THE IMPACT OF PRIVATISATION ON THE FINANCIAL AND ENVIRONMENTAL PERFORMANCE OF THE PORT OF BRISBANE PROPRIETARY LIMITED (PBPL): A CASE STUDY

A Thesis submitted by

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ABSTRACT

The purpose of this study was to investigate whether there was a potential impact from privatisation on the financial and environmental performance of Port of Brisbane Proprietary Limited (PBPL). There are two motivating factors. First, available literature has provided contradictions between the predictions from the theory of the firm and stakeholder theory when comparing the financial and environmental performance of a firm being operated by a government-owned organisation compared to a private enterprise. Second, there is a need to investigate the inconsistencies of findings and arguments when comparing public versus private ownership of an Australian port due to the paucity of such studies in Australia.

There is also, limited literature which has evaluated the financial and environmental performance of privatised ports in Australia. A null hypothesis, therefore, was developed to evaluate the impact of ownership types on financial and environmental performance to address the inconsistencies of findings and arguments comparing public versus private ownership of an Australian port.

The theoretical framework used was based on the theory of the firm and stakeholder theory. Primary and secondary data for the Port of Brisbane's financial and environmental performance operations was gathered across the pre-and post-privatisation ownership conditions (between 2005 and 2017). Six-year pre- and six-year post-privatisation periods were selected due to size and complexity. Each 6-year period was divided into two equal periods to account for the public ownership operations and the transitional period from public ownership as well as the transitional period into privatisation and the private ownership operations.

Step 1 involved a one-way Multivariate Analysis of Variance (MANOVA) for twelve (12) performance variables ratios across the four periods to test the null hypothesis. The MANOVA and ANOVA post-hoc tests significant results were used as an investigative analysis tool to frame the open-ended questions to gather reasons for such differences from interviewees in Step 2. The findings collected by interviews is used to triangulate the results of Step 1.

The financial and environmental performances of PBPL were found to improve during private ownership (between 2012 and 2017) compared to state ownership (between 2005 and 2010). Further, interviews revealed that the operational effectiveness and efficiency had increased statistically during private ownership as they had heavily invested in new technology during 2014 and 2017. Also, the total energy consumption ratio and the total Emission of CO_2 values of PBPL reduced significantly after privatisation. A reason supplied was that the private management was strongly influenced by the terms and conditions of the PBPL privatisation agreement, corporate governance, accountability, competition created by the vicinity ports, the advantages of the geographical location of PBPL, and organisational mechanisms.

Consequently, PBPL conducted its business affairs and operational activities to meet its financial, operational and environmental strategic goals with the objective of achieving long term sustainability, while also creating increased shareholder value through correct market anticipations. This was achieved while also practising significant environmental protection, conservation policies and procedures in their daily operations.

This study provides a model for evaluating the impact of privatisation based on stakeholder theory. Further research could be conducted to determine the real purpose motivating the drive towards privatisation and establish if that motivation is driven by the desire for profit maximisation or to improve stakeholder satisfaction. Additionally, future research could perform a multi-port performance evaluation approach, which would enhance the appropriateness and significance of the research.

Keywords: Port Privatisation, Ownership structure, Performance measures,

CERTIFICATION OF THESIS

This thesis is entirely the work of Jayasundara Mudiyanselage Upali Ranjith Jayasundara except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: Professor John Sands

Associate Supervisor: Dr. Gregory Jones

Student and supervisors' signatures of endorsement are held at the University.

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ABBREVIATIONS

ABC News-Australian Broadcasting Corporation News

ABS-Australian Bureau of Statistics

ANOVA-Analysis of Variance

ASIC-Australian Securities and Investment Commission

BAA -British Airport Authority

BMT- Brisbane Multimodal Terminal

CAMEL-Capital Adequacy, Asset quality, Management, Earning, and Liquidity

DEA-Data Envelopment Analysis

DEHP-Department of Environment and Heritage Protection

DIRD-Department of Infrastructure and Regional Development

DMUs-Decision Making Units

DV-Dependent variables

EBIT-Earning Before Interest and Tax

EBT-Earning Before Tax

IV-Independent Variable

MANOVA-Multivariate Analysis of Variance

NSWNMA-New South Wales Nurses and Midwives' Association

PBC-Port of Brisbane Corporation

PBPL-Port of Brisbane Proprietary Limited

QNU-Queensland Nurses Union

SOEs- State Owned Enterprises

SPSS-Statistical Package for Social Science

TAFE-Technical And Further Education

TBL-Triple Bottom Line

UNCATD-United Nations Conference on Trade and Development

<center>**CHAPTER 1**</center>

1.0 INTRODUCTION

Privatisation is not a new phenomenon, as even the government in ancient Greece, contracted most of its services to the private sector, during the reign between the 9th and the 12th centuries (Parker & Saal 2003). Later, during the 19th and 20th centuries, privatisation became more prominent around the world. Between 1950 and 2000, Great Britain had privatised almost all of its State-Owned Enterprises (SOEs) into the private sector enterprises. As a result of emerging Western liberalised economic policies, in the 1980s, privatisation flourished in Latin America (Parker & Saal 2003). By 1990s, Russia, Eastern and Central Europe engaged in extensive privatisation programmes. In 1987, involving the largest public share offering in the financial history of the world at the time, Nippon Telegraph and Telephone (NTT) was privatised by the Japanese government (Sueyoshi 1998). According to the Reserve Bank of Australia (1997) and Abbott and Cohen (2014), even though there were some early examples, privatisation of public enterprises became common in Australia in 1980s.

Whether a country has a capitalist or socialist political basis, or a developed or developing economic basis, each society has some forms of beliefs for and against privatisation (Garcia 2013). From employees' perspective, they are in fear of losing their jobs due to privatisation, and therefore, they may protest against any restructuring programmes (ABC news 2013, Skynews 2017, Telford 2015, and WSWS 2017). Queensland Nurses Union (QNU) recently protested against the privatisation decisions of Wide Bay Hospital and Health Services (Busch 2013). Also, New South Wales nurses have more recently resolved to take all necessary actions to conduct a campaign against the privatisation of NSW public hospitals and services (NSWNMA 2016). Recently, Sydney bus drivers walked off the job over privatisation plans announced by the state transport minister (Rourke 2017).

According to the theory of the firm and to the other associated theories such as shareholder, ownership, private interest, property rights and agency, firms owned by private ownership exist primarily to maximise profits. This positive relationship

between the structure of ownership and the performance of a firm has been researched for many decades. Meanwhile, during the past 20 years, there has been an emerging change of emphasis of a firm's responsibility, from the primary shareholders to the other stakeholder groups including Triple Bottom Line (TBL) aspects such as; Profit, Planet, and People (The Economist 2009).

According to Dr. Edward Freeman; a philosopher and an academician, the current dominant scenario of businesses is about the money and profits. Further, he explains that there are three major flows of business. The first purpose of business is money. The second is that there is a contradiction between business and ethics. The third is that people are not simply beings motivated by self-interest. Therefore, he suggested that to improve business practices, there is a need for a conceptual revolution about business practices. Businesses should be about both the purpose and creating value together (Freeman, 2010). He stated as businesses should have the right purpose, profits follow. Moreover, business is about creating value for all stakeholders, not just shareholders. It is about dealing it without making trade-off (Freeman, 2010).

Therefore, it has been suggested that there is a need to consider the 3Ps within a business sustainability focus. This may then have an impact on the traditional proposition of profit maximisation posited by the theory of the firm, ownership, or shareholder theories. These factors need to be considered in today's business environment which has been emphasised by Freeman's application of stakeholder theory. This therefore suggests that the impact of privatisation of a public sector service organisation, should not only be focused on changes in the financial performance, but also non-financial performance factors such as social and environmental issues.

Consequently, in addition to investigating the impact of the change of ownership of PBPL on its financial performance, this research has also focused on the changes to their environmental performance under private ownership. This approach has been based on the use of stakeholder theory, which has proposed that shareholders of a firm would concern about the social responsibility activities of the company, in addition to the conventional motivation of profit maximisation.

The next section of chapter one has discussed the importance, the purpose and the motivation for this study followed by the research question, the null hypothesis, and the limitations of the research.

1.1 Importance of the study

Privatisation is a significant area of interest for researchers, economists, governments and even to the public in many aspects. During the three decades prior to 2000, many countries globally have shifted their State-Owned-Enterprises (SOEs) from the state ownership to private ownership. This phenomenon has generated for governments, total global revenue in excess of US$1 trillion by 2000 (Megginson & Netter 2001). In the Australian context, the total revenues from the privatisation process (sale of SOEs) between 1987 and 2013, were AUS$ 142.59 billion (Abbott & Cohen 2014). Therefore, as a revenue generator, privatisation is a significant activity which needs to be studied.

Australia, as an island nation, depends largely on shipping for both the local and international freight trades. Therefore, major ports and related infrastructure provisions are vital for supply chain activities. However, at present, almost all the major Australian ports have been privatised. Port of Newcastle, Port Botany, Port Kembla, Port of Adelaide, Port of Melbourne, Port of Geelong, Port of Portland, Port of Darwin, Port of Brisbane, Port of Gladstone and Townsville represent some of the privatised ports. The move towards the privatisation has not finished and is focused not only on ports but also on the other SOEs such as housing, land and property information, out of home care services, trustee and guardian, sport and recreation, Technical and Further Education institutes (TAFEs), trains, corrective services, powerhouse museums, courts reporters, public works and even government records which are yet to be privatised (The Lamp 2016).

From the financial perspective, PBPL was the second highest asset sale in Queensland's privatisation history which accounted for AUS$ 2.3 billion to the treasury (Trade Statistics, Ports Australia 2015). This port is significant as it plays a vital role in the development of the State's economy. The location is very important for mining and other exporters, buyers, entrepreneurs, and shipping companies as accessibility and proximity are critical factors for everyone. Hence,

the ownership of the firm and its performance are determinants not only for the port users but also for the port management.

National security is one of the prime considerations of any country. Some argue that having Australian ports in foreign hands could harm the nation's long-term security (Duyn 2015). Also, Australians need to be aware of the implications that the important State-Owned asset sales, their change of ownership and ramifications of these ownership changes have on the public and the local trades. Perhaps, the main drive for foreign investors, considering investing in formerly State-Owned-Enterprises is to maximise return on their investments. Possibly, the new owners of privatised firms may avoid tax liabilities when operating in Australia. It is, therefore, timely to analyse the impact of changes of ownership of Australian SOEs and to evaluate their subsequent financial and environmental performances.

Brisbane port is close to the world heritage area of 'The Great Barrier Reef' and most of its major shipping routes are in line with the coral reef (Garcia 2013). Therefore, incidents such as bow waves from ships' wake, dirty water, ship breaks and oil spills are known to have occurred in the area. These incidents threaten the balance of the ecosystem in the area. Also, being located in a known major flood affected area, the activities in Brisbane River lagoon, Moreton Bay, and the surrounded environment are critical to the State. The results of general port operations such as dredging, sediments, and land reclamation have the potential to affect the quality of water, shallowness, flora and fauna, mangroves and species which live in the area (Garcia 2013). Dredging, land reclamation operations and water footprints observations are some essential daily port operations, and these have become more crucial, as Moreton Bay silts up too quickly. As a result, in 2011, 2013 and 2014, fuel supply to the Brisbane city was delayed for almost five days by the silted Moreton Bay (Moore 2014). Also, the volume of dredging from the Brisbane River in 2013, was almost five times which for maintenance during an average year (Moore 2014). According to Moore (2014), approximately 1.4 million cubic metres of slits and sediments accumulated in the channels and berths due to multiple flooding and dam water releases within the catchments.

In Australian literature, however, there are few cross-country and case studies related to privatisation and those that have been conducted have demonstrated

mixed results related to performance. It is, therefore, important to know the actual procedures and prevention measures in place. Typically, the Department of Infrastructure and Regional Development seriously considers the activities of ports and their impact on the environment as indicated below.

'Commonwealth responsibilities regarding ports include an environmental assessment of port developments where matters of the national environmental significance are concerned, safety and security matters, customs, and implementing Australia's international maritime obligations relate to ports' (DIRD 2017).

Lastly, to be an efficient and well-performed company, a firm should manage and maintain its financial, social, and environmental risks, as well as its obligations and opportunities to achieve levels of sustainability. Energy and water savings, application of more energy and water efficient appliances, water recycling, reduction of CO_2 emissions, and equal employment opportunities are prominent activities of sustainable firms. Also, a sustainable port supports the economy, education, marine security and environment, leading to a better collaboration and supply chain management (The Economist 2009). Therefore, it is important to research the performance of PBPL to evaluate its sustainable achievements.

1.2 Purpose of the Study

1.3 The purpose of this study is to evaluate how the privatisation process has affected a State-owned port's financial and environmental performance by conducting a study of the privatisation of the Port of Brisbane Corporation operations, which is known as the Port of Brisbane Proprietary Limited (PBPL). Motivation of the study

Based on the theory of the firm and stakeholder theory, the prime motivation of conducting this research has been to answer the question of whether privatisation of a firm has an impact on its financial and environmental performance. Moving a step forward from conventional research findings which were heavily based on the theory of the firm, describing 'the private ownership impacts on a firm's financial performance than to the State ownership', this research has focused further on any created value for other stakeholders of PBPL as a result of privatisation, not just for shareholders. When referring to the business goal in the mission statement of PBPL,

it was obvious that there was a need to investigate how and if, a privatised firm attempts to maximise profits in a sustainable manner.

1.4 Research Question

This research is based on the evaluation of the impact of privatisation of State-Owned Enterprises (SOEs). In the light of the purpose of this study, and the expected impact of a change in ownership as postulated by the theory of the firm and stakeholder theory, the discussion about the impact argued by a research question has been developed based on the reviewed literature and the theoretical discussion in chapter 2.

Research Question 1 (RQ_1): To what extent has privatisation impacted upon the financial and environmental performance of PBPL?

1.5 Null hypothesis

A null hypothesis has been developed based on the paucity of literature on the contradiction between the theory of the firm and stakeholder theory. The null hypothesis (H_0) is as below;

1. H_0- There is no mean difference in the financial and environmental performance of Port of Brisbane Proprietary Limited under either private or State ownership.

    H_0: $\mu_{1 =} \mu_2$

Where,

H_0 = the null hypothesis,

μ_1 = the statistical mean of the financial and environmental performance under State-owned

μ_2 = the statistical mean of the financial and environmental performance under Private owned.

The null hypothesis (H_0) stated above represents both the theory of the firm and stakeholder theory as they are believed to be true and have been used as a basis for argument, though they have not been consistently proved.

1.6 Limitations of the study

The research has investigated a single firm through two ownership structures. It is possible that other ports in Australia may be subjected to the same political and environmental situations. In such cases comparing the findings of this study with studies of those ports may generate more significant findings though, it is acknowledged that as this study has examined and compared the financial and environmental performance of PBPL, the results may not be necessarily generalised to all privatised ports in Australia. This limitation is due to geographical, financial and time constraints, which are outside the scope of this study. Additionally, there are some possible disadvantages created by selecting a case study approach for this study. Firstly, case studies by their nature take a narrow field of investigation and the results cannot be generalised or extrapolated to fit an entire population.

To counter the listed limitations, the research problem has permitted an approach that was more flexible and enabled an in-depth gathering of knowledge about the research problem. Also, non-accessibility of some data of PBPL after privatisation was an issue which impacted on the methodology and conclusion. To overcome this limitation, company financial reports, obtained from the Australian Securities and Investment Commission (ASIC), were used to gather relevant information. Also, data were obtained from BIRTE and Water Line reports, Australian Bureau of Statistics (ABS), Ports Australia, the Department of Environment and Heritage Protection (DEHP) and the Department of Infrastructure and Regional Development (DIRD). Additionally, raw data were gathered from interviews.

To overcome inherent negatives, this research implemented prioritised formulae and parametric MANOVA tests. The selected port operational performance criteria used for this research are recognised by UNCTAD. A parametric analysis was the best suit as this study made assumptions and hypotheses about parameters, by defining properties of the distribution of the population from where the data were gathered. Some have argued that a conclusion drawn from a non-parametric analysis is not as strong as a conclusion drawn from a parametric analysis. This issue has been addressed through the selection of combined methods of analytical tools. The qualitative analysis was a non-parametric thematic tool as there were not

any assumptions before the test. The financial and non-financial (descriptive and inferential) statistics were compared and bring a more realistic conclusion to the research.

1.7 Company background overview

Private ports are not a new phenomenon to Australia as many bulk ports have been built and owned by the end user mining companies. Publicly owned ports such as Portland, Geelong, and Adelaide had been privatised before the port of Brisbane. The corporate mission of Port of Brisbane Proprietary Limited has been presented below.

"Our goal is to grow trade through the port in a sustainable manner which optimizes stakeholders' satisfaction and shareholders' returns by retaining and developing qualified employees, providing world-class infrastructure to satisfy customer demand and working cooperatively to ensure a safe and secure workplace" (portbris 2017).

Port of Brisbane Proprietary Limited, located at the mouth of the Brisbane River in South East Queensland, was formed on the 6th December 1976, under the Port of Brisbane Authority Act-1976. Originally, it was known as the Port of Brisbane Authority though in 1994, the firm was incorporated under the Government Owned Corporation Act-1993 and became known as the Port of Brisbane Corporation (PBC). On the 1st July 2007, PBC became a limited liability company under a statutory to a State-Owned Company and listed with the Australian Securities and Investment Commission (ASIC). While PBC was responsible for the management of the port of Brisbane, the company reported to the Ministers in Treasury and the Minister for Employment and Economic Development.

Timber, sugar, meat, mining output and oil were some of the early exported goods by the port. Also, shipping operations, pilotage, port development through new infrastructures, land reclamation and development, maintenance of existing facilities and dredging operations were the port management duties initially.

Under the 'Renewing Queensland Plan,' the sell-off of PBC was announced in 2009. The port land and infrastructure including wharves, buildings, terminals, and

roads were leased in 2010 while ownership was retained. Also, the port of Bundaberg was transferred to the Gladstone Port Corporation (GPC). The Queensland government restructured PBC as the Port of Brisbane Proprietary Limited (PBPL); a fully owned subsidiary of PBC. PBPL acted as the port manager and the lessee of the port land, buildings, infrastructure and other port assets.

Through a competitive bidding process, on the 1st July 2010, PBPL was leased to Q-Port Holdings for a 99-year period and the total proceedings from the privatisation were AUS$ 2.1 billion. Q-Port Holdings; comprised of four of the largest and most experienced infrastructure investors in the world, have owned PBPL since the 1st December 2010. Global Infrastructure Partners, Industry Funds Management, Queensland Investment Corporation, and Tawreed Investment; a fully owned subsidiary of the Abu Dhabi Investment Authority are the major shareholders of PBPL. Operating 29 berths with over more than 7.5kms of quay lines, PBPL provides interstate connected rail and road access logistics network to the port. The 24-hour operated Brisbane Multimodal Terminal (BMT) performs as the interface between rail, roads and container terminals at the port. In 2014, PBPL became the first Australian port where all stevedores used automated container handling equipment at berth 11 and 12 by Hutchison Port Holdings. Under the Land Use Plan (LUP) PBPL owns, manages, and develops a total of 1828.5 hectares of wet and dry Brisbane core port lands for industrial, commercial, environmental and buffering purposes. These lands include Fisherman Island and Port Gate, Lindum (Port West), Pinkenba and Bulwer Island (Port North), and Colmslie. By 2017, the port had 187 of full-time employees.

1.8 Organisation of the study

The rest of the thesis has been organised as follows. Chapter 2 has defined the technical terms of the study and has been followed by the literature review and theoretical discussion. Chapter 3 has described the methodology and the research methods, rationales for the selection of methods and the limitations of the research. Quantitative analyse of the assumptions underpinning MANOVA test method has been addressed in chapter 4. Chapter 5 has presented the results and findings of the

study. Chapter 6 has provided a discussion about the results particularly for implications of these results for future practice and research purposes, the study's limitations, and conclusions.

1.9   Chapter Summary

According to literature, privatisation is not a new phenomenon and it has a long history dated back to the ancient Greek government. The importance of this study is that privatisation is significant to the public, the policy makers and the entire economy because, financial, economic, academic or management importance of the port privatisation is immense. Also, when privatising a port, it is important to concern national security. Further, ports activities impact the environment. Also, the lack of port privatisation research in the literature, inconsistency of findings and the contradiction between the theory of the firm and stakeholder theory are some of the major factors which influenced the study.

As set out in the mission statement, the business goal of PBPL is to maximise shareholders' profits through sustainability. According to behavioural economics theories which were described above, it is important to study how does PBPL maximise profits in a sustainable manner. With reference to the arguments of literature and the inconsistent results of prior studies, a null hypothesis (H_0) has been developed based on that inconsistency and the contradiction between the theory of the firm and stakeholder theory predictions of financial and environmental performance of a firm being operated by a government-owned organisation or a private enterprise. Meanwhile, this study accepts some limitations of the study especially being a case study, the results cannot be generalised or extrapolated to fit an entire population. Also, non-accessibility of some data of PBPL after privatisation would be an issue for the methodology and conclusion though, the study gathered data from numerous sources in order to minimise the negatives.

