalise sustainable shipping practices based on their activities (Lai et al., 2013a; Lun et al., 2014).

Although sustainability is commonly associated with the triple bottom line, which seeks to address environmental and societal concerns along with achieving economic performance (Meixell and Luoma, 2015), it is noted that many sustainability indexes have excluded the economic dimension in their evaluation. For instance, referring to a few popular indexes, Kinder, Lydenberg, and Domini (KLD) Database utilises eight attributes of social and environmental activities (i.e. community relations, employee relations, environment, product, treatment of women and minorities, military contracts, nuclear power, and South Africa) to produce an index that reflects the sustainability behaviour of a company. Similarly,

Sustainalytics employs [three dimensions relating to a company's social, environmental, and governance practices](#).

The same observation is noted in scale development studies in the general management or shipping literature. For instance, Wolf (2014) operationalised sustainable supply chain management using three social and environment conditions concerning social supply chain standards, supply chain monitoring systems, and green procurement. Turker (2009) developed a scale that reflects a company's responsibility to the society, employees, customers, and government. Lu et al. (2009) developed a scale for container shipping comprising community involvement and environment, employee and consumer interests, and disclosure. Finally, Lun et al. (2014) developed a scale for green shipping practices which concerns company policy and procedure, shipping documentation, shipping equipment, shipper cooperation, shipping materials, and shipping design for compliance.

Turker (2009) explained that the exclusion of the economic dimension in measuring corporate sustainability is that it represents the basic function of businesses in the society, and is the reason for existence of a business, rather than a responsibility to the society or environment. In the other words, the economic dimension of sustainability mainly serves a company's profit and has little bearings on the ability of the future generations of meeting their own needs, which is a central idea in the definition of sustainability. Therefore, in the measurement of sustainability practices, it should address and reflect concerns, needs, and goals of the society and environment, and transcend beyond economic interest of a company (Daft, 2003; Davis, 1973). This indicates that the operationalisation of sustainable practices includes an implicit rather than explicit recognition of economic responsibility (Carter and Jennings, 2004). These practices should be implemented with the consideration that they do not affect companies' ability to make normal profits from its economic activities, which is consistent with the triple bottom line principle of achieving a balance between social, environmental, and economic performance (Carter and Rogers, 2008).

Aligned with the above observations, previous literature on sustainable practices, and arguments, this study has excluded the economic dimension in measuring sustainable shipping practices. Instead, the economic dimension is reflected in the business performance of a shipping company. Measures for business performance were adopted from Lu et al. (2009), Ortega (2010), and Brik et al. (2011). The first two measures (BP1 and BP2) reflect the leading performance indicators of a firm. They are customer satisfaction and employee satisfaction. A

7-point scale with 1 – strongly disagree and 7 – strongly agree was adopted. The remaining three measures (BP3 – BP5) reflect the lagging indicators i.e. financial performance of a firm. A scale of 1 – much worse and 7 – much better was employed to evaluate a firm's financial performance against its major competitors over the past three years. Using competitors as references in the evaluation minimises self-evaluation bias while stipulating a time-frame of three year reduces short-term variation in evaluating the financial performance of the firm.

### *3.2 Survey Design*

The survey comprises three sections. The first section of the survey introduces the concept of sustainability in the context of shipping and explains its objectives which are to study the extent of sustainability being practised by shipping companies as well as understand the motivators and outcomes of practising sustainability from the stakeholders' and behavioural perspective. Since the measures presented in Table 1 require participants to possess good knowledge of their firms' sustainable practices and business performance, a request to forward the survey to a suitable candidate was stated. The candidate should preferably be managing the company's sustainable practices or activities, possess several years of experience working in the company, hold a managerial position, and have knowledge of the company's performance and financial situation. The survey also assures the anonymity of the participants and their affiliations to elicit truthful, unbiased responses.

The second section of the survey encompasses the measures presented in Table 1. The participants were requested to rate each measure in accordance with the given scale or response anchor. To minimise common method variance, which is a form of response bias resulting from the use of a single instrument for data collection, a time lag of at least one month was introduced between the completion of the exogenous (i.e. stakeholder pressure, attitude, and behavioural control) and endogenous measures (i.e. sustainable shipping practices and business performance). This temporal separation of data collection was noted to considerably correct for common method bias (Podsakoff et al., 2012).

The third section encompasses questions pertaining to the respondent and the associated shipping company. Information such as the respondent's present designation, department, years of experience in the company, and e-mail address was collected. In addition, information on the respondent's company such as firm age, firm size, sector (bulk or container) was also obtained.

### *3.3 Sampling Frame and Survey Administration*

An internet survey was designed and targeted at shipping companies. To avoid missing data and the need for data imputation, the respondents are prompted to complete all survey questions before they can submit the survey online. In this study, a shipping company is defined as a commercial entity that owns or operates ships. This excludes non-vessel operating common carriers or freight forwarders, agents, or brokers that do not own or operate ships. The exclusion is necessary as a few measures of sustainable shipping practices require the respondents' companies to own or operate ships. This study further limits its scope to two broad types of commodity shipping companies i.e. container and bulk (both dry and liquid) shipping companies (Branch and Stopford, 2013). Other types of shipping companies such as specialised-cargo shipping companies, passenger shipping companies, and those that own or operate a mixed fleet of ships were excluded from the search.

The sampling frame was built from combining three online directories i.e. Lloyd's List, Green Book Directory, and Singapore Maritime Industry, Products and Services Directory. Lloyd's List was selected because it is one of the leading maritime intelligence companies in the world. In addition, in the directory, it provides information about the registered companies such as their ownership type (e.g. shipowner or operator), location of the company (e.g. Singapore), and commodities transported (e.g. bulk or containerised cargo). This facilitates filtering of the search results. The search for shipping companies is further complemented by two reputable local directories i.e. Green Book Directory and Singapore Maritime Industry, Products and Services Directory to identify the remaining registered shipping companies in Singapore. In total, 1,583 shipping companies with business offices in Singapore were consolidated from these directories.

The data collection of this study began on 1st October 2016 and ended on 15th April 2017. The survey invitation and questionnaire were sent via e-mail to the correspondent of each shipping company with the request to forward the survey to a suitable candidate in the company. The survey respondents were required to complete phase one of the survey which includes the exogenous measures in the second section of the survey as well as all the questions in the third section of survey. Thereafter, a month after completing phase one of the survey, an e-mail was sent to the respondents to complete phase two which comprises the endogenous measures in the survey. Monthly reminders were sent to the respondents for the completion of the survey. In the event that the survey was not completed after three months, the e-mail address and/or correspondent of the shipping company was updated, and an invitation to participate was again sent to the shipping company.

### *3.4 Sample Statistics*

As mentioned earlier, the survey administration comprises two phases. Phase one of the survey collects information on the exogenous variables of the respondent's company while phase two of the survey collects information on the endogenous variables of the respondent's company. For the first phase of the survey administration, 227 responses were received. Subsequently, for the second phase of the survey administration, the respondents were contacted again to complete the remaining sections of the survey questionnaire. However, only 186 of them completed the survey. As a result, a response rate of approximately 12% was achieved.