CHAPTER 2

2. 0 REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK

2.1 Introduction

The rationale behind privatisation is based on the premise that State-Owned Enterprises are highly inefficient, and they grow sluggishly due to the reasons such as government intervention, bureaucracy, poor decision making, changes in administration and workers' union activities (Veljnovski & Bentley 1987). Thus, relying on the belief that private ownership is superior to public ownership, which is supported by the theory of the firm, many researchers have argued that privatisation brings financial success to loss generating State-Owned Enterprises (SOEs). This belief is supported by some other theories such as shareholder theory, public/ private interest theory (public/private choice theory), agency theory (agency problem), and property right theory.

The first part of this chapter has discussed the theories behind this study. This discussion involved examining the core theory and the subsequent theories which have been developed by different researchers and the insights that those theories may have on privatisation activities. Also, this chapter has discussed how privatisation may affect the performance of a firm. Finally, analysis of the importance of the financial and environmental performance of a firm has been discussed.

The following section has defined the meanings of relevant technical terms and their inter-relation prior to the literature review.

2.2 Definitions of technical terms

According to Aktan (1995), the broader meaning of privatisation is to restrict the role of government by applying some methods or policies in order to strengthen a free market economy. This study has defined the privatisation as a process of transferring the ownership of State-Owned-Enterprises to private ownership.

Efficiency has been defined as the percentage of output related to the input of a firm. Usually, changes in efficiency will result in a change in the level of productivity. If a firm is more efficient and productive then as a result, its performance would be improved. Productivity has been defined as the efficiency with which companies as a whole, convert inputs such as labour, capital and raw materials into output.

Generally, the performance of a firm has been defined as the quality of output of the process. This study has defined the performance of PBPL as the quality of output of both the financial and environmental operations of PBPL. The relationship between efficiency and performance is demonstrated when a firm's efficiency increases while at the same time the productivity of the firm also increases. The resultant increased productivity then leads to improvements in the firm's performance.

Profitability has been defined as the comparison of the firm's ability to achieve an overall profit performance relative to other firms in the industry or within the same firm in different periods. When profitability measures how much profits a firm has generated within a specified context, efficiency measures how efficient a firm has been in utilising its resources to generate those profits.

According to The Economist (2009), business sustainability has been defined as the process of managing the triple bottom line (The 3 Ps) - Profits, People, and Planets. An efficient and well-performed company is able to manage and maintain its financial, social, and environmental risks, as well as meet its obligations and take advantage of opportunities while still being able to achieve high levels of sustainability. Energy and water savings, application of more energy and water efficient appliances, water recycling, reducing CO_2 emissions, and equal employment opportunities are prominent mechanisms to reduce emissions and consumption of resources in firms which are considered to be sustainable. A sustainable port should be able to support the sectors such as economy, education, marine security and the environment, which would then lead to a better collaboration and a strong supply chain management (The Economist 2009).

Before moving onto the evaluation of theory, this study rephrases as the common belief of the ultimate goal of privatisation is to enhance the performance and

efficiency of state-owned enterprises and this has been discussed by chapter two until now. This argument of privatisation has assumed that companies under private ownership would be able to perform better than when under state ownership. Some theoretical arguments support the idea that firms produce a superior performance under private ownership than under state ownership. These arguments have been explained in detailed under each theory below.

2.3 Evaluation of theories behind privatisation

The following discussion of various theories provides a range of views behind the theory of privatisation. These theories have been developed over time and reflect the advancement of knowledge through a cycle described by Kuhn (1962), (Thwink 2014) as the revolution of thought that occurs within an area of research. The discussion with initially begin with the more traditional theories (agency theory to the theory of the firm) and transition into a discussion about theory that reflects the multidimensional stakeholder theory, which influences the modern business environment through legislation requirements, case precedent judgements, as well as public and political expectations of legitimise the activities of any business (Deegan 2013, Du Plessis et al. 2018).

Agency theory (Agency problem)

Agency theory outlines that the separation of ownership and control is the main source of the relative inferior performance of public firms. This theory suggests that managers in private firms may, receive stronger incentives to reduce waste and to maximise performance. Conversely, it has been suggested that shareholders in public sector firms have fewer opportunities to monitor the behaviour of managers while managers' in private firm are more professional and disciplined. Also, their actions are controlled by many external control mechanisms such as recognition for their achievements, and incentive schemes as a motivation.

As mentioned above, shareholder theory proposes that an agent has a fiduciary duty to the owner of a firm. When the agents (the managers) of a firm act in principals' (shareholders' or owners') best interests, there is an inherent conflict of interest between the management and the firm's shareholders as the shareholders' needs

may not align with the interests of the managers. The managers who act as the agents for the shareholders or the principals are supposed to make decisions which maximise principals' wealth, though it is in the managers' best interest to maximise their own wealth. This conflict is called the agency problem. The relationship between the agent and the principal, the conflict between them, and the issues concerned with resolving that conflict are explained by agency theory. Vickers and Yarrow (1991) introduce as the behaviours of the agents (managers) can be monitored and influenced by the shareholders through their votes at general meetings.

Property rights theory

Property right theory explains that managers in public firms do not suffer from economic consequences of their decisions they have made and even such decisions may not affect to reduce their incentives to maximise profits and reduce waste. In contrast, private firm managers are prevented by the threat of bankruptcy and takeover from making selfish decisions which benefit themselves. However, the availability of soft budget constraints prevents public firms from the risk of bankruptcy, provided that the gap which exists between income and expenditure is balanced by the state budget. If a firm can survive without covering its costs, the price mechanism does influence the behaviour of managers encouraging economic wastes such as overstaffing, political patronage, excessive salaries, and earning illegitimate commissions.

Kornai (1980) states that property rights theory focuses on the agency problem under two forms, which are more acute under public ownership structures. Accordingly, managers would not perform well unless they are monitored. When managers in the public sector are poorly monitored, they lack incentives to perform competitively. Such poor monitoring could happen when the firms are not publicly traded, and then there is no risk of takeover of their organisation. Therefore, ownership is diffused. As a result, SOEs are inefficient until property rights are clearly assigned publicly. This could be worse if the monitoring system is performed by politicians and bureaucrats for the public's interest. This inefficiency would occur because they are not efficient and productive in designing or monitoring incentive systems that are performed by shareholders of private sector

companies. The other reason the managers in SOEs lack incentives to perform competitively is these managers do not have a fear of bankruptcy; as long as the soft budgets would cover the deficits (Kornai 1980).

The control right which State-Owned-Enterprises have can be used to manage assets in order to achieve set objectives such as to create employment opportunities and provide basic needs to the public while privately-owned enterprises have the need to maximise profits (Alchian 1965). This standard approach to public and private ownership stresses the agency problem in all forms of ownership. However, the theory claims that managing by owners (shareholders) would be more efficient than monitoring by political processes (Alchian 1965).

Public/ Private interest theory (Public/ private choice theory)

Public interest theory describes and predicts the actual behaviour within the public sector. This theory proposes that the government supports the public interests through State-Owned-Enterprises participating in activities such as maximising social welfare and fostering country's economy while maintaining a high level of employment (Carter 2013). The core element of this theory is that politicians and government bureaucrats are likely pursuing their own interests rather than the public interest (Buchanan and Tollison 1984).

Shleifer et al. (1996) claimed that, unlike the managers in private sector, SOEs' managers are expected to pursue different objectives rather than the objectives of maximising profits. This is because the managers in SOEs are responsible for various constituents, such as legislators, ministers and civil servants, who have their own objectives with SOEs. Typically, politicians who are responsible for unemployment would tend to influence the managers in SOEs to employ their constituency voters, which in turn the cost of labour in SOEs would increase. Migue and Belanger (1974) argue that in order to maximise state public political objectives such as seeking votes to retain political power, policies and regulations can be manipulated. Both property rights and public choice theories suggest that the behaviour and performance of the managers in SOEs would differ from the managers in the private sector because each has different objectives and constraints.

On the other hand, private interest theory primarily focuses on profit maximisation (profitability) and shareholder wealth (high return for investment). These conflicting and competing interest as well as the responsibility preferences of public and private interest theories create a vacuum about the real responsibility of a privatised firm. Therefore, to address concerns, private interest theory suggested an emphasis on complete contracts; law and regulations which can be used to adequately protect the public interest and prevent private sector's opportunistic behaviours (Carter 2013).

As mentioned above, public officials, bureaucrats, and politicians are more concerned in maximising their own objectives such as elections, votes, or power than protecting the public interest and the efficiency of their decisions. This may encourage trade union activities to safeguard such interests, particularly for certain stakeholders. As a result, transferring the public ownership of a firm to private ownership is seen as the most productive measure to avoid the inefficiency generated by public ownership.

Despite the theoretical arguments, the impact of privatisation on a firm's performance in practice is far from conclusive and instead has produced mixed results.

The theory of the firm

The theory of the firm is used to explain the nature of a firm and predict the existence, structure, behaviour and relationships of a business entity with the market forces. It is clustered with several other economic theories which are used to explain the existence, behaviour, structure and relationship of a firm to the market (Spulber, 2009). Simply, this theory explains that firms exist and make decisions in order to maximise their profits. To achieve that goal the firms, interact with the market-price mechanism in determining price and demand/supply and then allocate scarce resources in the most profitable manner (Spulber, 2009). However, recently, this theory has been debated and expanded to consider whether a firm's goal is to maximise its profits in the long-term or short-term. This theory works side by side with other theories, such as stakeholder theory and the theory of consumers. These other theories distinguish between short-term motivations, such as profit maximisation, and long-term motivations, such as sustainability.

Therefore, today's firms must consider not only maximising shareholders wealth through dividends but also, public perception, social responsibilities, environmental protection and long-term investments in the firm's viability.

Shareholder theory

Shareholder theory presents the traditional view of a firm, which expresses the view that only the owners or the shareholders of an entity are important, and that the firms, therefore have a binding fiduciary duty to put their needs first in order to increase value for them. This theory was introduced by economist Milton Friedman in 1970 and according to him, the owners or the shareholders (the principals) of a firm legally authorise the management (the agents) to supervise or to protect the principal's wealth or property on behalf of them in which agents owe a fiduciary duty to the principals to maximise the profits (Friedman, 1970). The essence of shareholder theory is that a business exists to maximise profits (profitability) for the benefit of the shareholders. Primarily, privately owned firms run businesses under this shareholder theory as their prime motive of running a business is profit maximisation. This study evaluated the performance of a privately-owned port, which has been regulated by the government through policies, procedures and privatisation agreement. Therefore, the contradiction of the aims of running the business of the Port of Brisbane must be evaluated in both private and public ownership aspects. Shareholder theory is relevant here in order to evaluate the achievements of private ownership from privatisation.

Stakeholder theory

Stakeholder theory, introduced by Dr. Edward Freeman in 1984, relates to organisational management and business ethics, which can then be used to address issues such as the morals and values needed to be considered when managing a firm (Freeman, 2010). In 1983, stakeholders have been broadly defined by Freeman and Reed (1983, p.91) as any identifiable group, or individuals, who either can affect the achievements of a firm's objectives or are affected by the achievements of a firm's objectives. Moreover, Freeman (2010) suggested that shareholders are just one of many stakeholders of a firm. Additionally, all employees, vendors, government agencies, environmentalists, suppliers, investors, and communities who have interconnected relationships and a stake in a firm should be valued by a

well-performing firm. Also, he argued that a firm's real success relies on satisfying all the above-mentioned stakeholders of the firm, not just the shareholders who provide capital and then make profit from the company's success. Therefore, stakeholder theory questions the content of shareholder theory which focuses just on the shareholders' wealth as the main objective of a business.

However, the revolution of thought that has occurred within stakeholder theory reflects societal expectation over time. *2.4 Corporate Social Responsibility (CSR) and Stakeholder theory*

As discussed above, stakeholder theory distinguishes the accountability of a firm and the equal rights of its stakeholders, when performing its business activities. As Mulgan (1997) stated, the term 'accountability' is derived from 'responsibility concept. In that sense, accountability is the responsibility of a particular party to another who has entrusted the said particular party to perform some assigned duties. During this process of performing its accountability to a firm's stakeholders, the disclosure of information in accounting is vital. As Gray et al (1996) stated, disclosure of information includes not only financial and regulated information, but also nonfinancial and unregulated information. This has been emphasised by Stakeholder theory as the community has the right to know the aspects of any firm's operations and their consequences. Therefore, it is the duty of a firm to disclose its information in a responsibility-driven way rather than in a demand-driven way.

Disclosure of information in a responsibility-driven way is the role of Corporate Social Responsibility/ Reporting (CSR), which provides society-at-large (Principal) with information (Accountability) about the extent to that a firm (Agent) has met the responsibilities imposed on it (Gray et al 1996). The principal or the society at large represents a firm's stakeholders. Unlike the ethical branch, often, the managerial branch of stakeholder theory related to CSR has been empirically tested by various researchers. Roberts (1992) studied on the ability of a firm's stakeholders to impact on its CSR disclosure and found measures of stakeholder power and their related information needs, which can provide some explanation of levels and types of CSR disclosures. Similarly, Neu et al (1998) stated that firms are more responsive in terms of corporate environmental disclosure, to the concerns of financial stakeholders and government regulators than to environmentalists.

Also, Bhattacharyya (2015) found that the prime motivation of CSR disclosures relies on the desire to manage the most powerful group of stakeholders.

In summary, the paradigms within the current branches of stakeholder theory, which encompass the theory of the firm, are the motivational influences on the financial and environmental performance of PBPL; the privatised operations of the formerly publicly owned Port of Brisbane Corporation (PBC).

2.5 Literature review As literature has emphasised, SOEs' performances are considered to be slow and inefficient mainly due to the government bureaucracy, poor decision-making practices, political intervention, labour trade union activities and changes in administration. Further, various theories have been posited to emphasise the commitment of private ownership to maximise profits and reduce cost than the commitment of state ownership. The theories mentioned above have described the reason why the structure of company ownership has an influence on the performance of a firm (Shleifer 1998). For example, private interest theory proposes that private owners are motivated by profits and therefore wish to engage in profit maximisation, and that suggests the shareholders are therefore less interested in the provision of public interests, especially in protecting the environment (Parker 1998, Shleifer 1998). Similarly, shareholder theory explains that a firm's sole responsibility is profit maximisation for its shareholders. Additionally, theories such as property rights and agency problem, have further explained that there is a relationship between the ownership structure and a firm's performance. Most studies based on such theories have demonstrated that the ownership structure influence a firm's performance. These theories propose that private ownership leads to an increase in the performance of firms when compared with state ownership. The reason proposed for this phenomenon is that shareholders of privately-owned firms are driven by the profit maximisation whereas the State-owned firms are more likely to be driven by a social welfare motivation (Megginson and Netter (2001), Parker and Saal (2003)).

However, some alternative studies have revealed factors which influence a firm's performance are not only the structure of ownership but include the competition, the degree of autonomy and the rewards management receive from the owners of firms (Nickell, 1996). However, a considerable amount of research findings in the

literature are in favour of the increased performance of private ownership. Therefore, Zraiq and Fadzil (2018) maintain that the studies wouldn't reveal any further significance between the ownership structure and a firm's performance and what the most needed in future research in the privatisation is that a new dimension to the conventional relationship between ownership and performance.

Also, the perception that privately-owned firms have superior performance when compared to State-Owned-Firms has been researched extensively to find the relationship between the change of ownership and company performance (Parker 1998, Shleifer 1998, Poitras, Tongzon & Li 1996). Some studies have indicated that privatisation has positively impacted on the performance of firms. For instance, having compared pre-and post-privatisation conditions of 61 firms from 32 different industries in 18 countries, Megginson et al (1994) suggested that output, profitability and operating efficiency of their sample population was increased by privatisation. Again, in 2001, Megginson and Netter demonstrated that privatisation significantly and dramatically improved the financial and operating performance of divested firms. They concluded their study with thoughts on the current literature at the time. They stated that, by 2000, the role of the State-Owned-Enterprises had been reduced significantly by privatisation programmes, especially in developing countries. Further they summarised by stating that most studies supported the proposition that privately-owned firms were more efficient and profitable compared to the state-owned firms. They concluded that it was true that privatisation beneficial to the divested firms, as they become financially healthier, although there were costs for the workers of the SOEs as their jobs were unresolved. The most interesting conclusion was that there was little empirical evidence on how privatisation affected stakeholders except shareholders.

Some researchers (Megginson & Netter 2001, Guriev & Megginson 2005, Boardman & Vining 1989), however, theorise that even though privatisation has led to improvements in company performance, the change of ownership itself is not the only reason for it, but there are some other factors which possibly increase the efficiency; i.e. competition, change of technology, and regulation reforms. Further, to the conclusion of the meta-data analysis of Bachiller (2015), the method of privatisation also a determinant of the performance of privatised firms. However, previous researchers have not suggested a world-wide accepted methodology to

evaluate the performance of a privatised firm. Accordingly, it is evident that there is no consensus on how to analyse performance improvements of SOEs after privatisation.

According to the literature, most of the time, government operates enterprises at a loss. Therefore, when ownership changes to the private sector, there is an expectation of improving fiscal efficiency and capacity to generate profits. Critics against privatisation, especially related to the provision of services, argue that profit motive would cause a privatised State-Owned Enterprise (SOE) to provide stakeholders with inferior services (Carter 2013). The reason behind is that the services may be provided at a low quality under a maximum profit margin. However, some researchers have argued that the proper administration of a privatised firm would still facilitate quality services and protect stakeholders' interests (Bowyer & Chapman 2014).

Other than being a political decision, theoretically, privatisation is an option for the government to restructure policies and regulations (structural adjustment) for the provision of better services to the public by eliminating loss generating SOEs. The main debate in the literature about privatisation is whether it improves the performance of previously State-Owned-Enterprises. This argument ranges from improved efficiency, lack of political interference, increased competition to the natural monopoly, public interest, industry fragmentation and regulating private ownership (from positives to negatives of privatisation) (Boussofiane et al. 2010; Megginson & Netter 2001; Nagorski 1972). While having a doubt about the increased performance by privatisation, some argue about the best method for privatisation(Havrylyshyn & McGettigan 1999, Sozzani 2001). However, this research is based on the first argument to keep the study concise.

Globally, the port industry has been analysed in various perspectives. Measuring port privatisation efficiency and productivity is the common endeavour. Until recent time, technical and economic efficiency measures are more popular among academicians (e.g., Liu, 1995; Coto-Millan et al., 2000; Notteboom et al., 2000; and Cullinane et al., 2002). These example studies are some of the benchmark studies in technical and economic efficiency in the literature. Some of the other researchers (e.g., Talley, 2007; Saygili & Taymaz, 2001; Parker, 1998; Cowie,

1999; Boussofiane, Martin, & Parker, 2010) who assessed the impact of privatisation from a technical and productivity aspect using the following frontier efficiency measurement techniques. Stochastic Production Frontier approach, or Data Envelopment Analysis (DEA) are used to evaluate a firm's technical and productive impact of privatisation. Most of these studies have produced mixed results (Boussofiane, Martin, & Parker, 2010). Some of them have returned significant outcomes (Cowie, 1999), while others have insignificant outcomes related to improved performance of former State-Owned-Enterprises (Saygili & Taymaz 2001).

However, the impact of port privatisation on the sustainability, environment and social responsibility has been less weighted in the literature. With the advancement of technology, different objectives and diverse operational activities plead new measures of performance analyses not only in the port industry but also, in any industry as a whole. Currently, this is more due to the conceptual advancement in the fields of economics and management in environmental protection, sustainability, and Corporate Social Responsibility (CSR). Therefore, the modern studies urge better criteria in analysing environmental performance, sustainability and CSR of port activities when evaluation port privatisation performance.

Another significance of the measuring process of the impact of port privatisation is the methodology which a study implemented. Often, researchers use either quantitative or qualitative method separately in their studies to evaluate the impact of privatisation. Quantitative approach concerns with discovering facts about port privatisation while assuming fixed and measurable realities. Data are collected through measuring tools and also, are analysed through numerical comparisons and statistical inferences. Quantitative approaches are dominated by ratio analysis (ROE, ROA, ROS), non-parametric analysis (Data Envelopment Analysis-DEA) and parametric analysis (Stochastic Frontier Analysis SFA).

Ratio analyses often represent financial and operation proxies and they seldom represent environmental and sustainability ratios. Djankov and Murrell (2002), Megginson (2002), Megginson and Netter (2001), Parker and Saal (2003), and Sheshinski and Lopez-Calva (2003) are some prominent researchers who followed the statistical ratio approach. For example, Megginson et al. (1994), focused on

financial and operating ratios such as profitability, sales, labour productivity, debt, investment, employment, and dividends. Subsequently, widely cited studies such as of Boubakri and Cosset (1998), DeWenter and Malatesta (1997), and D'Souza and Megginson (1999) followed the same approach, concluding that privatisation was associated with gains in a company's profitability and labour productivity whereas, the other performance indicators produced mixed results.