To test for non-response bias, two approaches were adopted. Accordingly, they are the (1) extrapolation approach and (2) non-response, follow-up study.

The first approach involves comparing the responses between the early and late respondents (Armstrong and Overton, 1977). The notion is that subjects who respond less readily (or late) are more likely non-respondents. Under this approach, the means of the measures were compared between the first 50% and last 50% of the respondents using t-tests. No significant differences were found between both groups, which suggests the absence of non-response bias.

The second approach involves conducting non-response, follow-up surveys with shipping companies that have not responded. The underlying reason for employing this approach is to address the issue of 'interest' whereby individuals who are more interested in the subject may respond more readily to a survey. In this context, there is a potential social desirability issue i.e. the current sample may be biased as it mainly comprises shipping companies that are active in implementing sustainable practices or activities.

To examine the impact of social desirability on the data, 30 shipping companies which have not responded to the survey were randomly selected, and contacted. A sample size of 30 was targeted so that the distribution of the sample mean is close to normal distribution based on Central Limit Theorem. The assumption of normality is critical to testing mean differences. In the event that a selected shipping company declined to be surveyed or could not be contacted, another shipping company that did not respond was randomly selected without replacement. During the follow-up call, the respondents were requested to comment on their reasons for not participating in the survey. In addition, to encourage participation and minimise their workload, the respondents were invited to rate the measures for sustainable shipping practices (SS1 to SS7) and business performance (BP1 to BP5) of their shipping companies presented in Table



1. Subsequently, tests of mean difference between the respondents and non-respondents for both constructs ‘sustainable shipping practices’ and ‘business performance’ were conducted. The p-values of both tests are 0.23 and 0.35 respectively, suggesting no significant differences in the responses between respondents and non-respondents.

The profile of the respondents and their companies is summarised in Table 2. As shown in Table 2, about 91% of the respondents are holding designations of managers and above. In addition, approximately 81% of them have worked at least five years in their company. This suggests that the respondents possess sufficient knowledge and experience about their companies and can answer the survey questions reliably and accurately.

*<Insert Table 2 here>*

From Table 2, most of the survey respondents are from the commercial (39%) or technical department (35%). They were nominated by the correspondents of their companies to be qualified, subject experts who possessed sufficient knowledge about their companies sustainable shipping practices and business performance. The limited number of respondents from the sustainability department may suggest that most shipping companies are lacking a department that is dedicated to managing sustainable activities. Instead, these activities are tied with the daily commercial and operations of a shipping company.

#### **4. Results and Discussion**

This section is divided into four parts. The first sub-section examines issues associated with the developed measures. This includes evaluating the goodness-of-fit of the measurement model, the reliability and validity of the measures, and common method variance. The second sub-section compares the structural models and tests the hypotheses of this study depicted in Figure 1. The third sub-section presents and discusses the best-fitting structural model. All model estimations were performed using the software, LISREL 8.80. The fourth sub-section examines endogeneity issues in the best-fitting structural model.

##### *4.1 Measurement Model Analysis*

Prior to comparing the models depicted in Figure 1, a confirmatory factor analysis was conducted to examine overall model fit, and reliability and validity of the measures. Table 3 shows the standardised factor loadings ( $\lambda$ ), average variance extracted (AVE), and composite reliability (CR) of the measures or constructs. The fit indices of the measurement model are presented in the footnotes of Table 3.

The following fit indices are used to evaluate the goodness-of-fit of the measurement model. They include minimum fit function chi-square ( $\chi^2$ ), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR). Accordingly, their values are  $\chi^2=526.93$  ( $p<0.05$ , degree of freedom (df)=314); CFI=0.97; TLI=0.97; RMSEA=0.021; SRMR=0.032. Overall, the fit indices meet the cut-off criteria specified by Hu and Bentler (1999), suggesting good model fit.

The reliability of the measures was assessed using CR which estimates the extent to which a set of construct measures share in their measurement of a construct (Hair et al., 2010). As depicted in Table 3, the CRs of the constructs range from 0.87 to 0.90, which are well above the acceptable benchmark of 0.70, suggesting internal consistency. This suggests that the measures reliably represent their intended constructs.

The validity of the measures was ascertained based on convergent and discriminant validity. Table 4 presents the AVE, correlations, and squared correlations of the constructs which are required to test validity. The AVEs of the constructs are above the recommended value of 0.50, indicating convergent validity. In addition, the AVEs of any pair of constructs are greater than their squared correlations suggesting discriminant validity. This indicates that the measures are accurately operationalising their intended constructs.

*<Insert Table 3 here>*

*<Insert Table 4 here>*

To provide evidence that the self-reported measures of business performance are valid, a sample size of 30 shipping companies were randomly selected from the 94 companies which have participated in the survey and published their financial records in the public domain. Their ROI, profit growth and sales growth for the past three years were calculated. Subsequently, the correlations of these objective financial indicators with their equivalent self-reported measures were estimated. Accordingly, the correlations are 0.58, 0.67, and 0.62, which are positive and significant ( $p < 0.05$ ). Therefore, the null hypothesis of independence between the variables is rejected at a confidence level of 95%. This indicates that the self-reported measures are reasonable substitutes for objective financial measures in this study (Ortega, 2010; Spanos and Lioukas, 2001).

Given that all data were collected from a single source, common method bias could affect the validity of the results. To test common method bias, the fit indices of the measurement model (see footnotes of Table 3) were compared with the fit indices of a one-factor model where all 27 measures were loaded on a single factor. The fit indices of the one factor model are  $\chi^2=1802.03$  ( $p<0.05$ ,  $df=324$ ),  $CFI=0.80$ ;  $TLI=0.78$ ;  $RMSEA=0.19$ ;  $SRMR=0.15$ . The indices are considerably worse than those of the measurement model. Therefore, common method bias is not a major issue in this study.

#### *4.2 Structural Model Comparison*

As shown in Figure 1, this study introduces three theory-driven models,  $M_1$ ,  $M_2$ , and  $M_3$ , with each extending on the previous model and emphasising on a specific theory. The models were estimated using the survey data collected from shipping companies. Both the size and sector of shipping companies were used as control variables in this study to adjust for sectorial and size differences in stakeholder pressure, sustainability shipping practices, and business performance.

The fit indices of the models are presented in Table 5 to facilitate comparison. The comparison is performed in a pair-wise fashion whereby  $M_1$  is first compared with  $M_2$ . Subsequently, the superior model is compared with  $M_3$ , which integrates all three theoretical lenses (i.e. stakeholder theory, theory of planned behaviour, and resource dependence theory) and is expected to be the best fitting model in this study.