DeWenter and Malatesta (2001) concluded that a firm's profitability could be increased by the government through effectively restructuring the firm without privatisation. However, most of these studies (Boubakri et al. 2005, D'Souza & Megginson 1999) did not consider the influence of other factors (such as sustainability measures, the conditions of a privatisation agreement, regulations and economic changes), which also influence the privatisation process. Further, Verbrugge et al (1999) found that the performance of 65 selected banks of their study was moderately improved after the privatisation. Using a panel of 60 banks, Beck et al (2003) also concluded that privatisation had a positive impact on efficiency. One thing common from all above studies was that those studies revealed that profitability of the selected sample companies was improved after privatisation, though the studies did not focus on the changes in the overall value of the selected firms.

According to Arocena and Oliveros (2012), some studies contain two broad limitations which have been often exposed by the authors themselves. The primary criticism is that the majority of studies focus on partial financial and economic ratio analysis or single factor productivity measurements without estimating productive efficiency. Further, their study depicts profitability is an inappropriate variable to measure performance or efficiency as higher profit margins may exist due to an increase in price rather than from an increase in marginal profit which can be a result of market power. The second set of studies as they identified as having limitations, failed to properly compare the performance level of a SOE before and after its privatisation, with what was achieved by private owners in the same economic environment.

Non-parametric approaches (stochastic linear programming) do not consider random noise and they do not allow statistical hypothesis to be contrasted. Also,

they do not carry out assumptions on the distribution of the inefficiency term while they exclude error terms. Additionally, they are sensitive to the number of variables, measurement errors and outliers. Further, these approaches do not require specifying a functional form and they are just mathematical programs. Prior studies (e.g., Roll and Hayuth, 1993; Tongzon, 2001; Culliednane et al., 2004; Park and De, 2004; Barros and Athanassiou, 2004) are some of the benchmark non-parametric approach researchers in the literature. All of these researches have used Data Envelopment Analysis (DEA) model. Also, the selection of the sample for the above studies consisted of cross-sectional and panel data.

In practice, some researchers have found through non-parametric approaches that a change of ownership did not necessarily improve a firm's performance, or it had a mixed impact on the performance. Parker (1998) concluded in his performance analysis of the British Airports Authority (BAA) that there was no evidence to claim that BAA's performance improved after privatisation. Using a non-parametric Data Envelopment Analysis (DEA), he maintained that technical efficiency was expected to rise over time due to the change of Decision-Making Units (DMUs) both before and after privatisation. However, it is questionable the accuracy of his findings as DEA cannot be used to evaluate the performance of a single firm. Talley (2007) asserted that frontier statistical models that utilise DEA technique are for the technical efficiency evaluation of multi-port performance. It is, therefore, difficult to rely on the results of Parker's study, because he used one set of data (one year's data) as one set of DMUs (as one firm's efficiency) to achieve a score of 100, which may mislead the efficiency ratings. In addition to this technical issue, the study had also not considered the environmental impact of the privatisation of BAA.

Using non-parametric DEA method, Cullinane et al (2006) examined a panel data of 57 international ports and the impact of their privatisation on the technical efficiency. However, it is doubtful the accuracy of the outcome of that multi-port analysis because, ports have complex operations, different regulations and different levels of technology and competition. Therefore, a comparison of different ports and different port activities using a multi-port approach is dubious. Instead, a single-port approach is far more accurate than to the multi-port approach.

Further, many researchers compare the performance of firms under public and private ownership using cross-sectional regression with the assumption of the effect of ownership controls on the other determinants of performance. Boardman and Vining (1989) argued a regression analysis should be considered to be inappropriate because ownership is endogenous (having an internal cause or origin) in a cross-section and it is therefore, difficult to control for all possible determinants of performance at the firm level. According to Bachiller (2015), Dimensional Balanced-Scorecard method, Time Series Cross-Sectional Analysis, Wilcoxon t-test, and Mann-Whitney Test, are some other approaches widely used as non-parametric statistical tools to analyse changes to ownership and performance.

On the other hand, parametric approaches (econometric) do consider random noise and allow statistical hypothesis to be contrasted. Parametric approaches usually carryout assumptions on the distribution of the inefficiency term and they include compound error terms; for instance, one of one side and the other is symmetrical-as two queues. Nevertheless, these approaches require specifying a functional form and also, they can also, confuse inefficiency with a bad specification of the model because they are econometrics. Liu (1995)- (SFP), Coto-Millan et al. (2000)-(SFC), Notteboom et al. (2000)- (SFP), Cullinane et al. (2002)- (SFP), and Cullinane and Song (2003)- (SFP), are some of the prominent parametric studies of efficiency analyses in the port sector which have been used Stochastic Frontier Production (SFP), Stochastic Frontier Cost (SFC) and Distance Function (DF) and Cost Share (CS) models. The common functionality of all above-mentioned studies is that they have focused only on technical efficiency with the use of cross-sectional and panel data. However, the frontier approach is consistent with the economic theory of the optimising behaviour of companies. Also, the deviations from the frontier can be directly interpreted as measures of the efficiency through which companies achieve their objectives.

Tongzon and Heng (2005) studied the quantitative relationship between a port's ownership structure, port size and technical efficiency with reference to a cross-sectional data panel of 25 international ports. They used a Stochastic Frontier (SF) model which incorporates the inefficiency effect to demonstrate the importance of port privatisation as a necessary strategy to gain a competitive advantage. The study also investigated the determinant factors of port competitiveness. The outcome of

the study was that port privatisation can improve port operation efficiency to some extent which will, in turn, increase the port competitiveness. However, one disadvantage of the SF model is that there is no prior justification for the selection of any particular distributional form for the technical inefficiency effects. Also, the study concentrated only the relationship between the ownership structure, and technical inefficiency but not the environment and sustainability.

Qualitative approach concerned with understanding human behaviour towards privatisation from the informant's perspective. As the methodology, qualitative approach collects data through participant observation and interviews and then data are analysed by themes from descriptions by informants. Data are reported in a descriptive manner. This method is more suitable to analysing human behaviours which are unable to capture successfully through scientific methods. Mixed methods (both quantitative and qualitative) approach for the performance evaluation of a privatised port is rare in the literature.

According to a qualitative study performed by Tsamenyi, Onumah and Tetteh-Kumah (2010), the evaluation of post-privatisation performance of two selected firms in Ghana was positive. Using a five-dimensions balanced scorecard, they conducted interviews on five perspectives of the selected companies such as accounting-financial, customers, internal business process, learning, and growth and community aspects, and then they rated those five perspectives. However, it can be arguable that relying on perceptions of the interviewees for the purpose of generalising the findings to the wider community may be biased. The views expressed may represent the personal viewpoint and sentimental values towards the success of the privatisation process that may not reflective of the privatisation process in general.

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In the Australian context, McKenzie and Keneley (2011) highlighted that their main hypothesis which proposed that "performance is different after privatisation" was not found to be supported by the evaluation of four Australian finance institutions. Further, they demonstrated that some of the sample institutions were performing well before their privatisation. Therefore, they concluded that privatisation was not the key factor in improving performance. Using a CAMEL analysis (Capital

adequacy, Asset quality, Management, Earning, and Liquidity) the researchers initially evaluated the financial performance of the selected firms and then, the result of the ratio analysis was tested through the non-parametric Wilcoxon small sample test. The selection of those statistical tools was similar to the quantitative structure of this study though, it differs from McKenzie and Keneley's as this study used both parametric testing and qualitative thematic analysis.

King and Pitchford (1998) have studied privatisation in Australia to understand the incentives operating in public and private firms. They applied a simple framework to the ownership approach in Australian prison, airports, Telstra, water and gas distribution and ambulance services. This study explained the relationship between incentives and ownership policies although, there were no concerns related to the financial and environmental performance and the change of ownership. According to Chen et al. (2017), privatisation has a positive effect on SOEs 'balance sheets in the short term though, it may result in a risk of undervaluing port assets. Also, the change of ownership may have resulted in increased port charges, fewer port investments, impeded port competition, and less concern about the public interest in the long run (Chen et al. 2017). However, their study did not address the significance of the changes in ownership nor the financial and environmental performance of the selected firms.

As already discussed under stakeholder theory in section 2.3, findings of Chakravarthy (1986) confirmed the inadequacy of traditional strategic performance evaluation measures which are based on a firm's profitability (financial data). To be an important discriminator of strategic performance evaluation, therefore, he emphasises the requirement of having the sophisticated measures which assess the quality of a firm's transformation and the satisfaction of all of the firm's stakeholders. For this, he analysed seven excellent firms (firms were from the computer industry, featured in a book published by Peters and Waterman) in contrast with seven other non-excellent firms from the same industry. However, the study could not distinguish key performance measures of excellent firms. Also, the profitability measurements do not seem capable of discriminating excellence and accounting data which the study used to construct the proxies captured historical

performance of trends. Financial ratios such as ROE, ROI and M/B (Book to Market value) are necessary for a firm's excellence though they are not sufficient, therefore, Chakravarthy (1986) suggested the need of futuristic measures.

Predominantly, Ullmann (1985) proposed that inconsistent findings from the studies of the relationship among social disclosure, social performance, and economic performance of American firms were majorly due to lack of theories, inappropriate definitions of key terms, and deficiencies in the empirical databases. Therefore, one of his suggestions was the improvements in methodology in analysing a firm's social and economic performance. Accordingly, research attempt to correlate social disclosure, social performance, and economic performance should include additional variables based on a contingency approach (situational approach). The situational approach suggests the most appropriate analytical method is dependent on the context of the situation, rather than an inefficient single and rigid method. Typically, selected firms in the sample should have to have different strategic postures. Longitudinal studies should have to address how management strategies change over stakeholder power and economic performance. Also, differentiation between mandated and voluntary social performance and related disclosure activities is suggested. However, Ullmann accepts the difficulties of having complex social performance measures in measuring the performance of a firm. Lastly, also, he accepts the existence of considerable shortcomings among social performance criteria. In conclusion, Ullmann (1985) emphasises the best consideration in analysing a firm's performance is the relationship between social performance, economic performance and social disclosure performance until an adequate theory arises.

The other factor when considering the evaluation of a port's privatisation is the selection of a single-port approach or multi-port approach. Most of the benchmark port performance analyses are multi-port analyses while single-port evaluations are inferior (different categories of the evaluation of port privatisation have been discussed in section 3.0 Methodology in Chapter 3).

Having sought the existing literature, this study, therefore used both quantitative analysis and qualitative interview analysis adequately to find out the factors which may have affected the performance of PBPL. Thus, the main contribution of this

study is to add to the literature from a perspective which examines the financial and environmental performance of a privatised port in Australia, using a mixed methods (both qualitative and quantitative) approach, which the quantitative analysis consists of parametric MANOVA analysis than using traditional non-parametric Stochastic Frontier Models or Data Envelopment Analysis (DEA). Also, the quantitative method is different here from the traditional parametric regression analysis approaches. The justification for the use of a mixed-methods approach has been discussed later in chapter 3.

2.6 Theoretical framework

The theoretical framework of this study has been based primarily on the theory of the firm and the stakeholder theory. The significance of these two theories is that while the former emphasises a firm exists to maximise shareholders profits, the latter stresses a business entity should create value for not only shareholders but all stakeholders.

Stakeholder theory proposes that a firm has responsibilities to all stakeholders such as employees, customers, competitors, vendors, contractors, community members, institutes and shareholders. Accordingly, when States transfer their ownership of loss-generating enterprises to private ownership the needs of all stakeholders need to be considered. The conceptual intention of the privatisation should be the provision of better, quality goods and services to address the needs of the public. If not so, then the purpose of the privatisation of government may be just to make profits of selling state-owned assets while reducing the costs to the State and realising the money tied up in the SOEs.

The significance of the privatisation using stakeholder theory is contradicted by the theory of the firm as the latter states that a business exists and makes decisions to maximise profits (fiscal improvement). Further, private interest theory, agency theory, shareholder theory, property rights theory and ownership approach, assert that the prime motive of private ownership is profit maximisation. Firms engage in the market to determine price and demand and then to allocates resources for the goods and services the company produces. The scarcity of resources, the

opportunity cost, and the risk of investments are some drives for private ownership to maximise profits. The profit maximisation concept goes along with the theory of property rights and describes the allocation of property rights into private or public affects the efficiency of resource in use (Kim & Mahoney 2005).

Nevertheless, shareholder theory explains that private ownership engagement in business is motivated by a narrow concept of self-interest including wealth, fame, and power (Schenk 2017). However, researchers have argued that proper contracts with clear laws and regulations would eliminate the contradiction of stakeholder and private interest theories (Carter 2013). Therefore, the interviews conducted for this research were focused mostly on the new regulations and laws which affected PBPL's financial and environmental performance after privatisation.

According to Bowyer and Chapman (2014), stakeholder theory implies that a firm is compelled to make profits, to satisfy its stakeholders and to continue positive growth. A firm's stakeholders consisted of shareholders, employees, customers, community members, competitors, and contractors. One reason for the privatisation of ports may be to position them as a more competitive firm while catering for their stakeholders. Thus, it is important to explore both the impact of privatisation on the financial and environmental performance and the perceptions of key stakeholders and what benefits have been achieved from privatised port operations. According to the study of Bowyer and Chapman (2014), Sydney airport privatisation has led the airport operations to increased profitability, while also attracting criticism about the commercial orientation of the airport operations, overall business growth, and land development. Though the outcomes after privatisation are seen as more accountable to the public and its stakeholders. Transferring the ownership and management of Sydney airport into private hands has generated more value and efficiencies (Bowyer & Chapman 2014). Additionally, legitimacy theory also describes the importance of the employees' views on the change of ownership of a firm and its impact on the society (Mares and Musil 1994).2.7 Chapter summary

The determinant factors of privatisation are varied. Continuous losses made by the state have been seen as the main reason. Also, state-owned firms are regarded as slow and inefficient. Moreover, there is a belief that firms which are privately owned perform better than state-owned firms. This has been supported up by several theories and some of them are as the theory of the firm, private interest (choice) theory, shareholder theory, agency theory, and property rights theory. However, there has been no consensus to whether there is an increase in

performance by privatised firms or the best methodology to evaluate the performance of a privatised firm. This study has been based on the theory of the firm and then utilised stakeholder theory as the privatised business goal stated by PBPL, is profit maximisation through sustainability. Therefore, a mixed-methods (qualitative and quantitative) approach has been used to evaluate the performance of PBPL.

CHAPTER 3

3. 0 METHODOLOGY

This study has focused on the impact of privatisation on both the financial and environmental performance of PBPL and the evaluation has been performed in two stages. The first stage was a quantitative analysis and the second stage was a qualitative analysis. The quantitative analysis was performed by a one-way Multivariate Analysis of Variance (MANOVA) which used the outcomes of 12 selected performance analysis ratios. The qualitative analysis was performed by interviews. The questions asked of the interviews related to identifying why there were significant differences in the performance of the two types of ownership.

The sample population was Port of Brisbane Proprietary Limited in Brisbane (PBPL). Therefore, the study operated as a mixed methods case study. These methods, techniques, and proxies have been selected according to the research variables (the nature of the data gathered), the nature of the research question, the assumptions the study has stipulated, and the gap in the literature.

As the majority of literature describes, change of ownership (privatisation) improves a firm's performance. This has been researched extensively and the percentage of improving performance under private ownership after privatisation is immense. Also, the theory of the firm explains, the private ownership operates a business to maximise profits and therefore, the function that describes the relationship between the change of ownership (privatisation-the response) and its impact on the performance (explanatory variables) most of the time, is positive (as literature describes). One thing is certain that private ownership would perform to increase the financial performance of a firm though, they would not operate to improve the environmental performance as it needs heavy investments to enhance environmental performance which decreases the firm's profits. According to the vision and mission statement of PBPL, the firm operates its activities to maximise profits in a sustainable manner. Evidently, to be operated in a sustainable manner, PBPL should adhere to the steps revealed by stakeholder theory.

There is a positive function between the change of ownership and performance derives from the theory of the firm and the existing literature. Also from moral consideration that private ownership is superior to that state ownership. This study, therefore, attempted to verify this phenomenon in a scientific way followed by positivism research philosophy. Consequently, this study, therefore needed to distinguish the magnitude of profits maximisation procedures and sustainability maintenance procedures of PBPL (i.e., the extent of profit maximisation activities and sustainability maintenance activities of PBPL). Therefore, this study implemented a parametric One-way MANOVA approach as the quantitative method and a qualitative interview technique with an assumption of 'no change of financial and environmental performance after privatisation of PBPL'.

Confirming to the empirical evidence provided by literature, Mohan (2000) classified the entire privatisation process into three categories as;

1. Case study- A single firm as pre and post-privatisation or a selected privatised firm with another firm which was already privatised nor not
2. Cross-sectional comparison of public-private ownership performance
3. Econometric analysis of before and after the privatisation of firms

A case study focuses on the performance of a single firm, in comparing its performance under its pre and post-privatisation conditions. As an extension to the case study, a selected privatised firm's performance can be compared to another firm which is either in the stated sector or in the private sector (Mohan 2000). Adams et al (1992) had used the case study method to evaluate single firm privatisation performance from eight developing countries and had found that improvements in efficiency in some Malaysian privatised companies. Also, Bishop and Kay (1989) compared the performance of selected set of UK infrastructure firms in the shipping, gas, oil, telecommunication and automobile industries with another set of firms in the rail, coal, postal and steel industries and found improved performance in revenue, employment, total factor productivity, profit and profit margins indicators in both set of firms.

Using a cost-benefit analysis, Galal, et al (1994) performed a case study of 12 privatised companies in four countries to inquire the net change in the welfare of

consumers, labour, competitors and enterprise profits in those twelve firms and concluded that there were significant changes in the welfare of the selected sectors. Foreman-Peck and Manning (1998) is another milestone study for a case study approach. A cross-sectional study compares the performance of a set of privatised companies to their industry peers either in the same country or across countries which is known as a head-to-head comparison.

According to the literature, Boardman and Vining (1989) presented a landmark cross-sectional comparison of 500 firms (409 private-owned, 57 state-owned and 23 both state and private owned firms) to evaluate their performance using criteria such as return on assets, return on equity, return on income and sales, sales per employee productivity, sales per asset productivity and assets per employee and concluded that private sector performance is superior to the government sector. One finding of this study is that while private ownership of the selected firms represented in all industries, state-ownership most frequently performed in metal, petroleum and transportation industries whereas, mixed-ownership performed worse compared to private and state ownership. It is noteworthy that the selection criterion of firms was biased.

Picot and Kaufman (1989) also, carried out a similar cross-sectional study on analysing the improved performance of selected 500 firms in six different countries in fifteen different industries. They concluded that the rate of return and productivity measures in SOEs were lower to private-owned firms. Yunker (1975), Meyer (1975), Caves and Christensen (1980), Finsinger (1984), Grosskopf and Logan (1985), and Martin and Parker (1997) were the other renowned researchers who did benchmark cross-sectional analyses in evaluating the performance of privatised firms.

Econometric analysis of the performance of firms under pre and post-privatisation conditions investigates a large sample of privatised firms in a country or across different countries over a long period. The study of Megginson et al (1994) is one of the most sophisticated examples for this category. Having compared the financial and operational performance of 61 firms under pre and post-privatisation conditions, they found the increased profitability, efficiency, employment, real

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sales after privatisation and capital spending of the sample. The sample firms were selected from 18 different countries and 32 industries during the period 1961-1990 (29 years). Also, they found that the increased profitability in regulated industries, for instance banking and utilities was insignificant. However, in addition to the problem of selection bias in SOEs, changes in the economic environment after privatisation which may contribute to improving a firm's performance had not been controlled during the study.

Later, Frydman et al (1997) researched about the improved performance of 190 firms in transition economies Eastern Europe, using the same approach and in their study, they addressed the issues in Megginson et al (1994) study which mentioned above. The study covered the period from 1990 to 1994 (4 years) with reference to the proxies such as revenue, cost-revenue ratio, employment and revenue per employee. To avoid the selection bias, Frydman et al (1997) used non-privatised firms as the control group and broke the analysis into two parts. First, they compared the post-privatisation performance of the selected privatised firms with the selected SOEs. After, they compared the pre-privatisation performance of the selected privatised firms with the same set of selected SOEs to find any differences in the performance. If any differences found only in the first step, this means the ownership has made a difference in the performance. Their regression equation which was based on the growth of each performance variable against the pre-privatisation performance value and a dummy variable which represented the nature of the ownership (if privatised 1, otherwise 0) captured two effects including the effect of the transition economy to a market economy and the effect of privatisation of the selected group. Some conclusions of the study were that the impact of privatisation on revenue, employment and revenue per employee were statistically significant whereas, the impact of privatisation on cost-revenue ratio was statistically insignificant. The most prolific finding of the study was that the effects of transition economies and privatisation behaved in the opposite direction while the 4 selected proxies were unfavourably impacted by transition and the privatisation process boosted the selected variables.

However, Talley (2007) divided the evaluation of port privatisation into two main categories as,

1. Single-port performance evaluation approach
2. Multi-port performance evaluation approach

The single-port performance approach evaluates a selected port's performance over time comparing the port's actual throughput to its optimum (engineering or economic) throughput. Optimum throughput is the maximum goods or services physically a port can handle under certain conditions. Optimum throughput is also called as the port's capacity which can be measured theoretically or empirically (Talley, 2007).

According to Talley (2000), the single-port performance evaluation can be done by either Throughput Performance Evaluation or Indicator Performance Evaluation. If a selected port's actual throughput reaches to its engineering or economic (port's capacity) throughput over time, it can be concluded as its performance has improved. Chadwin et al (1990) have defined extensively a port's engineering production optimum throughput and the methods of calculating it. Studies performed by De Neufville and Tsunokawa (1981), and Kim and Sachish (1986) are two other renounced examples of the throughput performance evaluation method.

Indicator performance evaluation can be divided into two contrasting methods as, operating objective specification and criteria specification (Talley, 2007). The former method requires the specification of an operating objective in order to select the performance indicators whereas the latter specifies the criteria which selected performance indicators must satisfy. Variables which the port management can control of their values in order to optimise the operating objectives, are considered to be in the operating objective specification method. The values of those variables which optimise the operating objectives are treated as the standard or the benchmark. If the actual values of the variables which were treated as the standard values, increase over time, then the port's performance which relevant to the given operating objectives, is considered as improved. (Talley, 2007). On the other hand, criteria specification method consists of criteria such as data availability, data collection time and cost, consistency with objectives, conciseness, measurability, robustness, and minimisation of uncontrollable factors (Talley, 1994).

Multi-port comparison defines a comparison of one port's performance to that of other port and generally, researchers use frontier statistical models to compare multi-port performance. However, such a comparison can be misleading as ports operate in different social, economic and fiscal environments. For instance, it is not always the same the economic objective of maximising annual optimum throughput subject to a profit constraint of the ports in the comparison, and it can differ from port to port. One port may have a negative profit constraint which is to be subsidised whereas another may have a break-even or positive profit constraint. Tongzon (2001) therefore, recommends using similar ports in a multi-port comparison as some port may have different economic objectives. Suykens (1986), Tongzon (1995), Tongzon (2001), Coto-Milan et al (2000), Cullinane et al (2002), Notteboom et al (2000) some of the benchmark multi-port performance evaluation studies which have utilised stochastic frontier models in the literature.

When considering into above two studies of Mohan (2000) and Talley (2007), each approach has its own requirements such as the size and the number of the sample, time frame, the accessibility of data, and the cost of conducting each approach. Therefore, due to time, data availability and cost constraints factors, this research follows the single-port case study approach and this selection has already been justified in depth under the limitations of the study in section 1.6 in chapter 1. Also, the focus of this study was divided into two sectors. The main focus of this study was to evaluate and compare the financial and environmental performance of PBPL under both private and public ownership with reference to the theory of the firm. The second part investigated how PBPL managed their social responsibility in creating overall value, with reference to stakeholder theory.

Next, this study needs a methodology to use with the case study approach in measuring the impact of privatisation of the selected firm. Different researchers have used various qualitative and quantitative techniques such as interviews, questionaries or statistical tools in measuring the impact. According to Talley (2007) traditionally, ports have been evaluated by the single-port approach of comparing its actual and engineering optimum throughputs such as the maximum throughputs or cargo tonnage which a port can physically handle under a certain

condition. Over time, if actual throughput of a port is approached or departed from its optimum throughput, this means that its performance has improved or deteriorated respectively (Talley 2007).

The variables of the analysis of this study are as below;

1. One categorical independent variable (IV)- *Privatisation* (change of ownership) with two levels- *before and after privatisation* (State ownership and Private ownership)

Literature has indicated that progressing towards and from a change of ownership structure involves a transitional period, both from the old structure and the new structure (Psarouthakis, 2013). Therefore, the categorical independent variable has been intersected into four periods of three years. Two "three-year periods" of

Table1.   Divisions of ownership periods of PBPL

Pre-privatisation State Ownership	2005	2006	2007	2008	2009	2010
	Period 1			**Period 2**		
Post-privatisation Private Ownership	2012	2013	2014	2015	2016	2017
	Period 3			**Period 4**		

transition prior to the change of ownership and two transitional periods of three years subsequent to the change of ownership (see table 1). The selected data pool consisted of 12 financial years; from 2005 to 2017. The pre-privatisation period of PBPL represented from 2005 to 2010 (6 financial years) whereas the post-privatisation period represented from 2012 to 2017 (6 financial years). The financial year; 2011 has treated as the transitional period because in that year both types of ownership traded (seven months by public ownership and five months by private ownership). For a better analytical and conclusion process, both pre and postprivatisation periods are divided into 4 periods and these four periods performed as the interceptions in MANOVA.

Cohen (1988, 1992), Pallant (2007), and Tabachnick and Fidell (2007) stated that MANOVA needs more cases in each cell than the available dependent variables

and therefore, the division of state and private ownership of PBPL into four periods is important as it creates more duplicate cases running MANOVA accurately.

2. Two continuous/ numerical dependent variables (DV)- *financial performance and environmental performance*

These two dependent variables have been operationalised using the following financial ratios as detailed in table 2 below.

Table 2	financial and environmental performance ratios
Financial performance	
Profitability-	
1. Return on Assets (ROA) % EBIT/total assets	
2. Return on Equity (ROE) % EBIT/equity	
Leverage-	
3. Debt to Assets %	
Investment Intensity-	
4.Capital Expenditure to Total Assets (CEA)	
Capital (i.e., net assets) to Total Assets (CEA)	
Port Operational-	
5.Total Container Throughput-TEUs	
6. Total Trade Throughput-Tonnes	
Environmental performance	
Employment-	
8. Total Employment (TE) (Full Time Employees)	
Energy-	
9.Total Energy consumption-Gigajoule	
10. Total Emission-CO_2 Tonnes	

The study used MANOVA firstly, to test the null hypothesis. Secondly, and conditional upon the results of MANOVA rejecting the null hypothesis, the analysis was investigated. The rejection of the null hypothesis enabled the purpose of the study to identify the differences in the financial and environmental performance before and after the privatisation of PBPL. For this, initially, the study explored the statistically significant differences in the financial and environmental performance before and after the change of ownership of PBPL through a one-way MANOVA analysis. However, this study did not explore the relationship between the selected variables. Secondly, where MANOVA found any significant mean differences of performance in samples, then the purpose of interview sessions was to ascertain reasons for such differences in order to draw conclusions about the impact of privatisation on the financial and environmental performance of PBPL.

3.1 One-way MANOVA test

MANOVA is an extension of the analysis of variance (ANOVA) for use when there is more than one dependent variable (DV) which are related in some way (Pallant 2007). As a theoretical construct, this was developed by Samual S. Wilks in 1932. Accordingly, MANOVA identifies;

- Any significant effect of different levels of independent variables (IVs) on a linear combination of each of the dependent variables (DVs)
- Any interactions between the independent variables and a linear combination of the dependent variables (DV)
- Any significant univariate effects for each of the dependent variables separately

The purpose of having a one-way MANOVA in this study was to test if the performance of PBPL during State ownership significantly differed from the performance of private ownership after privatisation in financial and environmental characteristics (table 2). In this study, change of ownership (two groups-S*tate vs Private or pre vs post-privatisation*) was the independent variable whereas, financial and environmental performance were the two dependent variables. The null hypothesis was that both DVs together were not affected by the change of ownership of PBPL which was tested by MANOVA. As shown in table 2, the two DVs were represented by twelve financial and environmental indicators. One reason of having twelve indicators to represent two DVs was that the study was aware that MANOVA is a highly sensitive analytical tool and if one or a few of the indicators violated the assumptions[1] of MANOVA, still the study might be able to reach for a conclusion with the help of the behaviour of the rest of the indicators of DVs. However, this study occasionally had removed and trimmed out some data from the sample to maintain the MANOVA assumptions. Pallant (2007) asserted

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[1] As a case study (single firm analysis) the study acknowledged any possibility of a violation of MANOVA assumptions.

that MANOVA performs well in situations where there are moderate correlations among the dependent variables.

Creating new summary dependent variables (DVs), MANOVA simultaneously compares the groups and then states the mean differences (equality of means) between the groups on the combination of each of original dependent variables and the *P* values in MANOVA test tables for each term to the relevant significance level (alpha-α). The standard significance which is 0.05 indicates a 5% risk of concluding which an association exists when there is no actual association.

If the Multivariate Tests analysis of MANOVA (Pillai's Trace value) calculates a *P* value which is less than or equal to the threshold significance level (α-0.05), this concludes that that differences between the means are statistically significant. Therefore, the outcome is as;

If, *P*-value ≤ α: Mean differences are statistically significant, -Reject the null hypothesis

If the P-value is greater than the threshold significance level (α-0.05), mean differences are statistically insignificant. Then the study does not reject the null hypothesis. Therefore, the outcome is as;

If, *P*-value > α: Mean differences are statistically insignificant, -Fail to reject the null hypothesis

There are many quantitative techniques that can be used to test for the significant differences among levels/ groups and also, to test the relationship of variables (Pallant 2007). It is possible to conduct a series of ANOVAs separately for each dependent variable, however, it would then run the risk of an 'inflated Type 1 error' with more significant results through a number of ANOVAs, even if there are no differences between selected groups in reality. The advantage of using MANOVA is that it controls and adjusts for this increased risk of Type 1 error (Pallant 2007). Therefore, this study used MANOVA, because the nature of this research problem, research variables, and the nature of data, satisfied MANOVA requirements.

In order to use MANOVA, the following assumptions must be satisfied. Also, different sources have different number of assumptions and this study, therefore

used the most common assumptions. (Landau & Everitt 2004, Minitab 2017, Pallant 2007, Tabachinick & Fidell 2007).

Assumption: 1- Adequate number of dependent variables- Selected Dependent Variables (DVs) should consist of two or more than two variables and they should be continuous and measured at the ratio or interval level. Typically, there were two DVs; financial performance and environmental performance.

Assumption: 2- Adequate number of categorical and grouped independent variables- Selected Independent Variable (IV) should be categorical and it should consist of two or more than two groups. Here, the IV is 'ownership' which was divided into two groups as 'State ownership and Private ownership' (pre-privatisation and post-privatisation/ before privatisation and after privatisation).

Assumption: 3- Independence of observations- The observations should be statistically independent, randomly sampled from the population, and there should not be any relationship between the observations in the IV and each group or between groups themselves. According to Pallant (2007), this cannot be tested as it is about the study design. This study analysed a single firm's performance though, it had two different periods of observations as pre and post-privatisation periods (State and Private ownership).

Assumption: 4- Adequate sample size- The sample size should be adequate for a one-way MANOVA and typically, there is no standard minimum or maximum sample size for the MANOVA test. Pallant (2007, p. 277), stated MANOVA needs more cases in each cell than the number of dependent variables the tests involves. Researchers such as Cohen (1988, 1992), and Tabachnik and Fidell (2007) suggested a better sample size between 15 to 20 though there is no consensus about the size of the sample for MANOVA. This study contained 12 observations which represented two dependent variables of a single firm. Therefore, 12 observations were adequate to run MANOVA tests.

Assumption: 5- Multivariate Normality- The sample should have multivariate normality. Dependent variables have multivariate normality distribution (bell-shaped) within each group of the categorical independent variables. This can be tested by Shapiro-Wilks test of normality.

Assumption: 6- Absence of univariate and multivariate outliers- The sample should not have any (univariate) outliers in each group of the IV for any of the DVs and multivariate outliers such as an unusual combination of scores on the DVs. MANOVA is sensitive to outliers which may produce Type I or Type II errors without giving an indication as to which is occurring. Univariate outliers are detected by boxplots whereas, multivariate outliers can be detected by Mahalanobis Distance.

Assumption: 7- Absence of multicollinearity- The selected DVs should be moderately correlated with each other. Both low and high correlations (greater than 0.9) create multicollinearity issue. This was tested by Pearson Correlations Test and Q-Q Plots.

Assumption: 8- Linearity-Dependent variables (DVs) should be measured at the interval level and all DVs should have a linear relationship. Unless the variables are not linearly related, then it reduces the power of the test. This can be tested by Scatterplot matrices for each group of the IV.

Assumption: 9 - Homogeneity of error variances- As an extension, univariate ANOVA assumes homogeneity of variance of each group is equal (variances of each group are similar). This is tested by Levene's test of MANOVA.

3.2 Multivariate test statistics

Multivariate test statistics assess for statistically significant differences among the levels of the independent variables for a linear combination of dependent variables. The overall f test, named in honour of the statistician Sir Ronald Fisher, calculates the f value (statistic) ratio of two variances with the equality of means. Variance is a measure of how far the specific data are scattered from the mean (dispersion). The larger the values the greater the dispersion (Tabachinick & Fidell 2007). Statistically, the variance is the square of the standard deviation (σ); a measure which is used to quantify the degree of variation or dispersion of a selected data set (Pallant 2007). Instead of a univariate f value, MANOVA obtains multivariate f value based on a comparison of the error variance matrix and the effect variance matrix. Wilk's λ (Lambda) is the most popular though Pillai's Trace is the best when the robustness (possible assumptions violated) is in question (Tabachinick &

Fidell 2007). Hotelling's Trace and Roy's Largest Root are the other two tests that the overall f test assesses for a statistical significance in the sample.

If there were significant differences among the ownership groups (state and private ownership/ pre and post-privatisation periods which were divided into four periods) on a linear combination of the two dependent variables (financial and environmental), then the f value of Pillai's Trace test (or f value of Wilk's λ) in the multivariate test of MANOVA is significant. As mentioned above, to test any violation of the assumptions of homogeneity of variance, the study used the Pillai's Trace test as it is very robust and not highly linked to the assumptions about the normality of the distribution of the data.

Provided that the multivariate test statistics of overall f value for MANOVA is significant, then the analysis needs to examine the Test of Between-Subject Effects for each of the dependent variables. This test performs as a two-way ANOVA to check the interactions of the variables. Simply, the test reveals the effect of statistical significance on the dependent variables created by the interactions of the independent variables. If the 'Sig' column of the tests indicates any statistically significant interactions less than $P < .05$, then it needs to be interpreted and reported.

MANOVA analysis consists of Levene's Test of Equality of Error Variances. When analysing the differences between groups, those subsets of samplings or multiple groups of data should be compatible or roughly equal. If such multiple data sets are not compatible then they have sampling bias such as different times, early or late responds, different reasons, multiple waves or groups. Therefore, the homogeneity of variances should be tested prior to the analysis and the test default outcome needs to be non-significant. Non-significant outcome depicts the variances of the sample data sets are not different, and they are compatible (equally distributed). If the data sets are different (variances are unequal) this can affect the Type 1 error rate (Pallant 2007). Levene's test provides an F statistic and a P significant value. P significant value is considered to be the prime and if the P value is greater than 0.05 ($P > .05$) then the group variances of the data sets can be treated as equal. Contrary, if the P value is less than 0.05, then it is considered as a violation of the assumption of homogeneity of variances.

This study used Levene's Test of Equality of Error Variances to test the assumption of MANOVA that the variances of each dependent variables were equal across the two groups. Provided that the outcome of the test is significant, then the assumption is violated. Under such circumstances, theoretically, then data should be viewed with cautions and transformed them as to equalise the variances. However, the available alternatives have been discussed situationally.

The last test of MANOVA is Multiple Comparison Tests (a post-hoc) and this study used the Tukey Honestly Significant Difference Test as this study involved a simple linear model. Tukey HSD t-test estimates the population parameters, i.e population mean when the population standard deviation is unknown.

3.3 Performance indicators

This study involved 12 selected port performance indicators/ratios (see table 3 below) which are widely used and accepted by the previous researchers and even recommended by the United Nations Conference on Trade and Development (UNCTAD). The data items or the variables of this research and the outcome of all proxies were financial values, numbers, or units. Therefore, they were numerical variables. Also, some of them were continuous variables (profit, income, revenues), and others were discrete variable (number of containers, ships, and employees). Numeric variables are quantitative variables and therefore, this research used one-way MANOVA tables to analyse the first part of the study.

As shown in Table 3 below, this study had 7 financial ratios and 3 environmental ratios of PBPL. The ratios were selected on the basis of the availability of data of PBPL. This study used one or multiple ratios per variable. Profitability, leverage, and capital investment variables were measured in percentages. Also, energy and carbon footprints (total Carbon Dioxide emissions) were measured in percentages. Port operations and employment variables were respectively measured in Twenty-Foot Equivalent Units (TEUs), Mass tonnes and in the number of ships. It is important to mention that this study had two dependent variables (financial and environmental performance) and those two DVs are represented by 12 indicators. Unless not altogether, when one or a few indicators violate any assumptions of MANOVA tests, this study still counted the behaviour of the majority of the

indicators to reach for a conclusion. To justify this, this study accepted the possibility of any violation of MANOVA assumptions as the assumptions and the test itself have been introduced to fit in general conditions where there is more than one participant.

Further, this study calculated Return on Assets (ROA) and Return on Equity (ROE) ratios for Earnings Before Interest and Tax (EBIT) and Earnings Before Tax (EBT). This was necessary to remove if there were any pre-privatisation operational expenses that did not exist in the post-privatisation operational expenses to demonstrate a consistent application of the ratios in both pre and post-privatisation periods. For example, the pre-privatisation operations had been funded by external loans whereas, the post-privatisation operations had been funded by equity. Therefore, the use of EBIT as the numerator for one of the ROA and ROE ratios removed the impact of the source of funding from the pre- and post-privatisation operational performance. The higher the EBIT numerator the ratio the better the performance and this difference in the ratio would be associated with income growth and efficient operations. The other two ratios without removing interest will highlight the impact of different funding sources (funding efficiencies), while the EBIT numerator-based ratios provide some insight into the efficiency of operations.

Debt to Assets (DA) ratio shows the proportion of the firm's assets financed through debts. A proportion of DA less than 0.5 would indicate the firm internally funds its assets (e.g. financed through equity) whereas a proportion of DA greater than 0.5 indicates the firm has assets financed through external debt. When a firm is highly leveraged it means that the firm has more debt than equity. Such a firm carries a great level of risk and it may increase the likelihood of bankruptcy. Also,

a highly leveraged firm may have to pay considerably high interest expenses on its debts because it has a higher debt and probably the lender charged a higher interest

Table 3.   Operationalising financial and environmental performance using ratios

Performance	Variables	Proxies (ratios)	Null hypothesis*
Financial	Profitability	Return on Assets (ROA_1) = Earnings Before Interests & Tax/Total Assets	$ROA_{1A} = ROA_{1B}$
		Return on Assets (ROA_2) = Earnings Before Tax/Total Assets	$ROA_{2A} = ROA_{2B}$
		Return on Equity (ROE_1) = Earnings Before Interests & Tax / Total Equity	$ROE_{1A} = ROE_{1B}$
		Return on Equity (ROE_2) = Earnings Before Tax / Total Equity	$ROE_{2A} = ROE_{2B}$
	Leverage	Debt to Assets = Total Debt/ Total Assets	$DTA_A = DTA_B$
	Investment Intensity	Capital Expenditure to Total Assets (CEA)= Capital Expenditure/Total Assets	$CEA_A = CEA_B$
	Port Operations	Total Container Throughput-TEUs	$TEUs_A = TEUs_B$
		Total Trade Throughput-Mass Tonnes	$Tonnes_A = Tonnes_B$
		Number of ships handled	$NOS_A = NOS_B$
Environmental	Employment	(TE)=Total number of Employees	$TE_A = TE_B$
	Energy	Total Energy consumption--Gigajoule	$TEC_A = TEC_B$
	Carbon Footprints	Total CO_2 emission- Tonnes	$TECO_{2A} = TECO_{2B}$

Source- varied,   *A is pre-privatisation & B is post-privatisation

rate commensurate with the level of business risk.

Investment intensity is a fund used by a firm to maintain, upgrade, and acquire assets such as property, plant or equipment, new projects or investments in order to maintain or increase the scope of its operations. Firms such as ports require large amounts of investments to produce goods or services. Therefore, a port may have a high percentage of fixed assets classified as Property, Plants & Equipment (PP&E). Firms in the capital-intensive sectors are often marked by high levels of depreciation. As investment intensity is a long-term investment indicator and it will not bring immediate retunes. Generally, the lower the ratio the better. However, lack of investment intensity could undermine a firm's ability to operate properly, resulting in negative effects. While a larger ratio should indicate a higher level of investment intensity, there may be changes within the firm's asset values that relate

to revaluation (which are paper increases) or devaluation (a paper decrease) and not physical investment increase or decrease through, respectively, the purchase or sale of fixed assets. In situations where the total assets (denominator) has increased disproportionally to the increase in capital expenditure (numerator), the ratio may decrease but the cause of the decrease is not the investment intensity but an accounting revaluation adjustment. The impact of such a revaluation (paper value) may be identified by a 5-year horizontal trend analysis and the horizontal indices used to adjust the disproportional change in the numerator and the denominator. Therefore, this ratio varies from industry to industry.

Total Container Throughput defines as the number of containers handled by the port throughout a financial year and it is measured by Twenty-foot Equivalent Units (TEUs). The higher the unit number the better the port operations. Total Tread Throughput defines the total exports and imports of goods in tonnes by the port over a financial year. The higher the number the better the operations of the port. The number of ships handled shows the number of ships facilitated by the port over a financial year. The higher the number of ships served the better the operations of the port.