*<Insert Table 5 here>*

From the viewpoint of structural equation modelling,  $M_1$  with  $M_2$  are non-nested models because neither of them is a subset of the other (Kline, 2010). Due to such property, likelihood ratio tests such as chi-square difference test could not be applied to determine the superiority of the models. Therefore, the current study relies on several fit indices for model selection (Rust et al., 1995). First, the chi-square fit indices favour  $M_2$ . Accordingly, the chi-square values, weighted by the degrees of freedom ( $\chi^2/df$ ) for  $M_1$  and  $M_2$  are 2.88 and 1.90. Since a larger  $\chi^2/df$  points to bad fit while a smaller  $\chi^2/df$  indicates good fit, the result suggests that  $M_2$  possesses better goodness-of-fit than  $M_1$ . Next, comparing other fit indices such as the CFI, TLI, and RMSEA of both models, it is apparent that  $M_2$  outperforms  $M_1$ . Moreover, the CFI and TLI of  $M_1$  are not acceptable based on the cut-off criteria prescribed by Hu and Bentler (1999). Finally, the addition of two latent predictors of sustainable shipping practices in  $M_2$

which are shipping companies' attitude and behavioural control, have considerably increased the squared-multiple correlation ( $R^2$ ) of sustainable shipping practices from 0.41 to 0.69. A proportionate increase of approximately 68% was observed. Based on the evidences presented above,  $M_2$  was proposed to be the superior model. From the theoretical perspective, it can be implied that the theory of planned behaviour complements stakeholder theory by providing stronger explanations for shipping companies' adoption of sustainable shipping practices.

$M_3$  differs from  $M_2$  with the inclusion of three structural paths as represented by  $H_5$ ,  $H_6$ ,  $H_7$ . This explains for the difference of three degrees of freedom in the models. In this light,  $M_2$  i.e. the restricted model can be viewed to be nested in  $M_3$  i.e. the full model. Due to such unique property, the models can be formally compared using chi-square difference test (Kline, 2010). As shown in Table 5, the addition of three structural paths has led to an improvement of model fit (i.e.  $\chi^2 = 701.8 - 627.76 = 74.04$ ). This improvement is significant at 99% confidence level since the chi-square value with three degrees of freedom is 11.34 ( $\chi^2_{3,0.01} = 11.34$ ). Therefore,  $M_2$  is rejected while  $M_3$  is accepted. The decision is further supported by TLI and RMSEA where slight improvements to these indices are noted. In addition, the specification of stakeholder pressure as a direct predictor of business performance has considerably improved the  $R^2$  of business performance from 0.30 to 0.42; an improvement of approximately 40% was recorded. From the theoretical angle, the acceptance of  $M_3$  suggests that resource dependence theory further reinforces the theory of planned behaviour by drawing connections among the predictors of sustainable shipping practices as reflected in  $H_5$  and  $H_6$ . In addition, it strengthens stakeholder theory by proposing a direct relationship between stakeholder pressure and business performance of shipping companies as reflected in  $H_7$ .

#### *4.3 Structural Model Analysis*

The structural parameters of  $M_3$ , which is the best fitting model, were estimated and presented in Figure 1. The estimates of the structural paths linking the latent constructs as well as control variables were standardised to aid discussion. In addition, the  $R^2$  of the endogenous constructs were also reported. As shown in Figure 24, all hypothesised paths ( $H_1 - H_7$ ) are positive and significant at 95% confidence level. Therefore, all hypotheses are accepted.

*<Insert Figure 2 here>*

Prior to discussing  $M_3$ , a statistical power analysis recommended by Cohen (1988) and Christopher Westland (2010) was conducted to determine the minimum size required to avoid

committing a Type II statistical error ( $\beta$ ), which refers to the incorrect rejection of an effect that is actually significant. By conventions, the desired statistical power ( $1 - \beta$ ) and alpha value ( $\alpha$ ) were fixed at 0.80 and 0.05 respectively. As shown in Figure 2, the number of latent and observable variables are 5 and 29. Consequently, based on these information, the minimum sample sizes required to detect significant effect sizes of 0.1, 0.3, and 0.5 were estimated. Accordingly, the values are 1559, 172, and 38. The current sample size ( $n=186$ ) is sufficient to detect significant effects with estimates of 0.3 and above, which generally covers all estimated relationships between the key constructs presented in Figure 2. More importantly, it indicates that caution should be exercised when interpreting non-significant relationships with effect size lesser than 0.3. As shown in Figure 2, there are four non-significant effects, and they emanate from the control variables with effect sizes ranging from 0.01 to 0.11. To confidently ascertain that these effects are truly non-significant, a sample size of approximately 1,599 or more is needed. This is not possible given the current sample size of this study. Nevertheless, as these effect sizes are considered small ( $\leq 0.11$ ) and does not relate to the hypotheses of this study, they can be viewed as inconsequential and have little effects on distorting the key parameter estimates of  $M_3$ .

Regarding the control variables, the results show that sector has a significant effect on stakeholder pressure ( $\gamma_{se-sp}=0.21, p<0.05$ ). Given that sector is a dichotomous variable with '0' being container shipping companies and '1' being bulk shipping companies, it can be interpreted that bulk shipping companies generally face greater pressure from their stakeholders to implement sustainability practices as compared to container shipping companies. Sustainability in shipping is often identified as synonymous with safety and environmental protection (Fafaliou and Aroni, 2016). Since bulk shipping companies, in particular, tanker shipping companies are exposed to greater safety risks or engaged in operations with a greater environmental impact, their stakeholders may exert greater pressure on them to implement sustainable shipping practices. Next, firm size has a positive influence on sustainable shipping practices ( $\gamma_{fs-sp}=0.20, p<0.05$ ). This indicates that larger shipping companies are practising sustainability more actively than smaller shipping companies. In this study, firm size is measured by the number of employees in this study. From the economic perspective, larger shipping companies provide greater opportunities for division of labour and specialisation of skills. Subsequently, employees possessing relevant specialisation in sustainability can implement sustainable shipping practices more efficiency resulting in higher level of sustainable shipping practices.

Stakeholder pressure has a positive effect on the adoption of sustainable shipping practices ( $\gamma_{sp-ss}=0.34$ ,  $p<0.05$ ). Consequently, sustainable shipping practices have a positive effect on the business performance of shipping companies ( $\beta_{sp-bp}=0.30$ ,  $p<0.05$ ). The results demonstrated that by addressing pressures exerted by stakeholders through sustainable shipping practices, business performance of shipping companies can be improved. This finding aligns with instrumental stakeholder theory which posits that business performance cannot be maximised without addressing the needs of various constituents that have a vested interest in the company.

Apart from stakeholder pressure, attitude ( $\beta_{at-ss}=0.28$ ,  $p<0.05$ ) and behavioural control ( $\beta_{bc-ss}=0.27$ ,  $p<0.05$ ) towards sustainability shipping practices also have positive effects on their adoption. In this context, the attitude of shipping companies can be referred to their philosophy or belief towards sustainability. This belief is influenced by the firms' affect and perceived utility of practising sustainability. Behavioural control relates to the presence of barriers or facilitators of adopting sustainable shipping practices. These barriers or facilitators influence shipping companies' capacity (e.g. availability of resources) or autonomy (i.e. freedom) to practise sustainability. The findings are largely consistent with the general framework of the theory of planned behaviour which views subjective norms (i.e. pressures from significant references), attitude, and behavioural control as key predictors of a behaviour.