Total employees of the PBPL was the number of full-time equivalent employees of the firm. From a firm's perspective, the lower the number the better the productivity and efficiency. However, from the employees', social or welfare perspective, lowering the number of total employments would indicate a negative impression.

Total energy consumption (TEC) indicates the number of gigajoules of energy sources the port has used over a financial year. Such sources can be diesel, petrol, oil, wind or gas. One major issue revolves around the fact that any increase or decrease in the level of consumption in the energy consumption measure may be attributed to a number of factors. For example, the increase (or decrease) level of operations (e.g., total container throughput, number of ships handled or the number of full-time equivalent employees). That is, the level of energy consumption may increase (decrease) due to increase (decrease) of any of these three example factors. To control for these potential spurious effects, additional ratio measures controlling for these two example factors were calculated and analysed using a MANOVA. (see **Appendix 4**, pp. 194-196).

Total Emissions of CO_2 indicates the tonnes of Carbon Dioxides the firm emitted into the air over a financial year. Similarly, to energy consumption, one major issue revolves around the fact that any increase or decrease may be attributed to any of these three previously identified example factors. To control for these potential spurious effects for CO_2 emissions, additional ratio measures controlling for these three factors were calculated and analysed using a MANOVA. Lower TE, TEC and TE CO_2 values, controlling for total container throughput, number of ships handled or the number of full-time equivalent employees, indicate better environmental performance by the firm.

The first stage of the analysis addressed the questions "is there any difference in the financial and environmental performance between pre and post- privatisation periods and if so, what are the differences and why have they occurred?" The study gathered PBPL's data from relevant sources before and after the privatisation to process related to the selected ratios. Table 3 above showed the predicted outcomes (relationships) of the ratio analysis. MANOVA analyses of these outcomes were conducted to distinguish any differences in the financial and environmental performance between pre- and post-privatisation. If any mean differences were found at this stage, (any significance in Pillai's Trace test, $p < 0.05$)) then the null hypothesis of 'no mean difference in the financial and environmental performance of Port of Brisbane Proprietary Limited under either private or State ownership' would be rejected. The second stage was consisted of interviews to uncover what these changes were and how they have affected the company's financial and environmental performance.

If there were not any significant differences found during the quantitative analysis, (any insignificance in Pillai's Trace test, $p > 0.05$) then the null hypothesis would not be rejected (if fail to reject the null hypothesis) and still the qualitative analyses would be used to frame the open-ended questions to interviewees, "then tell us about any changes in the financial and environmental performance measures before and after the privatisation of PBPL".

3.4 Documents and records analysis

The study gathered continuous/numerical secondary data from documents and records of PBPL and forms into two sets as pre-privatisation data (from 2005 to 2010) and post-privatisation data (from 2012 to 2017). These data sources primarily consisted of publicly available company annual reports and other financial and environmental reports published by the 'Ports Australia'. Additionally, BITRE publications and Waterline reports published by the Department of Infrastructure and Regional Development (DIRD), and some environmental research reports prepared by various organisations were analysed. Different financial reports and documents from various sources which contain similar information (usually, the previous year's financial details were available in the following year's financial report), were used as a data cross-reference and were expected to enhance the quality, rigour and the credibility of data rather than depending on a single source. To compile the documents relevant to the evaluation question, it was important to understand how and why the documents were produced. This added to the validity and reliability of the documents.

Gathered data were summarised into two sets as pre-privatisation and post-privatisation and then processed through selected ratios such as profitability, leverage, capital investment, port operations, employment, energy consumption, and annual carbon footprints. Finally, the outcomes of the ratios were used as the inputs of MANOVA analysis to distinguish if there is any significant difference in the financial and environmental performance between pre and post-privatisation periods of PBPL. 3.5 Interviews

In accordance with the research design, method, the problems, variables, and assumptions, this research collected primary data from semi-structured face to face interviews that included open-ended questions, which were introduced into the interview where it was considered necessary to gather more descriptive answers. The purpose of the interviews was to evaluate "the difference" (differences) between the financial and environmental performance before and after the privatisation of PBPL. This was to address the questions; what is the difference (differences)? What is the impact of such difference (differences)? Why did the difference (differences) occur? Or how did the difference (differences) happen? If there no differences were found out at the first stage, then the interview rounds would have addressed the reasons for the absence of any difference. The interview

questions consisted of "tell us about any differences in practices before and after the privatisation of PBPL". This was adequate as theoretically the change of ownership (privatisation) expected a difference. If the quantitative analysis showed a state of a difference of the financial and environmental performance of PBPL, then it would be an indication of the progress and achievements of the privatisation process.

The interviews were semi-structured, and 4 interviews were conducted with randomly selected employees who have been working in different departments of PBPL. Due to the time and cost constraints and the availability of the staff of PBPL, the number of interviews concluded into four interviewees. These four interviews provided a representative group which enabled the researcher to gather a good understanding of the company operations. The participants were from four different departments which provided an excellent overview of the company's activities these were; community relations, financial trade, infrastructure and environment, and port operations and pollution (oil and marine). Research questions started from easy to answer questions, designed to develop repour and to set the background and context, through to more difficult and controversial questions with probes and prompts (Creswell 2014). Questions on the interview guide were expanded upon with follow-up questions to gain more in-depth understanding. The length of an interview was a maximum of 45 minutes. Information obtained here will be treated strictly confidentially and the interviewees' names will not be used in any publications or reports. Interview lines of enquiry and the details of the interviewees are provided in **Appendix 1.**

The interviewer and PBPL employees engaged in formal discussions based on an 'interview guide' which consisted of a list of questions and topics to be covered during the discussion. This guide was prepared to elicit information related to the firm's financial and environmental changes, trends and impacts, energy consumption, water consumption, annual carbon footprint activities, and other environmental policies and procedures. However, the interviewer was able to follow trajectories brought up during the discussions which may have been out of the guidelines where the researchers felt it is appropriated. The open-ended questions prompted participants to talk openly about the research problem without predetermined answers. All the questions were focused on evaluating the changes

in the financial and environmental management before and after the privatisation of PBPL.

The participants were sent the consent and information sheet prior to the interviews and they were acknowledged about the nature, topic, purpose, and the risks of the research. Development of dialogue and rapport is essential in semi-structured and unstructured interviews (Crabtree & Cohen 2006). The investigator did not capture notes of respondents' answers during the interviews because it was likely to result in poor conducting of the interview and detract from developing a rapport between the interviewer and the interviewee.

3.6 Chapter summary

This chapter has explained the methodology for the research. The research has been based on both quantitative and qualitative research methods. The independent variable forming the basis for this study was the change of ownership or the privatisation, whereas the dependent variables were the financial and environmental performance of PBPL. The financial performance represented 7 indicators namely, ROA, ROE, leverage, investment intensity, the total TEUs loaded and unloaded, the total throughput tonnes and the number of ships served by the port. The total number of employees, the total energy consumption and the total Carbon footprints were used as the environmental performance indicators for this study. Here, the ROA and ROE ratios were calculated with and without EBIT to identify pre- and privatisation funding expenses. Also, EBTI was used in order to remove any pre-privatisation operational expenses that did not exist in the post-privatisation operational expenses. This use of EBIT was used to demonstrate a consistent application of the ratios in both the pre and post-privatisation periods. Any conclusion was driven by the behaviour of the majority of indicators which satisfy the assumptions of MANOVA and if some of the indicators did not meet the requirements of MANOVA then such variances were reported while running the tests with trimming or removing of data.

First, the quantitative analysis was performed by a One-way MANOVA. If the MANOVA outcome was significant, then the study would show that there was a difference in the financial and environmental performance between pre and post-privatisation. Then the qualitative analysis via the interviews would investigate

the reasons for the differences the study found in the quantitative analysis. If there was no difference, then still the qualitative interviews would find reasons for the absence of no difference in the financial and environmental performance of PBPL. The qualitative analysis was supported by relevant documents and records issues by various institutes.

CHAPTER 4

4.0 QUANTITATIVE AND QUALITATIVE DESCRIPTIVE ANALYSES

4.1. Quantitative MANOVA assumptions testing

This study used the Multivariate Analysis of Variance (MANOVA) to compare the mean differences in multivariate data. Financial and environmental performance of pre and post-privatisation periods (*the difference of financial and environmental performance under state and private ownership or the difference of performance after the change of ownership)* were the four multivariate periods in this study.

The first two periods relate to the under *state-ownership* and reflect two three-year periods; one three-year period for under *state ownership* and one three-year under state ownership however in the transition to *private ownership.* The second two periods relate to the under *private ownership* and reflect two three-year periods; one three-year under *private ownership* however in the transition from *state ownership* and a one three-year period for under *private ownership.* Literature recognises that a change of ownership involves a transition period that can range between six and eighteen months depending on the size and complexity of the company (e.g. Psarouthakis, 2013) 3-years pre- and post-ownership transitional period was selected due to the size and operational complexity of the of the Port of Brisbane operations.

Before the use of MANOVA, this study examined the fitness of running the test with the selected data. To test the feasibility, the study performed the SPSS tests for five most important MANOVA assumptions; normality of distribution, multicollinearity, multivariate outliers, and homogeneity of variances between groups. Meeting the first four assumptions which had been discussed in chapter three above is not crucial in running MANOVA as this study was an analysis of a single-firm performance with four three-year periods. (Pallant 2007, Landau & Everitt 2004).

Assumption: 5- Data should be normally distributed (multivariate normality)

This assumption emphasises that the dependent variables (DVs) of the data set are normally distributed and they have multivariate normality within groups. According to Pallant (2007), the acceptable and most common significance value to pass the normality test is $P = 0.05$. For instance, if the probability is significant ($P < 0.05$) then the data set does not pass the normality test. Therefore, it should be insignificant in order to maintain the assumption 'normal distribution of data' ($P > 0.05$). However, Pallant (2007) distinguishes that this cut-off is totally arbitrary.

There are two tests on SPSS to check the normality; Shapiro Wilks and Kolmogorov-Smirnov. This study selected the Shapiro Wilk because, it is a parametric test, which specified for testing normality. Also, it is more powerful than non-parametric Kolmogorov-Smirnov. On the contrary, Kolmogorov-Smirnov is comparatively more general and less powerful than Shapiro-Wilk (Razali & Wah 2010, Landau & Everitt 2004).

The null hypothesis of Shapiro-Wilk is that the sample is drawn from a normal distribution (H_0=Sample is normally distributed) whereas, the alternative hypothesis is that the sample is not drawn from a normal distribution (H_1=Sample is not normally distributed). If the $P< \alpha=0.05$, the null hypothesis is rejected at a 5% level of significance and also concluded as the random sample is not drawn from a normal distribution. For a normal sample, if the $P> \alpha=0.05$, the null hypothesis is not rejected (fail to reject) for the normality at a 5% level of significance because there is not enough evidence to conclude as the data set is non-normal (it means the data set is normally distributed). Table 4 below, indicated the SPSS results of the selected data for the significance levels of a normal distribution in Shapiro-Wilk test.

As shown in table 4 below, the sample data set was not violating the assumption of normality as the P values of Shapiro-Wilk above were always as $P>0.05$. Therefore, the study did not reject the null hypothesis as there was not enough evidence to conclude that the data was non-normal. Therefore, it was concluded as the data set was normally distributed, and the null hypothesis of normality was satisfied.

Test of Normality

Table 4	Ownership	Shapiro-Wilk		
		Statistic	df	Sig.
FinROA1	Gov-05/06/07	.993	3	.843
	Gov-08/09/10	.952	3	.578
	Pty-12/13/14	.990	3	.804
	Pty-15/16/17	1.000	3	.959
FinROA2	Gov-05/06/07	.889	3	.350
	Gov-08/09/10	.974	3	.689
	Pty-12/13/14	.990	3	.804
	Pty-15/16/17	1.000	3	.959
FinROE1	Gov-05/06/07	.953	3	.583
	Gov-08/09/10	.963	3	.629
	Pty-12/13/14	.997	3	.899
	Pty-15/16/17	.780	3	.067
FinROE2	Gov-05/06/07	.806	3	.129
	Gov-08/09/10	.978	3	.716
	Pty-12/13/14	.998	3	.905
	Pty-15/16/17	.777	3	.061
FinDTA	Gov-05/06/07	.964	3	.637
	Gov-08/09/10	.923	3	.463
	Pty-12/13/14	1.000	3	1.000
	Pty-15/16/17	.923	3	.463
FinCEA	Gov-05/06/07	.964	3	.637
	Gov-08/09/10	.923	3	.463
	Pty-12/13/14	1.000	3	1.000
	Pty-15/16/17	.964	3	.637
FinTEUs	Gov-05/06/07	.895	3	.368
	Gov-08/09/10	1.000	3	.995
	Pty-12/13/14	.981	3	.737
	Pty-15/16/17	.958	3	.605
FinTonnes	Gov-05/06/07	.838	3	.208
	Gov-08/09/10	.844	3	.226
	Pty-12/13/14	.791	3	.094
	Pty-15/16/17	.992	3	.833
FinNoS	Gov-05/06/07	.925	3	.471
	Gov-08/09/10	.789	3	.087
	Pty-12/13/14	.986	3	.773
	Pty-15/16/17	.858	3	.261
EnvoTE	Gov-05/06/07	.932	3	.497
	Gov-08/09/10	.999	3	.948
	Pty-12/13/14	1.000	3	.962
	Pty-15/16/17	.871	3	.298
EnvoTEC	Gov-05/06/07	.955	3	.590
	Gov-08/09/10	.984	3	.760
	Pty-12/13/14	.866	3	.285
	Pty-15/16/17	.995	3	.865
EnvoTECO2	Gov-05/06/07	.781	3	.069
	Gov-08/09/10	.992	3	.829
	Pty-12/13/14	.997	3	.902
	Pty-15/16/17	.978	3	.714

Assumption 6- Absence of multivariate outliers

This study used two methods to test the multivariate outliers of the sample data set. The first method was the Mahalanobis Distance (provided in table 2) and the second method was the Boxplot.

Table 5 **Residuals Statistics^a -Mahalanobis Distance**

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.97	4.04	2.50	1.168	12
Std. Predicted Value	-1.309	1.320	.000	1.000	12
Standard Error of Predicted Value	.063	.075	.072	.004	12
Adjusted Predicted Value	.11	6.05	2.57	1.819	12
Residual	-.042	.030	.000	.023	12
Std. Residual	-.551	.395	.000	.302	12
Stud. Residual	-1.000	1.000	.000	1.044	12
Deleted Residual	-2.054	1.889	-.074	1.014	12
Stud. Deleted Residual	.	.	.	.	0
Mahal. Distance	**6.749**	**10.068**	**9.167**	**1.115**	**12**
Cook's Distance	.209	67.145	15.030	22.913	12
Centered Leverage Value	.614	.915	.833	.101	12

a. Dependent Variable: Ownership

The standard Mahalanobis Distance Critical value for two dependent variables is 13.82. This value is based on the Chi-Square Distribution, assessed using P< .001. The critical Chi-Square value for two degrees of freedom at a critical α: .001 is 13.82. The outcome of the study above showed the maximum Mahalanobis Distance value as 10.086. Therefore, the outcome of the Mahalanobis Distance of this study was as 10.068 < 13.82 and there were no outliers suggested by this statistic.

Figure 1: Box plot 1.
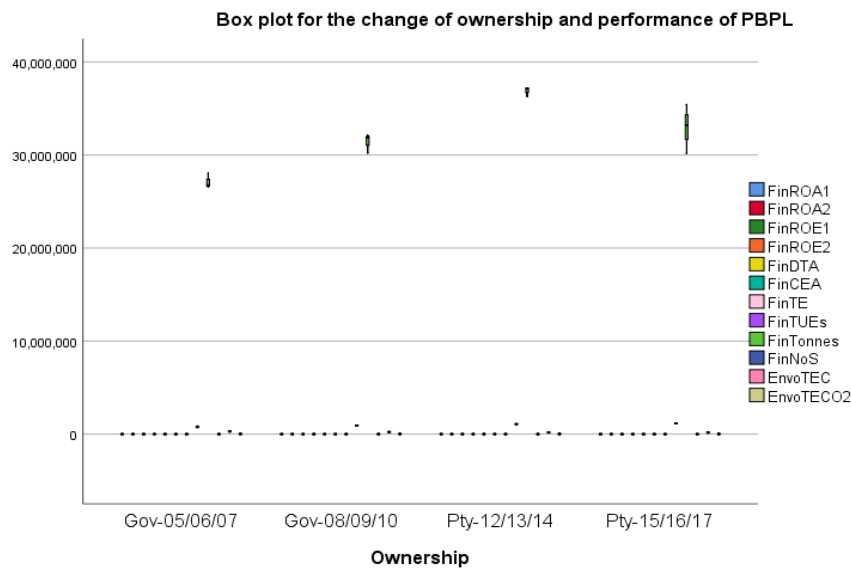
In addition to the Mahalanobis Distance for the absence of multivariate outliers, the Boxplot-1 above represents the test of multivariate outliers on SPSS. If there is any outlier exists, then there is a circle/ asterisk mark and a number on top of the Boxplot tails. As seen on the above Box plot, there is no evidence that the data set has outliers. As tested by both Mahalanobis Distance and Boxplot test, on the absence of multivariate outliers, the study is allowed to use MANOVA.

Assumption 7- Absence of Multicollinearity

Multicollinearity refers to a situation where one independent variable in a multiple regression model is highly linearly related to another independent variable than with the dependent variable (Gravetter & Wallnau 2014). However, this would not affect the regression equation when a dependent variable needs to be predicted from a set of independent variables. In order to examine the absence of multicollinearity of the selected data set of PBPL, this study checks the correlation (*r*) of the dependent variables through the SPSS. The absence of multicollinearity was tested by Pearson Correlation test and outcome is as below in Table 6-B.

Pearson Correlation Coefficient is a measure to show the strength of a linear association between two or more variables which is denoted by *r*. This test draws a line through the data of variables (two or more) which fit them the best and the test *r* indicates how far away the data are to the line of best fit. (how well the data points

of variables fit this line). This test can take a range of values from + 1 to -1 (Pallant 2007, Ratner 2009). Values of 0 (zero) indicate as no association between the variables (no linear relationship). Values greater than 0 indicate positive associations where the value of one variable increases, the value of the other variable also increases. Values less than 0 indicate positive associations where the value of one variable decreases, the value of the other variable also decreases.

Theoretically, the correlation coefficient receipts any value in the interval between +1 and −1, which includes the end values +1 or -1 (Ratner 2009, p.139). According to the guidelines for interpreting the correlation coefficient presented by Ratner (2009) and even Field (2009), +1.00 indicates a perfect positive linear relationship where the value of one variable increases, the value of the other variable also increases across an exact linear rule. In contrast, a -1.00 indicates a perfect negative linear relationship where the value of one variable increases, the value of the other variable decreases through an exact linear line. A value between (±) 0.00 and 0.3 indicates a weak positive/ negative linear relationship across an unsteady linear rule. Also, a value between (±) 0.3 and 0.7 indicates a moderate positive/ negative linear relationship through an ambiguous-firm linear rule.