Stakeholder pressure also partially explains shipping companies' attitude ( $\gamma_{sp-at}=0.47$ ,  $p<0.05$ ,  $R^2=0.31$ ) and behavioural control towards practising sustainability ( $\gamma_{sp-bc}=0.45$ ,  $p<0.05$ ,  $R^2=0.30$ ). This finding supports resource dependence theory which views firms as open systems that constantly strives to reduce their dependencies on resources residing in the external environment or in this context, the stakeholders. Practising sustainability can improve shipping companies' relationships with stakeholders, garner stronger commitment from stakeholders, and grant shipping companies' access to the resources from stakeholders in the long-term. As supported by the results, strong stimuli in the external environment, for example, pressure exerted by stakeholders to practise sustainability can positively shape shipping companies' attitude towards practising sustainability through operant conditioning. For instance, constant negative feedback from stakeholders on a shipping companies' lack of involvement in sustainability could influence its attitude to avoid negative consequences such as the withdrawal of resources from stakeholders. In a similar vein, stakeholder pressure can be seen as a facilitator that positively influences shipping companies' control over their behaviour i.e. practising sustainability. Stakeholder pressure provides strong impetus for the

management of shipping companies to prioritise and allocate more resources for implementing sustainable practices, which could enable shipping companies to overcome the perceived difficulties or challenges associated with practising sustainability.

Lastly, stakeholder pressure has a direct positive effect on business performance ( $\gamma_{sp-bp}=0.20, p<0.05$ ). This finding is again consistent with resource dependence theory. Valuable organisational resources held by stakeholders also confer them the power to reward (or punish) a shipping companies' active (or lacklustre) involvement in sustainability, and therefore, directly influencing business outcomes. For instance, shippers possess the power to switch to another service operator when their sustainability needs are neglected. This results in declined revenue for the shipping companies. Employees may withdraw their commitment to a shipping company resulting in attrition, loss of knowledge and productivity. Similarly, shareholders may withdraw or stop further financial investments. In addition, port authorities may exercise legitimate power such as detaining ships that do not comply with the port state's environmental laws. All the above examples demonstrate that stakeholders can directly influence corporate goals i.e. both financial and non-financial goals of a shipping company.

#### *4.4 Direct, Indirect, and Total Effect Analysis*

With reference to Figure 2, which is the theoretical model, it is observed that stakeholder pressure has both direct and indirect effects on sustainable shipping practices and business performance, suggesting a partially-mediated relationship. The current study employs the approach proposed by Hair et al. (2010) and Cohen et al. (2013) to ascertain partial-mediation relationships. Based on the principle that no-mediation, full-mediation, and partial-mediation are mutually exclusive events, the approach involves an elimination process by disproving no-mediation and full-mediation relationships in the theoretical model.

Firstly, no-mediation relationships can be rejected if it can be shown that the direct effects of stakeholder pressure on sustainable shipping practices and business performance diminish in magnitude with the inclusion of mediators (Cohen et al., 2013). Accordingly, the direct effects of stakeholder pressure on sustainable shipping practices and business performance, with the inclusion of control variables i.e. firm size and sector but without mediators are 0.54 and 0.47. However, with the inclusion of control variables and mediators (refer to Figure 2), the direct effects of stakeholder pressure on sustainable shipping practices and business performance are 0.34 and 0.20 respectively. The magnitude of both direct effects are considerably smaller than those in the absence of mediators. This indicates the presence of

significant mediators in the theoretical model, and therefore, the proposition of no-mediation is not supported.

Secondly, full-mediation relationships can be rejected if it can be shown that the direct effects of stakeholder pressure on sustainable shipping practices and business performance remain significant after the inclusion of mediators in the theoretical model (Cohen et al., 2013). For this purpose, two alternative models were developed. The first alternative model ( $M_{A1}$ ) is a replica of the theoretical model but with the exclusion of  $H_1$ , which represents the direct relationship between stakeholder pressure and sustainable shipping practices. The second alternative model ( $M_{A2}$ ) is also a replica of the theoretical model but with the exclusion of  $H_7$ , which represents the direct relationship between stakeholder pressure and business performance. The chi-square fit indices of  $M_{A1}$  ( $\chi^2 = 644.50$ ,  $df = 367$ ) and  $M_{A2}$  ( $\chi^2 = 635.71$ ,  $df = 367$ ) were then compared with the theoretical model ( $\chi^2 = 627.76$ ,  $df = 366$ ). The results reveal a significant loss in model-fit when the theoretical model is reduced or constrained to  $M_{A1}$  or  $M_{A2}$  ( $p < 0.05$ ). This indicates that the direct effects of stakeholder pressure on sustainable shipping practices and business performance remain significant even after accounting for the direct effects of the mediators. Therefore, the proposition of full-mediation is not supported.

Based on the above tests, it can be concluded that the effect of stakeholder pressure on sustainable shipping practices is partially-mediated by a shipping company's attitude and behavioural control. Similarly, the effect of stakeholder pressure on business performance is partially-mediated by a shipping company's attitude, behavioural control, and sustainable shipping practices. Table 6 summarises the direct, indirect, and total effects of the exogenous variables on key endogenous variables which include sustainable shipping practices and business performance.

*<Insert Table 6 here>*

As shown in Table 6, the antecedents of sustainable shipping practices i.e. stakeholder pressure ( $a_{11} = 0.34$ ), attitude ( $a_{21} = 0.28$ ), and behavioural control ( $a_{31} = 0.27$ ) have relatively moderate direct effects on sustainable shipping practices. This highlights their irreplaceable roles in directly motivating the implementation of sustainable shipping practices. However, not all of them have a direct influence on business performance. It is observed that only stakeholder pressure ( $a_{12} = 0.20$ ) and sustainable shipping practices ( $a_{42} = 0.30$ ) have direct effects on business performance.



Furthermore, among the three antecedent variables, only stakeholder pressure has a moderate indirect effect ( $b_{11} = 0.25$ ) on sustainable shipping practices. The effect is channelled via attitude and behavioural control, which suggests that stakeholder pressure aids in the formation of attitude and behavioural control, and subsequently, the implementation of sustainable shipping practices. Next, stakeholder pressure ( $b_{12} = 0.18$ ), attitude ( $b_{22} = 0.08$ ), and behavioural control ( $b_{32} = 0.08$ ) are noted to have indirect effects on business performance. The indirect effect of stakeholder pressure is considerably larger than the indirect effects of the other two antecedent variables. Specifically, the effect is channelled via three paths (1. stakeholder pressure  $\rightarrow$  attitude  $\rightarrow$  sustainable shipping practices  $\rightarrow$  business performance, 2. stakeholder pressure  $\rightarrow$  sustainable shipping practices  $\rightarrow$  business performance, and 3. stakeholder pressure  $\rightarrow$  behavioural control  $\rightarrow$  sustainable shipping practices  $\rightarrow$  business performance) while the indirect effects of the other two antecedent variables are channelled via sustainable shipping practices.

The total effects of stakeholder pressure ( $c_{11}$ ), attitude ( $c_{21}$ ), and behavioural control ( $c_{31}$ ) on sustainable shipping practices are 0.59, 0.28, and 0.27 respectively. The total effect of stakeholder pressure is considered large and possessed about twice the magnitude of the other two antecedent variables, which have moderate total effects on sustainable shipping practices. Again, this finding suggests the uniqueness and importance of all three antecedent variables in driving the implementation of sustainable shipping practices. Finally, the total effects of stakeholder pressure ( $c_{12}$ ), attitude ( $c_{22}$ ), behavioural control ( $c_{32}$ ), and sustainable shipping practices ( $c_{42}$ ) are 0.38, 0.08, 0.08, and 0.30. Stakeholder pressure and sustainable shipping practices have large total effects on business performance. They can be viewed as the key contributors of business performance. On the other hand, attitude and behavioural control have relatively small total effects on business performance.

#### *4.5 Endogeneity Test*

A possibility exists that sustainable shipping practices may be endogenously influenced by business performance, which may lead to biased and inconsistent results (Greene, 2003). To examine the potential endogeneity bias, a two-stage least squares regression (2SLS) with instrumental variables was adopted (Liu et al., 2016).

To conduct the 2SLS regression, instrumental variables for sustainable shipping practices must be identified. In this study, firm size and firm age were identified as potential instrumental variables because they were reported to be significantly related to sustainable

shipping practices and not significantly related to business performance (Lee, 2015; Tam and Tan, 2007; Withisuphakorn and Jiraporn, 2016). In addition, based on the theoretical arguments presented in the literature review section, the attitude and behavioural control of shipping companies towards sustainability were also selected as instrumental variables as they were argued to influence sustainable shipping practices and not business performance.

Subsequently, for the first stage of the 2SLS regression, sustainable shipping practices were regressed on all assumed instrumental variables. The  $R^2$  of the first stage regression model is 0.72 indicating that firm size, firm age, attitude, and behavioural control are effective instrumental variables for sustainable shipping practices. Based on the regression model, the predicted values of sustainable shipping practices and residual of each observation were calculated. For the second stage of the 2SLS regression, business performance was regressed on the predicted value of sustainable shipping practices. The beta-coefficient was positive and significant ( $\beta = 0.49$ ,  $p < 0.05$ ).

After conducting the 2SLS regression, a Durbin-Wu-Hausman post-estimation test of endogeneity was performed (Davidson and MacKinnon, 1993). An augmented regression was conducted by regressing business performance on sustainable shipping practices, the four instrumental variables, and the residual obtained from the first stage 2SLS regression. The beta coefficient of the residual was insignificant ( $\beta = 0.06$ ,  $p > 0.05$ ). This indicates that the endogeneity test associated with sustainable shipping practices was insignificant, and thus the null hypothesis that the construct is exogenous cannot be rejected. Accordingly, it can be concluded that the results and conclusions are unlikely to be influenced by endogeneity.

## **5 Conclusion**

### *5.1 Summary of Findings*

The objective of this study is to identify and examine the antecedents and outcomes of sustainable shipping practices through the theoretical lenses of stakeholder theory and firm behavioural theories, which include the theory of planned behaviour and resource dependence theory. Three theoretical models were developed based on a systematic, hierarchical approach where each model was extended from the previous model and further refined using an anchoring theory. A survey was conducted on 186 shipping companies operating in Singapore and the collected data were analysed using structural equation modelling. The models were compared using a series of tests which include non-nested, or nested model comparison techniques. The results show that each model outperforms its predecessor in terms of model fit

and explanatory power, suggesting that all three theories are complementary, and crucial for this study. Relating to the objective of this study, the results reveal that: (1) stakeholder pressure, (2) shipping companies' attitude and (3) behavioural control towards practising sustainability are the antecedents of sustainable shipping practices. In addition, the effect of stakeholder pressure on sustainable shipping practices is partially-mediated by shipping companies' attitude and behavioural control. Finally, it was found that both stakeholder pressure and sustainable shipping practices directly influence the business performance of shipping companies.

### *5.2 Theoretical and Managerial Implications*

The contributions or implications of this study are two-folds; theoretically and managerially. From the theoretical perspective, this study enriches the literature on sustainable practices whereby their motivation and consequences are often explained using stakeholder or institutional theory (Meixell and Luoma, 2015). This study offers an alternative theoretical angle to understand this area of research with the introduction of behavioural theories i.e. the theory of planned behaviour and resource dependence theory. The current study argues that sustainable shipping practices are a specific set of firm behaviour targeted at improving environmental and social performance of a shipping company. Therefore, the motivation and consequences of sustainable shipping practices could be better explained or understood from the integration and application of behavioural theories.

Another theoretical contribution of this research is that it employs an incremental, hierarchical approach to model development which allows the network of relationships posited by each theory to be empirically validated. Stakeholder theory provides the fundamental framework that establishes the role of stakeholders and their influences on a shipping company's sustainable practices and business performance. The theory of planned behaviour expands the views of stakeholder theory by addressing non-stakeholder-related drivers of sustainable shipping practices, which arise from shipping companies' attitude and behavioural control (e.g. resource constraints). Lastly, resource dependence theory further widens the perspectives of both theories by drawing connections between the antecedents of sustainable shipping practices, and between stakeholder pressure and business performance. The results show that the hypothesised relationships posited by all three theories are supported. More importantly, the results imply that the theories are complementary, which is demonstrated by noticeable improvements in model-fit and explanatory power of the research models.

Next, this research is one of the few studies that analyse the antecedents and outcomes of sustainable shipping practices holistically at a triadic level i.e. drivers-practice-performance rather than at the dyadic levels i.e. drivers-practice or practice-performance. This triadic level analysis provides a better nomological understanding of the connections between the latent constructs examined by this study. This study demonstrates that the constructs do not necessarily abide to a fully-mediated structure. For instance, stakeholder pressure, which is a driver of sustainable shipping practices, can directly influence the business performance of a shipping company. In addition, the effect of stakeholder pressure on sustainable shipping practices was noted to be partially-mediated by other drivers i.e. shipping companies' attitude and behavioural control.

From the managerial perspective, this study highlights the importance of sustainable shipping practices which drives shipping companies' business performance. The statement holds true regardless of the size of shipping companies or the sector that they are operating in i.e. bulk or container shipping. This implies that it is imperative that shipping companies address the societal and environmental impacts of their operations and incorporate them as part of their business strategy in light of increasing competition in the shipping markets and the growing emphasis towards environmental and social management in businesses.

The study also sheds light to the approaches that can be employed by shipping companies to improve the adoption of sustainable shipping practices. First, the improvement can be achieved from shaping the attitude of shipping companies, which are managed and run by their employees. It is important that the top management understands the benefits that are associated with sustainable shipping practices. With sufficient buy-in from the top management, they should then communicate or express their commitment towards sustainability in their companies' vision, mission, goals and objectives. This commitment towards sustainability can be further disseminated to the rest of the employees in the company by conducting departmental meetings as well as publishing internal newsletters and reports on the company's involvement in sustainability. This top-down approach to garnering employees' commitment could shape shipping companies' attitude towards practising sustainability.