Table 6-A   Pearson Correlation **-Descriptive Statistics**

	Mean	Std. Deviation	N
FinROA1	13.4067	10.90135	12
FinROA2	12.7942	11.49854	12
FinROE1	19.2750	13.69618	12
FinROE2	18.0917	14.86832	12
FinDTA	.3908	.09462	12
FinCEA	.0417	.03927	12
FinTEUs	980607.25	145653.684	12
FinTonnes	32087338.92	3872484.107	12
FinNoS	981.42	60.626	12
EnvoTE	248.33	53.140	12
EnvoTEC	211357.58	51315.938	12
EnvoTECO2	15544.58	2968.219	12

Table 6-B

Pearson Correlations (r)

		FinROA1	FinROA2	FinROE1	FinROE2	FinDTA	FinCEA	FinTEUs	FinTonnes	FinNoS	EnvoTE	EnvoTEC	EnvoTECO2
FinROA1	Pearson Correlation	1	.999**	.986**	.985**	-.957**	-.605*	.820**	.785**	.127	-.926**	-.791**	-.803**
	Sig. (2-tailed)		.000	.000	.000	.000	.037	.001	.003	.694	.000	.002	.002
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinROA2	Pearson Correlation	.999**	1	.986**	.987**	-.960**	-.608*	.836**	.795**	.107	-.922**	-.805**	-.800**
	Sig. (2-tailed)	.000		.000	.000	.000	.036	.001	.002	.740	.000	.002	.002
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinROE1	Pearson Correlation	.986**	.986**	1	.999**	-.969**	-.607*	.829**	.757**	.172	-.952**	-.793**	-.810**
	Sig. (2-tailed)	.000	.000		.000	.000	.036	.001	.004	.593	.000	.002	.001
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinROE2	Pearson Correlation	.985**	.987**	.999**	1	-.972**	-.610*	.851**	.774**	.139	-.942**	-.812**	-.804**
	Sig. (2-tailed)	.000	.000	.000		.000	.035	.000	.003	.667	.000	.001	.002
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinDTA	Pearson Correlation	-.957**	-.960**	-.969**	-.972**	1	.552	-.876**	-.710**	-.112	.955**	.822**	.826**
	Sig. (2-tailed)	.000	.000	.000	.000		.063	.000	.010	.728	.000	.001	.001
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinCEA	Pearson Correlation	-.605*	-.608*	-.607*	-.610*	.552	1	-.577*	-.634*	.147	.529	.734**	.756**
	Sig. (2-tailed)	.037	.036	.036	.035	.063		.049	.027	.647	.077	.007	.004
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinTEUs	Pearson Correlation	.820**	.836**	.829**	.851**	-.876**	-.577*	1	.737**	-.089	-.751**	-.896**	-.718**
	Sig. (2-tailed)	.001	.001	.001	.000	.000	.049		.006	.782	.005	.000	.008
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinTonnes	Pearson Correlation	.785**	.795**	.757**	.774**	-.710**	-.634*	.737**	1	-.331	-.571	-.826**	-.635*
	Sig. (2-tailed)	.003	.002	.004	.003	.010	.027	.006		.294	.052	.001	.027
	N	12	12	12	12	12	12	12	12	12	12	12	12
FinNoS	Pearson Correlation	.127	.107	.172	.139	-.112	.147	-.089	-.331	1	-.371	.328	-.059
	Sig. (2-tailed)	.694	.740	.593	.667	.728	.647	.782	.294		.235	.298	.855
	N	12	12	12	12	12	12	12	12	12	12	12	12
EnvoTE	Pearson Correlation	-.926**	-.922**	-.952**	-.942**	.955**	.529	-.751**	-.571	-.371	1	.685*	.831**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.077	.005	.052	.235		.014	.001
	N	12	12	12	12	12	12	12	12	12	12	12	12
EnvoTEC	Pearson Correlation	-.791**	-.805**	-.793**	-.812**	.822**	.734**	-.896**	-.826**	.328	.685*	1	.839**
	Sig. (2-tailed)	.002	.002	.002	.001	.001	.007	.000	.001	.298	.014		.001
	N	12	12	12	12	12	12	12	12	12	12	12	12
EnvoTECO2	Pearson Correlation	-.803**	-.800**	-.810**	-.804**	.826**	.756**	-.718**	-.635*	-.059	.831**	.839**	1
	Sig. (2-tailed)	.002	.002	.001	.002	.001	.004	.008	.027	.855	.001	.001	
	N	12	12	12	12	12	12	12	12	12	12	12	12

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Moreover, a value between (±) 0.7 and 1.0 indicates a strong positive/ negative linear relationship across a firm linear rule. Accordingly, the Pearson Correlation results above showed a correlation (r) between the dependent variables in this study as the values ranged from +1.0 to -0.957 (between +1.00 and -1.00). Therefore, the sample data set was perfectly correlated with positive and negative linear relationships.

In addition to checking the absence of multicollinearity by Pearson Correlation test, this study used the Q-Q plots to check the positive correlation between variables between the dependent variables. Those Q-Q plots were enclosed in **Appendix 2** and as seen on those graphs all the dot points were along the line. Therefore, there were both positive and negative correlations between the dependent variables (financial and environmental) of the sample. In order to maintain a positive correlation among variables, both variables should move in tandem. A positive correlation exists when one variable increases as the other variable increases or one variable decrease while the other decreases. A perfect positive correlation is represented by 1, whereas 0 and -1 indicate respectively, no correlation and negative correlation (Field 2009). As shown in **Appendix 2**, the correlations between the variables of the selected data set were perfect as the data were scattered along the lines.

Assumption 8 - Linearity

Linearity refers to a linear relationship (straight approach) between the dependent variables and an independent variable/s (Field 2009). Below scatterplots depicted the straight relationship of dependent variables with the two groups of independent variables (4 periods). As per the plots, the DV data were distributed systematically and evenly in all four plots. These patterns described the linearity of the data set.

As shown below, these plots did not depict any obvious evidence of non-linearity within the variables of the selected sample: therefore, the assumption of linearity was satisfied.

Figure 2: Scatter Plot 1
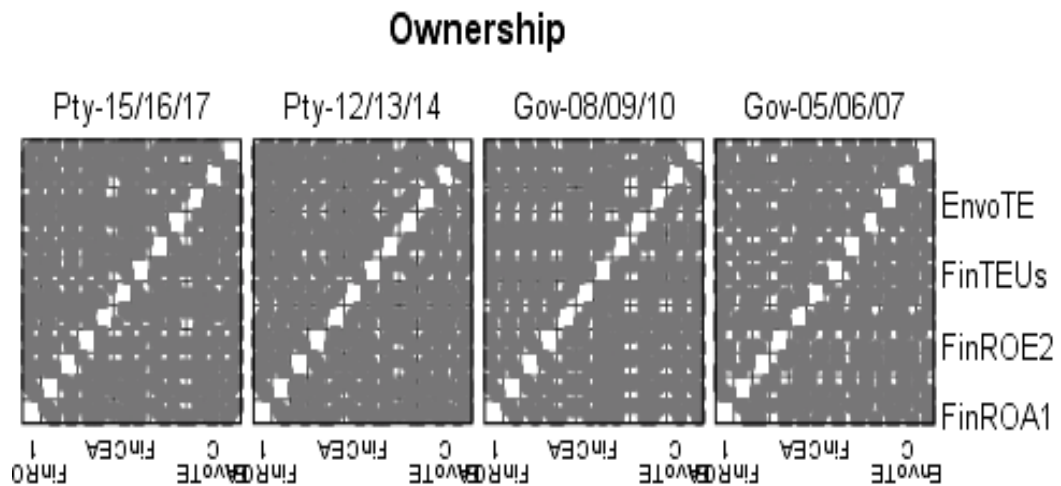
Assumption 9-Homogeneity of error variances was not performed at this stage as the SPSS performed Levene's Test of Equality of Error Variances during MANOVA analysis.

In conclusion, as all the assumptions above were satisfied and not violated any assumption, MANOVA was considered to be an appropriate analysis for the selected dataset. In chapter 5, the One-Way MANOVA test results of PBPL were conducted. MANOVA test consisted of the Multivariate test of hypothesis, Levene's test of equality of error variances, Test of Between-Subjects Effects for the significance of IVs and the Multiple Comparisons Test (Post-hoc Tukey HSD).

4.2 Qualitative Interview analysis

The purpose of conducting MANOVA tests is to test the null hypothesis. If MANOVA found any non-significant mean differences, then the null hypothesis is accepted. The qualitative interview analysis would focus on the questions about the reasons for the non-significance of the performance of PBPL under different ownership types. Alternatively, if the MANOVA tests produce any significant mean differences in performance, the Null hypothesis cannot be accepted. Therefore, the interviews should produce rich data to help explain the impact of privatisation on the financial and environmental performance of PBPL. The answers provided by the interviewees are in **Appendix 1**.

4.3 Chapter summary

Chapter 4 was reserved for pre-analysis sections of MANOVA of the study. The first section of chapter 4 examined the fitness of the MANOVA analysis. For that, the assumptions of the MANOVA were tested. Multivariate normality was tested by Shapiro-Wilk and the sample data set was not violating the assumption of normality as the P values of Shapiro-Wilk above are always as P>0.05. Therefore, the study did not reject the null hypothesis as there was not enough evidence to conclude that the data was non-normal. Therefore, the data set was normally distributed.

Next, Mahalanobis Distance and the boxplot represented the test of multivariate outliers. Mahalanobis Distance indicates as 10.068 < 13.82 and this concluded as there were no outliers of the sample data set. Also, the result of the Boxplot indicated nonexistence of outliers as if there was any outlier exists, then there was a circle/ asterisk mark and a number on top of the Boxplot tails. Here, the selected sample maintained the absence of multivariate outliers.

The absence of multicollinearity was checked by the correlation test and the Q-Q plots (Appendix 2). The Pearson Correlation test results showed that the correlation (r) between the dependent variables in this study ranged from 1.0 to -0.957. Further, Q-Q plots showed all the dot points were along the line. Therefore, there was a positive correlation between the dependent financial and environmental variables. Linearity indicated the linear relationship between DVs and IVs in the sample. The Scatter Plot 1 which depicted the DV data were distributed systematically and evenly in all four plots while maintaining the linearity of the selected sample. Levene's test of equality of error variances was done in the MANOVA tests section in Chapter 5.

As all the assumptions above were satisfied and not violated, MANOVA was considered to be an appropriate analysis for the selected data set. Lastly, the level of the significance of MANOVA tests in chapter 5 decided which type of approach did the qualitative interview analysis need in this study.

CHAPTER 5

5.0 RESULTS & DISCUSSION

5.1 One-Way MANOVA results and discussion

5.1.1 Multivariate tests results- Table 8

Table 8 in chapter 5 below, showed the four multivariate tests results of MANOVA. The purpose of MANOVA is to test the null hypothesis of no group mean difference in the sample. The Multivariate Tests consisted of four group tests (see table 7) and they provide the F values for the four different multivariate tests to distinguish any significant effect of the four groups (Fixed factors) on all the considered DVs. Consequently, the tests conducted by a MANOVA are the significant effect of each of the four groups (fixed factors) on each of the 12 DVs. Therefore, the highly correlated DVs in table 6-B in section 4.1 is not relevant for a MANOVA because the DVs are not concurrently explaining the proportional variance in the DVs. The Partial Eta squared measure provides information about this relationship. As explained in MANOVA introduction section in chapter 3, this study considered only the Pillai's Trace test value for multivariate test significance because it was the least sensitive to the violation of the assumption of the covariance of the matrices.

According to the Multivariate Tests results, the Pillai's Trace value for the independent variable; ownership was 2.84 with an F value of 6.55. This was significant at 5% level as Pillai's Trace is $P=0.003 < 0.05 = \alpha$. Also, the Partial ETA squared result is 0.954, which represents 95.4% of the variance is explained by the four periods of time (fixed factors).

$F (24, 9) = 6.55$, $P<0.05$; Pillai's Trace $= 2.84$, Partial η^2 0.95.

The significance level P of Wilk Lambda was $P=0.004 < 0.05 = \alpha$. Also, the F value of Wilk Lambda was as;

$F (24, 3.5) = 29.97$, $P<0.05$; Wilks $\Lambda = 0.001$, partial $\eta^2 = 0.994$.

Further, Roy's Largest Root test indicated a $P=0.001<0.05=\alpha$ of the multivariate significance of the sample. The interpretation was as;

F (8, 3) = 11878.3, $P<0.05$; Roy's Largest Root=31675.4, partial $\eta^2=1$

Essentially, all three tests were statistically significant ($P<0.05=\alpha$) except the Hotelling's Trace test. Accordingly, after the change of ownership, the one-way MANOVA revealed a statistically significant multivariate main effect on performance. Based on the statistical results therefore, the study cannot accept the null hypothesis that there were no differences in the financial and environmental performance of Port of Brisbane under either private ownership or state ownership. As seen above, the significance value of Pillai's Trace had a substantial difference between groups. This result emphasised that the four groups (two periods for the state ownership (normal and transitional periods) and two periods for the private ownership (transitional and normal periods)) differ on that linear composite. However, it was still unclear where the difference lies. Therefore, the study at this stage revealed that there was a difference in the financial and environmental performance values of PBPL across these *before and after privatisation* four periods. The post-hoc test in this chapter would reveal where that difference lies and what indicators have been impacted by the change of ownership allowing for each ownership type to have a transitional period.

Table 7.   Between-Subjects Factors

		Value Label	N
Ownership	1	State-05/06/07	3
	2	State-08/09/10	3
	3	Pty-12/13/14	3
	4	Pty-15/16/17	3

Table 8.   Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	1.000	7255.174[b]	8.000	1.000	.009	1.000	58041.388	1.000
	Wilks' Lambda	.000	7255.174[b]	8.000	1.000	.009	1.000	58041.388	1.000
	Hotelling's Trace	58041.388	7255.174[b]	8.000	1.000	.009	1.000	58041.388	1.000
	Roy's Largest Root	58041.388	7255.174[b]	8.000	1.000	.009	1.000	58041.388	1.000
Ownership	**Pillai's Trace**	**2.838**	**6.551**	**24.000**	**9.000**	**.003**	**.946**	**157.226**	**.990**
	Wilks' Lambda	.000	29.966	24.000	3.502	.004	.994	601.878	.993
	Hotelling's Trace	.	.	24.000	.	.	.	.	.
	Roy's Largest Root	31675.378	11878.267[c]	8.000	3.000	.000	1.000	95026.134	1.000

a. Design: Intercept + Ownership; b. Exact statistic; c. The statistic is an upper bound on F that yields a lower bound on the significance level;
d. Computed using alpha = .05

Table 9.   Levene's Test of Equality of Error Variances[a]

		Levene's Statistic	df1	df2	Sig.
FinROA1	**Based on Mean**	**3.432**	**3**	**8**	**.072**
	Based on Median	2.114	3	8	**.177**
	Based on Median and with adjusted df	2.114	3	2.921	**.281**
	Based on trimmed mean	3.345	3	8	**.076**
FinROA2	**Based on Mean**	**3.108**	**3**	**8**	**.089**
	Based on Median	1.955	3	8	**.199**
	Based on Median and with adjusted df	1.955	3	3.046	**.296**
	Based on trimmed mean	3.032	3	8	**.093**
FinROE1	**Based on Mean**	**2.586**	**3**	**8**	**.126**
	Based on Median	.951	3	8	**.461**
	Based on Median and with adjusted df	.951	3	5.520	**.478**
	Based on trimmed mean	2.447	3	8	**.139**
FinROE2	**Based on Mean**	**2.350**	**3**	**8**	**.149**
	Based on Median	1.059	3	8	**.419**
	Based on Median and with adjusted df	1.059	3	5.204	**.442**
	Based on trimmed mean	2.253	3	8	**.159**
FinDTA	**Based on Mean**	**.978**	**3**	**8**	**.450**
	Based on Median	.204	3	8	.891

	Based on Median and with adjusted df	.204	3	6.000	.890
	Based on trimmed mean	.894	3	8	.485
FinCEA	**Based on Mean**	**5.463**	**3**	**8**	**.024**
	Based on Median	1.257	3	8	.352
	Based on Median and with adjusted df	1.257	3	2.457	.448
	Based on trimmed mean	4.988	3	8	.031
EnvoTE	**Based on Mean**	**.359**	**3**	**8**	**.784**
	Based on Median	.182	3	8	.905
	Based on Median and with adjusted df	.182	3	6.323	.905
	Based on trimmed mean	.345	3	8	.794
FinTEUs	**Based on Mean**	**4.385**	**3**	**8**	**.042**
	Based on Median	.937	3	8	.467
	Based on Median and with adjusted df	.937	3	2.905	.523
	Based on trimmed mean	3.995	3	8	.052
FinTonnes	**Based on Mean**	**2.328**	**3**	**8**	**.151**
	Based on Median	1.276	3	8	.347
	Based on Median and with adjusted df	1.276	3	4.563	.385
	Based on trimmed mean	2.259	3	8	.159

FinNoS	**Based on Mean**	**1.494**	**3**	**8**	**.288**
	Based on Median	.330	3	8	.804
	Based on Median and with adjusted df	.330	3	4.965	.805
	Based on trimmed mean	1.358	3	8	.323
EnvoTEC	**Based on Mean**	**1.607**	**3**	**8**	**.263**
	Based on Median	.837	3	8	.511
	Based on Median and with adjusted df	.837	3	4.603	.533
	Based on trimmed mean	1.551	3	8	.275
EnvoTECO2	**Based on Mean**	**1.699**	**3**	**8**	**.244**
	Based on Median	1.055	3	8	.420
	Based on Median and with adjusted df	1.055	3	4.339	.455
	Based on trimmed mean	1.659	3	8	.252

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Ownership

5.1.2 Levene's test of Equality of Variances results- Table 9

Levene's test of Equality of Variances (table 9 in chapter 5) was used to examine any equal variances between the independent variable groups to prove the null hypothesis that the population variances were equal. This was also known as the homogeneity of variances (Pallant 2007). Precisely, homogeneity of variance means that the variance in the groups is of the same nature or that the two groups have the same kind of variability. According to Pallant (2007), the variance does not have to be precisely equal and just close is enough. Levine's test tests whether the variances of the two samples are approximately equal.

Levine's test started with a null hypothesis which was

$H_0: \sigma_1^2 - \sigma_2^2 = 0$ (the population variances of pre and post-privatisation were equal)

Or the alternative hypothesis was as;

$H_1: \sigma_1^2 - \sigma_2^2 \neq 0$ (the population variances of pre and post-privatisation were not equal)

This implied that if the null hypothesis of Levene's test was rejected, the variances of the two groups were not equal; i.e., that the homogeneity of variances assumption was violated. In this case, the null hypothesis was that there was no difference between the variance of the financial and environmental performance of PBPL before and after its privatisation. Again, if the P value of the Levene's test is less than $P<0.05$, then the null hypothesis of equal variances is rejected concluding that there is a difference between in the variances in the population. Because the obtained differences in the sample variances are unlikely to have happened based on random sampling from a population which has equal variances.

Based on the test result mean values, here is the summary of P values of Levene's.

FinROA$_1$ P =0.072; (P>0.05),   FinROA$_2$ P=0.076; (P>0.05),

FinROE$_1$ P=0.126; (P>0.05),   FinROE$_2$ P=0.149; (P>0.05),

FinDTA P=0.45; (P>0.05),   **FinCEA P=0.024; (P<0.05),**

EnvoTE P=0.784; (P>0.05),   **EnvoTEUs P=0.042; (P<0.05),**

FinTonnes P=0.151; (P>0.05),   FinNoS P=0.288; (P>0.05),

EnvoTEC P=0.263; (P>0.05), $EnvoTECO_2$ P=0.244; (P>0.05).

Since there were more than one dependent variables, this test examined the equality of variance or the interconnection between variables. If there was any equal variance between groups, (If the differences were equal in both samples/ periods) then Levene's test indicates non-significant P values. Contrary, non-equal variances between groups indicate significant P values. Accordingly, out of twelve, ten proxies here had insignificant P values. In other words, the majority of the ratios satisfied the assumption of homogeneity of variances.

The two financial performance indicators above (FinCEA, FinTEUs) showed differences of variances with statistically significant (P) values than the standard significant value of P=0.05 α (as FinCEA; P=0.024<0.05 α and FinTEUs; P=0.042 <0.05= α). This means that FinCEA and FinTEUs ratios had mean differences (absence of homogeneity of variances) between pre and post-privatisation periods and these two ratios did not meet the assumption of homogeneity of variances. Even though the assumption was violated by two proxies, it should be mentioned that the sample sizes for each group did not differ and therefore the P values of the other ratios were trustworthy. As Pallant (2007) and many other statisticians explained, this is possible when the samples have less than 20 observations. This study had one sample with two ownership periods (two groups) and 12 observations.

The alternatives for unmet homogeneity of variances of variables exist in the literature. One alternative is that homogeneity of variances can be assessed in different ways. Instead of Levene's Test, one can use a different test such as Bartlett's Test, Games-Howell Test, or Brown & Forsythe Test (Modified Levene's Test). Also, as per Pallant (2007) even, adjusting the standard confidence alpha level (probability level) from 0.05 to 0.025 or 0.01, any significant P value of equality of variances can be fixed. Minitab (2017) suggested that if the equality of variances is significant then the multiple comparisons method can be used. If the P value for the multiple compression method is significant, then the study can use the box plots to identify the specific populations with different standard deviations from each other. Then the conclusion can be delivered based on the multiple comparisons method, if the sample has less than 20 observations and the

distribution for one or more of the populations is heavily tailed or extremely skewed (Minitab, 2017).

Moreover, trimming off the non-equal variances which indicate significant *P* values and run the MANOVA analysis without those variables is another way to maintain the equal variances assumption. Following this method, This study has performed a complete set of tests of MANOVA without FinCEA and FinTEUs (the variables with significant P values in the first analysis). The new tests outcome was shown in **Appendix 3** section and the tests still showed similar results as above. Further, the multivariate normality tested by Shapiro-Wilk test above showed that the sample data set was not violating the assumption of normality (normal distribution) as the *P* values of Shapiro-Wilk above were always as *P* >0.05. This was also another way to consider the sample data were drawn from a normal distribution.

Finally, the null hypothesis; the four-period groups' population variances (group variances) were equal, can be accepted as 2 out of 12 indicators were significant and therefore non-equal of variances while the majority of ratios were insignificant and equal of variances[2]. Therefore, the study concluded the equality of variances across four-period groups' in the data set was maintained.

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[2] When a research has subject-matter reason for combining the variables in some way, other than letting MANOVA find the best linear combination, based on the theoretical considerations, the research can trim off some variables and rerun the test. This process of reducing the number of random variables in order to obtain a set of principal variables is called as dimensionality reduction technique. Accordingly, this study has done additional tests in the **Appendix** section with trimmed variables when they are necessary. Therefore, the sum of the study variables outcome is suggested to be better measurement than the pure MANOVA results.