In addition, the adoption can be improved from enhancing shipping companies' controllability on implementing sustainable shipping practices. On this aspect, a shipping company can pursue on two fronts: capacity and autonomy enhancement. Shipping companies

can increase their capacity (i.e. self-efficacy) by dedicating financial resources and manpower for implementing sustainable shipping practices. In addition, investments on training that is targeted at enhancing employees' knowledge, skills, and ability on managing sustainable shipping practices could be made to boost a shipping company's capacity. As for enhancing autonomy, shipping companies can create a task force comprising managers from different departments. This task force shall oversee the management of sustainable activities, and be responsible for the sustainable performance of its company. This should increase the perceived autonomy of implementing sustainable shipping practices in the company.

Finally, it is important for managers of a shipping company that among all the predictors, stakeholder pressure has the largest total effects on sustainability shipping practices and business performance. This highlights the instrumentality of addressing stakeholders' sustainability concerns. Given the extensive and sometimes conflicting sustainability requirements (Mitchell et al., 1997), it is of the managers' interest to prioritise and align sustainable shipping activities that best cater to the needs of their stakeholders, especially for those who have the power to influence the business outcomes of their shipping companies.

### *5.3 Limitations and Recommendations*

Despite the contributions of the study, there are several limitations. Firstly, the research has been conducted in Singapore and the results may not be generalisable across other countries. It was noted that national culture and the cultural mix of the employees, which is influenced by global recruitment strategy of a company (e.g. parent-country national, host-country national, and third-country national recruitment strategy), could influence the receptivity of sustainable practices and subsequently, their adoption (Choi et al., 2012; Ringov and Zollo, 2007). Future research could cross-validate the model with other countries or cultures.

Secondly, due to limited sample size, the current study has not examined the sensitivity of the results to certain firms' characteristics such as firm size and sector even though they were used as control variables in this study to account for their effects on sustainable shipping practices and business performance. A more nuanced analysis of the model which considers the moderating effects of the aforesaid variables could be conducted in the future. Future research may also seek to expand the generalisability of the developed research model by validating it with other shipping sectors such as non-vessel operating common carriers, freight forwarders, brokers, mixed-vessels operators, specialised-cargo carriers, or passenger carriers

that were presently not explored by this study. This shall draw greater managerial insights for the maritime transport sector.

Thirdly, there is currently insufficient power in the sample to determine whether a Type II error was committed in relation to rejecting the effects of firm size on stakeholder pressure and business performance, and the effects of sector on sustainable shipping practices and business performance. The significance of these control effects is inconclusive, and a larger sample size is required [to test the significance of their effects](#).

Another limitation of this study concerns the use of perceptual financial measures to operationalise the business performance of shipping companies. This is primarily due to limited, objective financial data. Out of the 186 samples that were collected, objective financial data for 94 (51%) of them are available. The remaining 92 (49%) shipping companies did not publicly publish their balance sheet or financial records. To avoid a considerable number of missing data, which could affect the reliability of the results, objective financial measures are not used to operationalise business performance. Future research studies could consider the use of objective financial measures, if available, to improve the accuracy or reliability of their analyses.

Lastly, having established that implementing sustainability shipping practices could improve business performance, the current study recommends additional research anchored on other theoretical lenses that are not presently examined in this study to identify approaches to increase the adoption of sustainable shipping practices.

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## TABLES

**Table 1. Construct, Response Anchors, Measures, and Source**

Construct	Response Anchors & Measures	Source
Stakeholder pressure (SP)	<i>Extremely low (1) / Extremely high (7)</i> SP1. Shippers SP2. Employees SP3. Shareholders SP4. Society SP5. Regulators	Sarkis et al. (2010)
Attitude (AT)	My company views implementing sustainable shipping practices as ____. AT1. <i>Unpleasant (1) / Pleasant (7)</i> AT2. <i>Bad (1) / Good (7)</i> AT3. <i>Irrelevant (1) / Relevant (7)</i> AT4. <i>Worthless (1) / Useful (7)</i> AT5. <i>Harmful (1) / Beneficial (7)</i>	Glanz et al. (2008)  Kim and Han (2010)
Behavioural control (BC)	<i>Strongly disagree (1) / Strongly agree (7)</i> BC1. My company has the ability to implement sustainable shipping practices BC2. My company has the resources (i.e. time, effort, money) to implement sustainable shipping practices BC3. My company is confident of implementing sustainable shipping practices BC4. Implementing sustainable shipping practices is beyond my company's control BC5. Implementing sustainable shipping practices is up to my company	Glanz et al. (2008)  Kim and Han (2010)
Sustainable shipping practices (SS)	<i>Strongly disagree (1) / Strongly agree (7)</i> SS1. My company provides complete and accurate information about our services to our customers SS2. My company provides training and education to develop employees' skillsets SS3. My company applies high standards for disclosure, accounting, auditing, and social and environmental reporting SS4. My company donates to charitable organisation SS5. My company complies with the tax laws and regulations in all operating countries SS6. My company uses environmental-friendly materials and equipment (e.g. nontoxic paint, electric deck machine, ballast water system) SS7. My company adopts environmental-friendly shipbuilding designs (e.g. improved engine design and waste heat recovery systems)	Lu et al. (2009)  Lai et al. (2013a)  Shin and Thai (2015)
Business performance (BP)	<i>Strongly disagree (1) / Strongly agree (7)</i> BP1. Customer satisfaction BP2. Employee satisfaction <i>Much worse (1) / Much better (7)</i> BP3. Return on Investment BP4. Sales growth BP5. Profit growth	Lu et al. (2009)  Ortega (2010)  Brik et al. (2011)

Note: All response anchors are italicised and calibrated on a 7-point scale with bipolar adjectives

**Table 2. Profile of Respondents and Companies**

Profile information	Number of respondents (n=186)	Percentage (%)
<i>Job designation</i>		
Director and above	58	31
Manager	112	60
Non-management or specialist	16	9
<i>Department</i>		
Commercial (e.g. sales or marketing)	72	39
Technical (e.g. operations or logistics)	66	35
Finance	22	12
Others (e.g. sustainability, HSSE, strategy, or administration)	26	14
<i>Experience in the company (years)</i>		
> 10	52	28
5–10	98	53
< 5	36	19
<i>Sector</i>		
Bulk (1)	109	59
Container (0)	77	41
<i>Firm size (number of employees)</i>		
> 200 (1)	88	47
≤ 200 (0)	98	53
<i>Firm age (years)</i>		
<10	30	16
10-20	62	33
>20	94	51

Note: Sector is a dichotomous variable with '0' equals to container shipping and '1' equals to bulk shipping. Firm size is a dichotomous variable with '0' equals 'less than or equal to 200 employees' and '1' equals 'more than 200 employees'.

**Table 3. Confirmatory Factor Analysis Results**

Construct (j)	Measure (i)	Standardised Factor Loadings ( $\lambda_i$ )	Average Variance Extracted (AVE <sub>j</sub> )	Composite Reliability (CR <sub>j</sub> )
Stakeholder pressure (SP)	SP1	0.80	0.64	0.90
	SP2	0.75		
	SP3	0.84		
	SP4	0.83		
	SP5	0.77		
Attitude (AT)	AT1	0.77	0.61	0.89
	AT2	0.79		
	AT3	0.77		
	AT4	0.79		
	AT5	0.79		
Behavioural control (BC)	BC1	0.78	0.58	0.87
	BC2	0.74		
	BC3	0.82		
	BC4	0.75		
	BC5	0.71		
Sustainable shipping practices (SS)	SS1	0.71	0.56	0.90
	SS2	0.73		
	SS3	0.73		
	SS4	0.73		
	SS5	0.80		
	SS6	0.77		
	SS7	0.78		
Business performance (BP)	BP1	0.71	0.60	0.88
	BP2	0.73		
	BP3	0.77		
	BP4	0.81		
	BP5	0.85		

Note: Model fit indices:  $\chi^2=526.93$  ( $p<0.05$ ,  $df=314$ ); CFI=0.97; TLI=0.97; RMSEA=0.021; SRMR=0.032

**Table 4. Average Variance Extracted and Squared Correlations of Constructs**

	SP	AT	BC	SS	BP
SP	<b>0.64</b>	0.23	0.21	0.41	0.17
AT	0.48	<b>0.61</b>	0.01	0.34	0.01
BC	0.46	0.08	<b>0.58</b>	0.24	0.01
SS	0.64	0.51	0.49	<b>0.56</b>	0.25
BP	0.41	0.04	0.02	0.50	<b>0.60</b>

Note: values along main diagonal are AVEs, values below main diagonal are correlations, values above main diagonal are squared correlations

**Table 5. Fit Indices and Comparison of Theoretical Models**

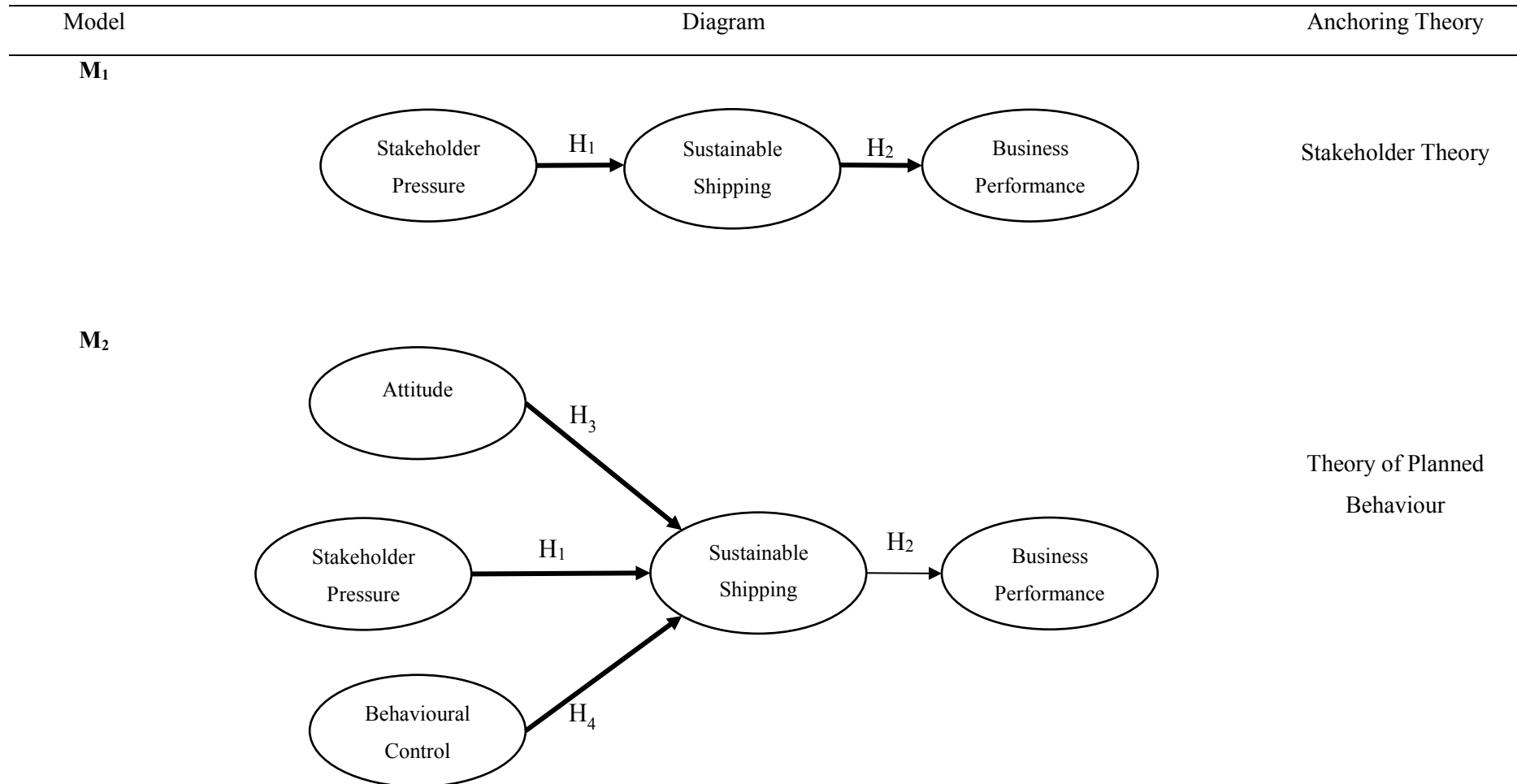
Fit indices	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>
$\chi^2$	417.30	701.80	627.76
df	145	369	366
$\chi^2/df$	2.88	1.90	1.72
CFI	0.94	0.96	0.97
TLI	0.93	0.95	0.96
RMSEA	0.070	0.038	0.028
$R^2$ of SS	0.41	0.69	0.69
BP	0.27	0.30	0.42
Model Comparison Results	<u>Decision rules for non-nested model comparison</u> (1) $\chi^2/df$ of M <sub>1</sub> > $\chi^2/df$ of M <sub>2</sub> (2) CFI of M <sub>1</sub> < CFI of M <sub>2</sub> (3) TLI of M <sub>1</sub> < TLI of M <sub>2</sub> (4) RMSEA of M <sub>1</sub> > RMSEA of M <sub>2</sub> (5) R <sup>2</sup> of SS in M <sub>1</sub> < R <sup>2</sup> of SS in M <sub>2</sub>  <b>M<sub>2</sub> concluded to be superior than M<sub>1</sub></b>		
		<u>Decision rule for nested model comparison</u> (1) $\chi^2$ difference of M <sub>2</sub> and M <sub>3</sub> = 74.04 (p<0.01)  <b>Reject M<sub>2</sub> &amp; accept M<sub>3</sub> at 99% confidence level</b>	