Table 10.   Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[m]
Corrected Model	FinROA1	1260.794[a]	3	420.265	72.396	.000	.964	217.189	1.000
	FinROA2	1406.177[b]	3	468.726	77.788	.000	.967	233.365	1.000
	FinROE1	2030.346[c]	3	676.782	163.599	.000	.984	490.798	1.000
	FinROE2	2391.476[d]	3	797.159	158.406	.000	.983	475.218	1.000
	FinDTA	.096[e]	3	.032	106.769	.000	.976	320.306	1.000
	FinCEA	.008[f]	3	.003	2.398	.144	.473	7.194	.400
	EnvoTE	29970.000[g]	3	9990.000	73.142	.000	.965	219.426	1.000
	FinTEUs	219127807118.250[h]	3	73042602372.750	41.043	.000	.939	123.130	1.000
	FinTonnes	146979120589987.530[i]	3	48993040196662.510	21.801	.000	.891	65.403	1.000
	FinNoS	25116.250[j]	3	8372.083	4.373	.042	.621	13.120	.658
	EnvoTEC	26250821016.917[k]	3	8750273672.306	25.776	.000	.906	77.329	1.000
	EnvoTECO2	72237538.917[l]	3	24079179.639	7.807	.009	.745	23.420	.898
Intercept	FinROA1	2156.865	1	2156.865	371.549	.000	.979	371.549	1.000
	FinROA2	1964.288	1	1964.288	325.988	.000	.976	325.988	1.000
	FinROE1	4458.307	1	4458.307	1077.712	.000	.993	1077.712	1.000
	FinROE2	3927.701	1	3927.701	780.487	.000	.990	780.487	1.000
	FinDTA	1.833	1	1.833	6110.028	.000	.999	6110.028	1.000
	FinCEA	.021	1	.021	18.657	.003	.700	18.657	.964
	EnvoTE	740033.333	1	740033.333	5418.182	.000	.999	5418.182	1.000

	FinTEUs	11539086945030.746	1	11539086945030.746	6483.933	.000	.999	6483.933	1.000
	FinTonnes	12355167825036366.0 00	1	12355167825036366.0 00	5497.800	.000	.999	5497.800	1.000
	FinNoS	11558144.083	1	11558144.083	6037.686	.000	.999	6037.686	1.000
	EnvoTEC	536064336390.083	1	536064336390.083	1579.121	.000	.995	1579.121	1.000
	EnvoTECO2	2899608852.083	1	2899608852.083	940.057	.000	.992	940.057	1.000
Ownership	**FinROA1**	**1260.794**	**3**	**420.265**	**72.396**	**.000**	**.964**	**217.189**	**1.000**
	FinROA2	**1406.177**	**3**	**468.726**	**77.788**	**.000**	**.967**	**233.365**	**1.000**
	FinROE1	**2030.345**	**3**	**676.782**	**163.599**	**.000**	**.984**	**490.798**	**1.000**
	FinROE2	**2391.476**	**3**	**797.159**	**158.406**	**.000**	**.983**	**475.218**	**1.000**
	FinDTA	**.096**	**3**	**.032**	**106.769**	**.000**	**.976**	**320.306**	**1.000**
	FinCEA	**.008**	**3**	**.003**	**2.398**	**.144**	**.473**	**7.194**	**.400**
	EnvoTE	**29970.000**	**3**	**9990.000**	**73.142**	**.000**	**.965**	**219.426**	**1.000**
	FinTEUs	**219127807118.250**	**3**	**73042602372.750**	**41.043**	**.000**	**.939**	**123.130**	**1.000**
	FinTonnes	**146979120589987.600**	**3**	**48993040196662.530**	**21.801**	**.000**	**.891**	**65.403**	**1.000**
	FinNoS	**25116.250**	**3**	**8372.083**	**4.373**	**.042**	**.621**	**13.120**	**.658**
	EnvoTEC	**26250821016.917**	**3**	**8750273672.306**	**25.776**	**.000**	**.906**	**77.329**	**1.000**
	EnvoTECO2	**72237538.917**	**3**	**24079179.639**	**7.807**	**.009**	**.745**	**23.420**	**.898**
Error	FinROA1	46.440	8	5.805					
	FinROA2	48.205	8	6.026					
	FinROE1	33.095	8	4.137					
	FinROE2	40.259	8	5.032					
	FinDTA	.002	8	.000					

	FinCEA	.009	8	.001						
	EnvoTE	1092.667	8	136.583						
	FinTEUs	14237145408.000	8	1779643176.000						
	FinTonnes	17978344131321.332	8	2247293016415.167						
	FinNoS	15314.667	8	1914.333						
	EnvoTEC	2715759954.000	8	339469994.250						
	EnvoTECO2	24676018.000	8	3084502.250						
Total	FinROA1	3464.099	12							
	FinROA2	3418.670	12							
	FinROE1	6521.748	12							
	FinROE2	6359.436	12							
	FinDTA	1.932	12							
	FinCEA	.038	12							
	EnvoTE	771096.000	12							
	FinTEUs	11772451897557.000	12							
	FinTonnes	12520125289757680.000	12							
	FinNoS	11598575.000	12							
	EnvoTEC	565030917361.000	12							
	EnvoTECO2	2996522409.000	12							
Corrected Total	FinROA1	1307.235	11							
	FinROA2	1454.382	11							
	FinROE1	2063.440	11							

FinROE2	2431.735	11						
FinDTA	.098	11						
FinCEA	.017	11						
EnvoTE	31062.667	11						
FinTEUs	233364952526.250	11						
FinTonnes	164957464721308.880	11						
FinNoS	40430.917	11						
EnvoTEC	28966580970.917	11						
EnvoTECO2	96913556.917	11						

a. R Squared = .964 (Adjusted R Squared = .951)

b. R Squared = .967 (Adjusted R Squared = .954)

c. R Squared = .984 (Adjusted R Squared = .978)

d. R Squared = .983 (Adjusted R Squared = .977)

e. R Squared = .976 (Adjusted R Squared = .966)

f. R Squared = .473 (Adjusted R Squared = .276)

g. R Squared = .965 (Adjusted R Squared = .952)

h. R Squared = .939 (Adjusted R Squared = .916)

i. R Squared = .891 (Adjusted R Squared = .850)

j. R Squared = .621 (Adjusted R Squared = .479)

k. R Squared = .906 (Adjusted R Squared = .871)

l. R Squared = .745 (Adjusted R Squared = .650)

m. Computed using alpha = .05

5.1.3 Tests of Between-Subjects effects results- Table 10

As the overall *F* test was significant, this study moved on to check the individual dependent variables with separate ANOVA tests. This is called as Tests of Between-Subjects effects and was shown in table 10. The idea of performing this test was to check whether either of the two DVs or their interaction were statistically significant. The significance *(P)* values in Table 10 indicated that change of ownership had a significant effect on the financial and environmental performance of PBPL.

$FinROA_1$ ($F(3,8) = 72.40$; $p < .001$; partial $\eta2 = 0.964$)

$FinROA_2$ ($F(3,8) = 77.80$; $p < .001$; partial $\eta2 = 0.967$)

$FinROE_1$ ($F(3,8) = 163.60$; $p < .001$; partial $\eta2 = 0.984$)

$FinROE_2$ ($F(3,8) = 158.41$; $p < .001$; partial $\eta2 = 0.983$)

FinDTA ($F(3,8) = 106.77$; $p < .001$; partial $\eta2 = 0.966$)

FinCEA ($F(3,8) = 2.40$; $p < .144$; partial $\eta2 = 0.473$)

FinTEUs ($F(3,8) = 41.04$; $p < .001$; partial $\eta2 = 0.939$)

FinTonnes ($F(3,8) = 21.80$; $p < .001$; partial $\eta2 = 0.891$)

FinNoS ($F(3,8) = 4.40$; $p < .042$; partial $\eta2 = 0.621$)

EnvoTE ($F(3,8) = 73.14$; $p < .001$; partial $\eta2 = 0.965$)

EnvoTEC ($F(3,8) = 25.78$; $p < .001$; partial $\eta2 = 0.906$)

$EnvoTECO_2$ ($F(3,8) = 7.81$; $p < .009$; partial $\eta2 = 0.745$)

As a follow-up test to MANOVA, the Tests of Between-Subject Effects (one-way ANOVAs) on each of the twelve dependent variable proxies was conducted (a step-down analysis). Accordingly, all of the variables were statistically significant except one variable FinCEA (P< .144) with effect sizes (partial $\eta^{2)}$ ranging from a high of 0.984 ($FinROA_1$) to a low of 0.473 (FinCEA). According to Gelman and Stern (2006) "not significantly different does not necessarily mean as they are not

different. Gelman and Stern (2006) and Keppel and Wickens (2004) suggested when to report the main effect of the differences of a data set. Also, this study performed the Tests of Between-Subjects Effects without the variable FinCEA which indicated a non-significant test value at the first instance. This evidenced even without the indicator FinCEA, the overall results of the Tests of Between-Subjects Effects were still significant. The second Tests of Between-Subjects Effects without FinCEA is in **Appendix 4**.

Table 11.   Tukey HSD Post-hoc test   Multiple Comparisons

Dependent Variable	(I) Ownership	(J) Ownership	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
FinROA$_1$	State-05/06/07	State-08/09/10	1.6767	1.96724	.829	-4.6231	7.9765
		Pty-12/13/14	-21.7633*	1.96724	.000	-28.0631	-15.4635
		Pty-15/16/17	-16.9133*	1.96724	.000	-23.2131	-10.6135
	State-08/09/10	State-05/06/07	-1.6767	1.96724	.829	-7.9765	4.6231
		Pty-12/13/14	-23.4400*	1.96724	.000	-29.7398	-17.1402
		Pty-15/16/17	-18.5900*	1.96724	.000	-24.8898	-12.2902
	Pty-12/13/14	**State-05/06/07**	**21.7633***	1.96724	**.000**	15.4635	28.0631
		State-08/09/10	**23.4400***	1.96724	**.000**	17.1402	29.7398
		Pty-15/16/17	4.8500	1.96724	.141	-1.4498	11.1498
	Pty-15/16/17	**State-05/06/07**	**16.9133***	1.96724	**.000**	10.6135	23.2131
		State-08/09/10	**18.5900***	1.96724	**.000**	12.2902	24.8898
		Pty-12/13/14	-4.8500	1.96724	.141	-11.1498	1.4498
FinROA$_2$	State-05/06/07	State-08/09/10	.8500	2.00427	.973	-5.5684	7.2684
		Pty-12/13/14	-23.3567*	2.00427	.000	-29.7750	-16.9383
		Pty-15/16/17	-18.5367*	2.00427	.000	-24.9550	-12.1183
	State-08/09/10	State-05/06/07	-.8500	2.00427	.973	-7.2684	5.5684
		Pty-12/13/14	-24.2067*	2.00427	.000	-30.6250	-17.7883
		Pty-15/16/17	-19.3867*	2.00427	.000	-25.8050	-12.9683

	Pty-12/13/**14**	**State-05/06/07**	23.3567*	2.00427	**.000**	16.9383	29.7750
		State-08/09/10	24.2067*	2.00427	**.000**	17.7883	30.6250
		Pty-15/16/17	4.8200	2.00427	.153	-1.5984	11.2384
	Pty-15/16/17	**State-05/06/07**	18.5367*	2.00427	**.000**	12.1183	24.9550
		State-08/09/10	19.3867*	2.00427	**.000**	12.9683	25.8050
		Pty-12/13/14	-4.8200	2.00427	.153	-11.2384	1.5984
FinROE₁	State-05/06/07	State-08/09/10	3.3133	1.66069	.266	-2.0048	8.6314
		Pty-12/13/14	-26.2900*	1.66069	.000	-31.6081	-20.9719
		Pty-15/16/17	-21.8300*	1.66069	.000	-27.1481	-16.5119
	State-08/09/10	State-05/06/07	-3.3133	1.66069	.266	-8.6314	2.0048
		Pty-12/13/14	-29.6033*	1.66069	.000	-34.9214	-24.2852
		Pty-15/16/17	-25.1433*	1.66069	.000	-30.4614	-19.8252
	Pty-12/13/14	**State-05/06/07**	26.2900*	1.66069	**.000**	20.9719	31.6081
		State-08/09/10	29.6033*	1.66069	**.000**	24.2852	34.9214
		Pty-15/16/17	4.4600	1.66069	.104	-.8581	9.7781
	Pty-15/16/17	**State-05/06/07**	21.8300*	1.66069	**.000**	16.5119	27.1481
		State-08/09/10	25.1433*	1.66069	**.000**	19.8252	30.4614
		Pty-12/13/14	-4.4600	1.66069	.104	-9.7781	.8581
FinROE₂	State-05/06/07	State-08/09/10	1.7367	1.83164	.781	-4.1289	7.6022
		Pty-12/13/14	-29.3767*	1.83164	.000	-35.2422	-23.5111
		Pty-15/16/17	-24.9533*	1.83164	.000	-30.8189	-19.0878
	State-08/09/10	State-05/06/07	-1.7367	1.83164	.781	-7.6022	4.1289
		Pty-12/13/14	-31.1133*	1.83164	.000	-36.9789	-25.2478

			Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
		Pty-15/16/17	-26.6900*	1.83164	.000	-32.5556	-20.8244
	Pty-12/13/14	**State-05/06/07**	**29.3767***	1.83164	**.000**	23.5111	35.2422
		State-08/09/10	**31.1133***	1.83164	**.000**	25.2478	36.9789
		Pty-15/16/17	4.4233	1.83164	.151	-1.4422	10.2889
	Pty-15/16/17	**State-05/06/07**	**24.9533***	1.83164	**.000**	19.0878	30.8189
		State-08/09/10	**26.6900***	1.83164	**.000**	20.8244	32.5556
		Pty-12/13/14	-4.4233	1.83164	.151	-10.2889	1.4422
FinDTA	State-05/06/07	State-08/09/10	-.0133	.01414	.784	-.0586	.0320
		Pty-12/13/14	.1633*	.01414	.000	.1180	.2086
		Pty-15/16/17	.1800*	.01414	.000	.1347	.2253
	State-08/09/10	State-05/06/07	.0133	.01414	.784	-.0320	.0586
		Pty-12/13/14	.1767*	.01414	.000	.1314	.2220
		Pty-15/16/17	.1933*	.01414	.000	.1480	.2386
	Pty-12/13/14	**State-05/06/07**	**-.1633***	.01414	**.000**	-.2086	-.1180
		State-08/09/10	**-.1767***	.01414	**.000**	-.2220	-.1314
		Pty-15/16/17	.0167	.01414	.656	-.0286	.0620
	Pty-15/16/17	**State-05/06/07**	**-.1800***	.01414	**.000**	-.2253	-.1347
		State-08/09/10	**-.1933***	.01414	**.000**	-.2386	-.1480
		Pty-12/13/14	-.0167	.01414	.656	-.0620	.0286
FinCEA	State-05/06/07	State-08/09/10	.0133	.02728	.959	-.0740	.1007
		Pty-12/13/14	.0633	.02728	.172	-.0240	.1507
		Pty-15/16/17	.0500	.02728	.326	-.0374	.1374
	State-08/09/10	State-05/06/07	-.0133	.02728	.959	-.1007	.0740

		Pty-12/13/14	.0500	.02728	.326	-.0374	.1374
		Pty-15/16/17	.0367	.02728	.563	-.0507	.1240
	Pty-12/13/14	**State-05/06/07**	**-.0633**	.02728	**.172**	-.1507	.0240
		State-08/09/10	**-.0500**	.02728	**.326**	-.1374	.0374
		Pty-15/16/17	-.0133	.02728	.959	-.1007	.0740
	Pty-15/16/17	**State-05/06/07**	**-.0500**	.02728	**.326**	-.1374	.0374
		State-08/09/10	**-.0367**	.02728	**.563**	-.1240	.0507
		Pty-12/13/14	.0133	.02728	.959	-.0740	.1007
EnvoTE	State-05/06/07	State-08/09/10	-43.00*	9.542	.009	-73.56	-12.44
		Pty-12/13/14	69.00*	9.542	.000	38.44	99.56
		Pty-15/16/17	78.00*	9.542	.000	47.44	108.56
	State-08/09/10	State-05/06/07	43.00*	9.542	.009	12.44	73.56
		Pty-12/13/14	112.00*	9.542	.000	81.44	142.56
		Pty-15/16/17	121.00*	9.542	.000	90.44	151.56
	Pty-12/13/14	**State-05/06/07**	**-69.00***	9.542	**.000**	-99.56	-38.44
		State-08/09/10	**-112.00***	9.542	**.000**	-142.56	-81.44
		Pty-15/16/17	9.00	9.542	.784	-21.56	39.56
	Pty-15/16/17	**State-05/06/07**	**-78.00***	9.542	**.000**	-108.56	-47.44
		State-08/09/10	**-121.00***	9.542	**.000**	-151.56	-90.44
		Pty-12/13/14	-9.00	9.542	.784	-39.56	21.56
FinTEUs	State-05/06/07	State-08/09/10	-125964.00*	34444.576	.027	-236267.66	-15660.34
		Pty-12/13/14	-270763.00*	34444.576	.000	-381066.66	-160459.34
		Pty-15/16/17	-352324.67*	34444.576	.000	-462628.32	-242021.01

	State-08/09/10	State-05/06/07	125964.00[*]	34444.576	.027	15660.34	236267.66
		Pty-12/13/14	-144799.00[*]	34444.576	.013	-255102.66	-34495.34
		Pty-15/16/17	-226360.67[*]	34444.576	.001	-336664.32	-116057.01
	Pty-12/13/14	**State-05/06/07**	**270763.00[*]**	34444.576	**.000**	160459.34	381066.66
		State-08/09/10	**144799.00[*]**	34444.576	**.013**	34495.34	255102.66
		Pty-15/16/17	-81561.67	34444.576	.161	-191865.32	28741.99
	Pty-15/16/17	**State-05/06/07**	**352324.67[*]**	34444.576	**.000**	242021.01	462628.32
		State-08/09/10	**226360.67[*]**	34444.576	**.001**	116057.01	336664.32
		Pty-12/13/14	81561.67	34444.576	.161	-28741.99	191865.32
FinTonnes	State-05/06/07	State-08/09/10	-4284335.00[*]	1224007.902	.033	-8204039.16	-364630.84
		Pty-12/13/14	-9776487.67[*]	1224007.902	.000	-13696191.83	-5856783.51
		Pty-15/16/17	-5818339.67[*]	1224007.902	.006	-9738043.83	-1898635.51
	State-08/09/10	State-05/06/07	4284335.00[*]	1224007.902	**.033**	364630.84	8204039.16
		Pty-12/13/14	-5492152.67[*]	1224007.902	**.009**	-9411856.83	-1572448.51
		Pty-15/16/17	-1534004.67	1224007.902	.614	-5453708.83	2385699.49
	Pty-12/13/14	**State-05/06/07**	**9776487.67[*]**	1224007.902	**.000**	5856783.51	13696191.83
		State-08/09/10	**5492152.67[*]**	1224007.902	**.009**	1572448.51	9411856.83
		Pty-15/16/17	3958148.00[*]	1224007.902	.048	38443.84	7877852.16
	Pty-15/16/17	**State-05/06/07**	**5818339.67[*]**	1224007.902	**.006**	1898635.51	9738043.83
		State-08/09/10	**1534004.67**	1224007.902	**.614**	-2385699.49	5453708.83
		Pty-12/13/14	-3958148.00[*]	1224007.902	.048	-7877852.16	-38443.84
FinNoS	State-05/06/07	State-08/09/10	128.00[*]	35.724	.029	13.60	242.40
		Pty-12/13/14	65.33	35.724	.328	-49.07	179.73

			Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
		Pty-15/16/17	49.00	35.724	.548	-65.40	163.40
	State-08/09/10	State-05/06/07	-128.00*	35.724	.029	-242.40	-13.60
		Pty-12/13/14	-62.67	35.724	.359	-177.07	51.73
		Pty-15/16/17	-79.00	35.724	.200	-193.40	35.40
	Pty-12/13/14	**State-05/06/07**	**-65.33**	35.724	**.328**	-179.73	49.07
		State-08/09/10	**62.67**	35.724	**.359**	-51.73	177.07
		Pty-15/16/17	-16.33	35.724	.966	-130.73	98.07
	Pty-15/16/17	**State-05/06/07**	**-49.00**	35.724	**.548**	-163.40	65.40
		State-08/09/10	**79.00**	35.724	**.200**	-35.40	193.40
		Pty-12/13/14	16.33	35.724	.966	-98.07	130.73
EnvoTEC	State-05/06/07	State-08/09/10	54506.33*	15043.714	.028	6331.07	102681.60
		Pty-12/13/14	107463.33*	15043.714	.000	59288.07	155638.60
		Pty-15/16/17	116978.67*	15043.714	.000	68803.40	165153.93
	State-08/09/10	State-05/06/07	-54506.33*	15043.714	.028	-102681.60	-6331.07
		Pty-12/13/14	52957.00*	15043.714	.032	4781.73	101132.27
		Pty-15/16/17	62472.33*	15043.714	.014	14297.07	110647.60
	Pty-12/13/14	**State-05/06/07**	**-107463.33***	15043.714	**.000**	-155638.60	-59288.07
		State-08/09/10	**-52957.00***	15043.714	**.032**	-101132.27	-4781.73
		Pty-15/16/17	9515.33	15043.714	.919	-38659.93	57690.60
	Pty-15/16/17	**State-05/06/07**	**-116978.67***	15043.714	**.000**	-165153.93	-68803.40
		State-08/09/10	**-62472.33***	15043.714	**.014**	-110647.60	-14297.07
		Pty-12/13/14	-9515.33	15043.714	.919	-57690.60	38659.93
EnvoTECO2	State-05/06/07	State-08/09/10	-771.33	1433.993	.947	-5363.48	3820.82

	Pty-12/13/14	3994.33	1433.993	.090	-597.82	8586.48
	Pty-15/16/17	4902.67*	1433.993	.037	310.52	9494.82
State-08/09/10	State-05/06/07	771.33	1433.993	.947	-3820.82	5363.48
	Pty-12/13/14	4765.67*	1433.993	.042	173.52	9357.82
	Pty-15/16/17	5674.00*	1433.993	.018	1081.85	10266.15
Pty-12/13/14	State-05/06/07	-3994.33	1433.993	.090	-8586.48	597.82
	State-08/09/10	**-4765.67***	1433.993	**.042**	-9357.82	-173.52
	Pty-15/16/17	908.33	1433.993	.918	-3683.82	5500.48
Pty-15/16/17	**State-05/06/07**	**-4902.67***	1433.993	**.037**	-9494.82	-310.52
	State-08/09/10	**-5674.00***	1433.993	**.018**	-10266.15	-1081.85
	Pty-12/13/14	-908.33	1433.993	.918	-5500.48	3683.82

Based on observed means.