**Table 6. The direct, indirect, and total effects**

	Sustainable Shipping Practices (k = 1)	Business Performance (k = 2)
<i>Direct effects (<math>a_{jk}</math>) of</i>		
Stakeholder pressure (j = 1)	0.34	0.20
Attitude (j = 2)	0.28	0
Behavioural control (j = 3)	0.27	0
Sustainable shipping practices (j = 4)	-	0.30
<i>Indirect effects (<math>b_{jk}</math>) of</i>		
Stakeholder pressure (j = 1)	0.25	0.18
Attitude (j = 2)	0	0.08
Behavioural control (j = 3)	0	0.08
Sustainable shipping practices (j = 4)	-	-
<i>Total effects (<math>c_{jk}</math>) of</i>		
Stakeholder pressure (j = 1)	0.59	0.38
Attitude (j = 2)	0.28	0.08
Behavioural control (j = 3)	0.27	0.08
Sustainable shipping practices (j = 4)	-	0.30

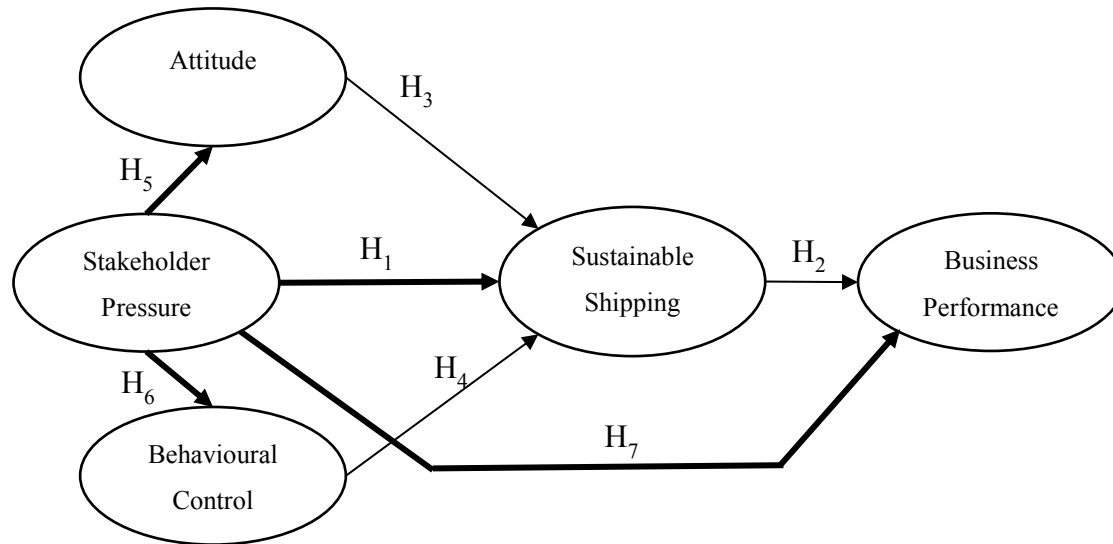
Note: j represents the exogenous variable; k represents the endogenous variable;  $a_{jk}$  represents the direct effect of exogenous variable j on endogenous variable k,  $b_{jk}$  represents the indirect effect of exogenous variable j on endogenous variable k,  $c_{jk}$  represents the total direct effect of exogenous variable j on endogenous variable k

## FIGURES





M<sub>3</sub>

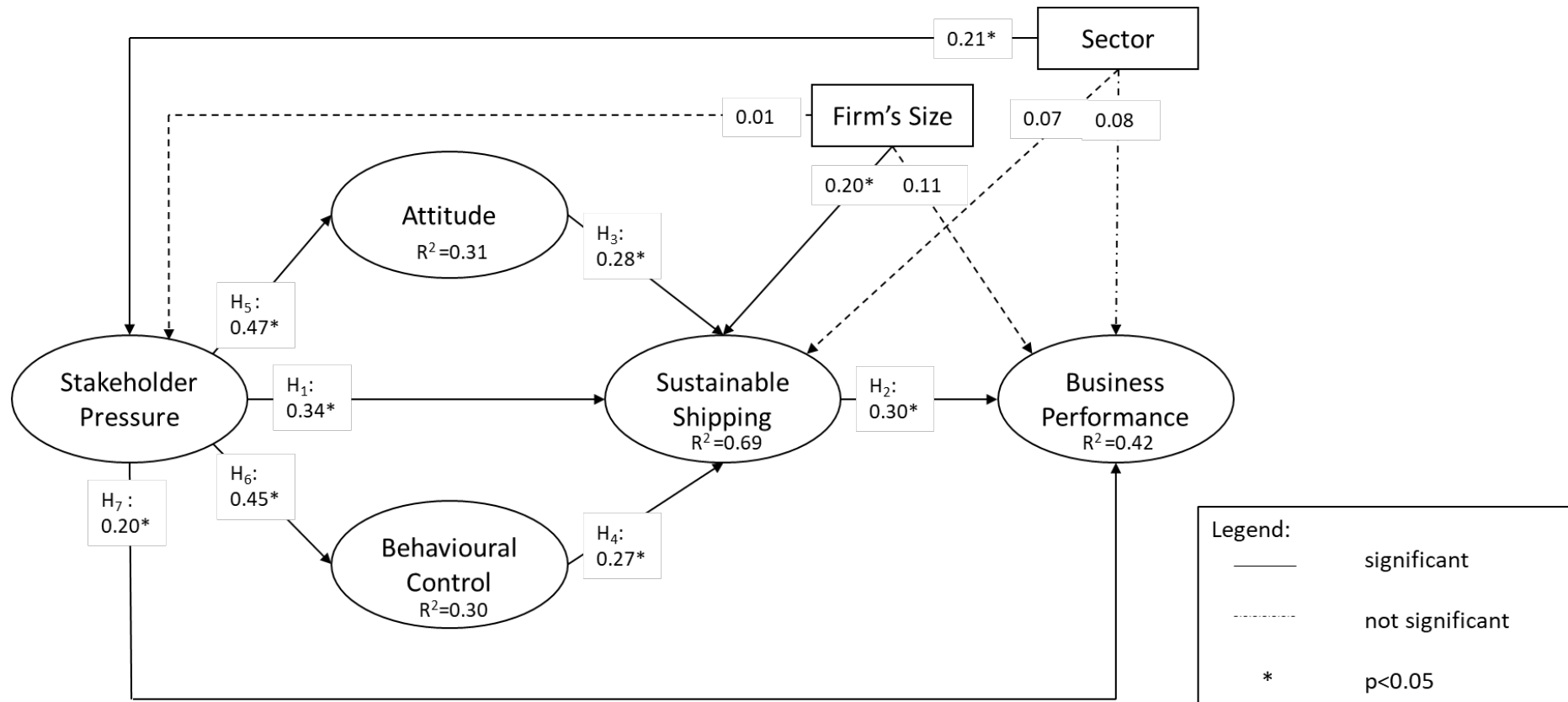


Resource Dependence  
Theory

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Note: Emboldened paths are hypothesised relationships asserted by the anchoring theory  
Solid paths suggest significant, positive relationships

**Figure 1. Theoretical Models and Anchoring Theories**



**Figure 2. Structural Equation Model Analysis of Best Theoretical Model (M<sub>3</sub>)**