The error term is Mean Square (Error) = 3084502.250.

*. The mean difference is significant at the .05 level.

5.1.4 Tukey's HSD post-hoc tests results- Table 11

Lastly, a series of Tukey's Honestly Significant Difference post-hoc tests were performed (table 11) in order to examine individual mean difference comparisons across four 3-year time periods that represent two independent variable groups of ownership (state and private) and all 12 dependent variable performance evaluation ratios. These four 3-year time periods comprise of two pre-privatisation time periods and two post-privatisation time periods. Firstly, the time period is pre-privatisation 05/06/07 (normal public ownership operations) and transitional pre-privatisation 08/09/10 (public ownership operations in the transition towards privatisation). Secondly, the post-privatisation transitional period 12/13/14 and the normal privatisation ownership operations 15/16/17.

Before the interpretation of the outcome of the Multiple Comparison tests in table 10, it is important to recall that as mentioned at the beginning, this study was based on the theory of the firm which describes that private ownership is superior to public ownership and therefore, privatisation brings financial success to State Owned Enterprises. Based on this notion, this study interpreted the outcome of the Multiple Comparison tests as the performance of private ownership versus the performance of state ownership.

Therefore, it is important to extract the outcome of the post-hoc results in Table 9 cautiously, such as starting from each proxy to private ownership (2 periods; post-privatisation- 12/13/14 and 15/16/17), then to state ownership (2 periods; pre-privatisation 05/06/07 and 08/09/10) direction. Precisely, important information has been highlighted in table 9. Mean difference and the significance (P) value should be followed by the dependent and independent variables.

For instance, proxy FinROA$_1$ has a statistically significant difference with a significance of P=0.001 < 0.05=α during the Pty 12/13/14 period against State05/06/07 and State08/09/10 periods. The positive difference is depicted by the mean differences of 21.76 and 23.44 respectively, which is the result FinROA$_1$ financial performance means for Pty12/13/14 being greater than the FinROA$_1$ financial performance means for State05/06/07 and State08/09/10 periods. On the contrary, it is possible to interpret as FinROA$_1$ has a negative difference in

State05/06/07 against Pty 12/13/14 and Pty15/16/17 periods as they have mean differences of -21.76 and -16.91 respectively. (The mean difference of State 08/09/10 against Pty 12/13/14 period is -23.44). In brief, ROA_1 has statistically significantly higher financial performance differences during both Pty period 3 and 4, compared to the financial performance in period 1 and 2. Overall, ROA_1 financial performance during private ownership is statistically significantly different than state ownership. As the ROA_1 ratio has EBIT as its denominator, this financial performance ratio excludes the source of funding from expenses. Therefore, the significant higher financial performance differences under private ownership relate to operational incomes and other expenses achieved during private ownership. ROA_2 includes interest expense, therefore the source of funding is included in the performance. Consequently, the significant difference relates to operational incomes and other expenses, including interest expense. Therefore, the lack of interest expense for private ownership also has contributed to the significant financial performance differences using private ownership as identified by ROA_2.

During the Pty period 3, the FinROA$_2$ proxy has the mean values against State period 1 and 2 as 23.36 and 24.21 whereas, Pty period 4 the mean difference of FinROA$_2$ against State periods 1 and 2 are, as 18.54 followed by 19.39. ROA_2 has a statistically significant difference during both period 3 and 4, compared to period 1 and 2. Overall, during the private ownership ROA_2 is statistically significantly different than state ownership.

FinDTA however, has negative mean values during both period 3 and 4 of Pty compared to the periods 1 and 2 of State. They are as, -0.163, -0.177, -0.18, and -0.193 and may reflect the funding source disparity between State and Pty; as identified by ROA_2. The reasons for these decreases have been addressed during the interview sessions and the results are discussed in the qualitative analysis section. However, overall, FinDTA mean difference is statistically significantly lower during both period 3 and 4, compared to period 1 and 2. Overall, during the private ownership periods, the FinDTA differences in means are statistically significantly lower than during the state ownership periods.

The levels of the significance of FinCEA during Pty periods against State periods are not statistically significant. As an observation for an insignificant difference,

it is noted that FinCEA also has negative comparison mean values during both Pty periods against State periods; -0.633, -0.50, -0.500, and -0.0367. Further, the levels of the significance of FinCEA during Pty periods against State periods are statistically insignificant. The reasons for these insignificances and negative mean differences are the continued investments strategy and assets devaluation practice. These reasons will be discussed extensively in the qualitative analysis below.

FinTEUs of PBPL is statistically significantly larger difference during both periods of private ownership than to both periods of state ownership. Comparatively, the significance of the higher ratio for total container throughputs is noticeable after the privatisation periods. This result may have some impact on the ROA_1 relate to increased operational incomes and lower other expenses achieved during the private ownership.

FinTonnes ratio of PBPL during the private ownership (during period 3 and 4) was a statistically significantly larger difference than to the state ownership periods (both period 1 and 2). Further, the FinTonnes value in period 4 in private ownership was decreased relatively, and significantly to period 3 in private ownership period. Overall, the FinTonnes ratio means of PBPL under private ownership have statistically significant mean differences than to state ownership.

While FinNoS of PBPL did not have any statistical mean differences during its private ownership period compared to state ownership period, there was a significant means difference between periods 1 and 2 of State ownership. The results show a lower number of ships were processed during the State ownership transitional period (period 2) compared to the normal State ownership period 1. Therefore, FinNoS was statistically insignificant under the transitional private ownership period and the normal private ownership period compared to state ownership. However, a comparison across periods 2, 3 and 4, that while statistical insignificance, there was a diminishing number of ships processed in period 3 compared to period 2 but an increase occurred during the period 4 under private ownership. This could be due to the recent investments on latest technology such as NCOS and Blockchain at PBPL. Overall, the FinNoS mean value differences during private ownership was statistically insignificant than compared to state ownership.

The Mean differences of EnvoTEC from the two State-owned periods (State 05/06/07 and State 08/09/10) to the two private ownership periods show that there are positive significant differences between the EnvoTEC means. Therefore, the post-hoc results show that the energy consumption during the State-owned periods was higher than during the private ownership periods. Interestingly, a comparison of EnvoTEC mean differences periods for State 08/09/10 and State 05/06/07 reveals a decrease in energy consumption during the State 08/09/10 (transitional) period. This statistically significant decrease in energy consumption trend continued from State 08/09/10 (transitional) through both private ownership periods but the decrease in energy consumption trend between private ownership Pty12/13/14 and Pty15/16/17 periods is not statistically significant.

Mean differences in EnvoTE during both periods of Pty were negative while the P-values interestingly were significant. These negative mean differences cannot be considered as decreased situations of performance as EnvoTE represents the Total number of Employees where the lower the number, the higher the level of productivity of the firm. Therefore, the EnvoTE of PBPL during both period 3 and 4 of the private ownership was statistically significantly different than the state ownership period 1 and 2.

Likewise, the mean differences of EnvoTEC proxy during both Pty periods were negative while the P-values were significant. Again, these were due to a result of the decline of the use of total energy consumption of the firm during the Pty periods compared to State periods. The decline of energy usage increased the level of the environmental performance of PBPL.

Further, the mean differences of the $EnvoTECO_2$ proxy which represented the total emissions of CO_2 in table 11 indicated that the negative mean values for the total CO_2 emission under the normal private ownership period (Pty15/16/17), has declined compared to the two State ownership periods. Also, the negative mean values for the total CO_2 emission under the transitional private ownership period (Pty12/13/14) was significant at $P < 1$ (Sig = 0.090), which may be due to the slowness of changes during the operational transitional to privatisation (Pty12/13/14) period. Further, during these two private ownership periods, the P-values of $EnvoTECO_2$ were non-significant to the standard alpha value of $P = 0.05$

but the negative mean differences between Pty15/16/17 and Pty12/13/14 is indicative of a continuing but not statistically significant decreasing CO_2 emissions trend. Overall, EnvoTECO$_2$ has statistically significantly difference under private ownership in both periods 3 and 4, compared to the state ownership in period 1 and 2. Overall, during the private ownership EnvoTECO$_2$ was statistically significantly different than state ownership.

As mentioned in section 3.3, *performance indicators*, any increase or decrease in the level of consumption in the energy consumption or total emissions of CO_2 measures may be attributed to an increase (or decrease) level of operations (e.g., total container throughput or the number of full-time equivalent employees). Additional ratios were calculated using the level of consumption in the energy consumption or total emissions of CO_2 as the numerator and total container throughput or the number of full-time equivalent employees as the denominator.

These ratios controlled for any changes in the level of operations and were included in a MANOVA to identify any potential impact on the results reported for the level of consumption in the energy consumption or total emissions of CO_2. The analyses produced significant MANOVA results (Pillai's Trace: sig = 0.003; tests of between-subjects effects: EnvoTEC sig = 0.000, EnvoTEC/FinTUE ratio sig = 0.000, EnvoTEC/FinTonnes ratio sig = 0.000, EnvoTECO2 sig = 0.009, EnvoTECO2/FinTUE sig = 0.000, EnvoTECO2/FinTUE sig = 0.008). Furthermore, the post-hoc tests included in Appendix 4, produced similar significant results for the three environmental consumption performance measures and either similar or improved total emissions of CO_2 results for the two ratios that controlled for any changes in operations compared to the total emissions of CO_2 measure. Therefore, the analysis produced two significant environmental performance results while controlling for change in the level of operations across the 12 years.

The test outcome revealed that all Tukey's HSD test mean comparisons were statistically significant (P<0.05) after the privatisation of PBPL except two indicators (FinCEA and FinNoS)[3]. Accordingly, after privatisation PBPL had not

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[3] The purpose of this study was to examine a single firm's operation across 12 years where there have been two ownership types for the operation. The limitations by examining the performance of

statistically significantly increased its investment intensity (FinCEA) and the number of ships (FinNoS) they served compared to the state ownership period. However, the majority of the indicators which represented the financial performance reported statistical significance. In other words, when comparing the financial and environmental performance of PBPL under private ownership, to PBPL under state ownership, the performance proxies indicated a significant increase in the financial and environmental performance of PBPL under private ownership.

Homogeneous subsets

Dividing the control group into subset1 and mnemonic A and B groups into subset 2 and 3, the homogeneous subsets (subsets are in Appendix 3 from page 187 to 193) showed the groups with same and different means of the sample dataset. Compared to the state ownership, ROA_1 significantly increased after the privatisation (period 3 and 4), Also, indicators such as ROA_2, ROE_1, and ROE_2 increased right after the privatisation (during period 3 and 4). Next, FinDTA ratio significantly decreased after privatisation. This was due to the change of the capital structure of PBPL after the privatisation. Again, the homogeneous subset for FinCEA showed that overall, there was no statistically significant difference in financial performance between pre and post-privatisation periods. However, comparatively, there was a slight decrease in the FinCEA indicator during the post-privatisation periods.

FinTEUs showed an increased statistical significance of financial performance after privatisation. This increase was gradual as it started from period 1 and then it raised up to its maximum during the 4th period under private management. Introduction of new technology and other operational investments during private ownership were the main reasons for this gradual increase in the FinTEUs. Simultaneously, FinTonnes increased considerably. There was a positive relationship between the

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one company with a quantitative analysis is to provide some basis for the collection of information using a qualitative research design. Therefore, this analysis was to provide a direction for further investigated data collection through interviews. Consequently, not achieving some expected statistical outcomes was not considered to be a significant limitation to this study because, the qualitative data would provide a more robust explanation of these violation of the expected outcomes.

FinTEUs and FinTonnes as when one ratio increased, the other also increased. The number of ships (FinNoS) also increased after the privatisation but compared to the first period of state ownership, this increase during the private ownership was insignificant. However, it was important to examine why the number of ships did not increase while both the number of TEUs and the number of tonnes increased. This was because, during the private ownership, the management extended and automated quays and their operations, and as a result, the port was able to cater long vessels in the port than ever before. Therefore, even when FinTEUs and FinTonnes increased still the new management was able to increase the performance, serving a smaller number of ships with more capacity.

EnvoTE showed that the number of total employees was reduced after privatisation. Also, EnvoTEC and EnvoTECO$_2$ homogenous subsets showed their decreased values after privatisation. Decrease values of total energy consumption and total emissions of Carbon mean that the firm had participated less in polluting the environment under private ownership.

5.2 Interview results

This section was narratively analysed according to the deductive method which started from the hypothesis, examination, and then ended in a logical conclusion.

The question of this study was to investigate what extent privatisation had impacted upon the financial and environmental performance of PBPL. This was stipulated upon the theory of firms which stated that a firm exists to maximise profits. Also, this theory was supported by stakeholder theory which asserts that the shareholders of a firm would undertake social responsibility actions in addition to the conventional motivation of profit maximisation. The former theory defines that the purpose of the shareholders of a firm is to maximise profits while the latter states that the purpose is not only profit maximisation but also addressing the stakeholders' expectations as well. What should then be the purpose of State seeking to privatise its State-Owned Enterprises? Should it be to maximise shareholders' profits or meeting stakeholders 'expectations? Because of this contradiction, which has emerged from the literature repeatedly, this study investigated the impact of privatisation on the financial and environmental

performance with reference to the Port of Brisbane Proprietary Limited (PBPL) assuming that there was no mean difference in the financial and environmental performance of Port of Brisbane under either private or state ownership.

During the first part of the quantitative analysis of this study, it was revealed that there was a difference in the financial and environmental performance of PBPL before and after its privatisation. Further, the MANOVA analysis concluded that the difference occurred when private ownership managed the business during the period between 2012 and 2017. The purpose of having these interviews with some selected employees of PBPL was to investigate the reasons for the mean differences in the financial and environmental performance of PBPL during the private ownership period between 2012 and 2017.

The interviews were held under 6 categories. They were as;

1. Financial
2. Port operations and pollutions
3. Land reclamation
4. Infrastructure and environmental
5. Dredging
6. Community relations

The purpose of dividing the interview topics as above was to seek reasons for the differences in the financial and environmental performance of the firm. Information related to the financial performance was garnered from the financial statements and the interviews focused on relating that information to the environmental performance of the company. Once the raw data were gathered under those topics, then they were categorised under the two variables; financial and environmental performance.

ROA and ROE were statistically significantly increased after privatisation.

Compared to the pre-privatisation period, the ROA and ROE ratios for both EBIT and EBT were increased during the post-privatisation period. This was mainly due to the remarkable decline of the interest expenses after the privatisation of PBPL. A decline of interest expenses indicated the pre-privatisation operations had been

funded by external loans whereas, the post-privatisation operations had been funded by equity. This phenomenon was a result of a change of the capital structure of the firm which happened due to the change of ownership of PBPL. The effect of the change of the capital structure of the firm has been shown by MANOVA analysis above, indicating the differences of dependent variables (ROA_1 + ROA_2 and ROE_1 + ROE_2) over time.

Before the privatisation (under the state ownership), PBPL had had extremely low numbers of ROAs over the years which were always less than 10% though, for the first time, the proxy went up about in 10% right after the privatisation. This was basically due to the increase of both profits and assets of PBPL under private ownership. Assets were increased after 2014 as the firm had invested on new major projects. These projects were as; Nonlinear Channel Optimisation Simulator system (NCOS Online system), port drive upgrade, Brisbane International Cruise Terminal, future port expansion works and offsite stormwater management projects. More details about these projects will be described in different sections of this chapter below.

Simultaneously, the total book value of the assets of PBPL had been considerably reduced after privatisation, from 2012 until 2014. According to the notes of the financial reports of the company, this could be the impairment/ written down of assets of PBPL after its privatisation. A value reduction of assets lowered the value at which the assets were carried on the books as changes in the assets or market conditions may reduce their current market values. Also, book value reduction was a non-cash charge. These were reported as expenses in PBPL's reports. As a result, their return on assets decreased right after the privatisation. This increased net profit numerator and decreased total assets denominator combination depicted a higher value of ROA of PBPL. Also, the decreased values of assets (assets impairment during the post -privatisation) declined at the latter period of the post privatisation. The ROA value of PBPL before the privatisation was a single number. For instance, by 2010, it was below 1%. However, to the first time, PBPL reported its two-digits ROA value right after the privatisation; 20% in 2012 and then it reached to its highest; 30% by 2013 and after that, the value declined to 21% by 2017. Therefore, compared to the state ownership performance, there was a significant increase of

ROA under private ownership though, within the private ownership, the increased ROA of PBPL had gradually declined during the study period.

An increased ROA value had increased the ROE as well. This may be either the increase of total revenues after privatisation or the new management of PBPL was making better reinvestment decisions. A reduction of interest expenses as the numerator and an increase of equity as the denominator change the integer of the ratio. Consequently, the ROE of PBPL had increased under private ownership. An increase of ROE indicated that the firm generated an increased percentage of profits on every dollar invested by its shareholders. When compared with the performance of PBPL under state ownership, the ROE values under private ownership were increased between 2012 and 2017. Before privatisation, the ROE value of PBPL was a single digit though with the change of ownership, it became a two-digit value since 2012. This was mainly due to the increase in the equity of the firm (change of capital structure). The new owners of PBPL were Q-Port Holdings which comprised four of the largest and most experienced infrastructure investors in the world suggesting that their experience may make them better at managing investments than the State.

The other important change in PBPL's financial activities was that after the privatisation, the firm's total liabilities were increased while the total assets were impaired which was in addition to the new investments on assets. These changes resulted in a decline in the ROE of PBPL even under private ownership. In other words, compared to the state ownership period, it was true that ROE of PBPL was increased during the post=privatisation period though there was a decline of ROE even during the private ownership because under the private ownership, PBPL's liabilities were increased while the assets were impaired.

In order to distinguish the above-mentioned differences in ROA and ROE, this study calculated EBIT which excludes pre-privatisation operating expenses that do not exist within the post-privatisation operational expenses. Lease payments and the other interest expenses were not included in the pre-privatisation operating expenses and these have been explained under the notes of PBPL's financial

reports. A closer comparison of the financial reports of PBPL revealed that the net profit of the firm gradually increased during private ownership.

Leverage (FinDTA) was statistically insignificant after privatisation.

There was an increase of the leverage during the private management though it was not statistically significant because the capital expenditure of PBPL had suddenly increased after 2014 with the investments of the Port Drive and local road network upgrade project and the use of world's most advanced Under-Keel Clearance (UKC) system in the sea channel. These were revealed during the interviews that PBPL had grown and acquired assets especially after 2014. Accordingly, the greater portion of assets of PBPL was financed by equity than debts. Before the privatisation, PBPL had had a higher degree of leverage (FinDTA). For instance, during the state ownership of PBPL the average leverage ratio from 2005 to 2010 was 0.48 whereas this number was 0.30 during the private ownership from 2012 to 2017. Under the private management, PBPL showed a deteriorated financial risk profile and this means the firm would be able to pay its debts. However, this did not imply that PBPL had limited borrowings or debts because the financial reports show that their total debts (total liabilities) slightly increasing over time during the private management. This may be due to the write-down of Plant, Property and Equipment (PP&E) of PBPL after the privatisation. Relatively, the numbers of total debts after the privatisation did not exceed the numbers of total debts before the privatisation. As mentioned above, prior to privatisation, the average amount of leverage was about 48%. This means that about 48% of PBPL's assets were financed by the creditors or debts while the other 52% was financed by the government. During post-privatisation, PBPL had maintained an average of 30% leverage rate (70% of assets were financed by the private owners whereas the other 30% was by creditors/debts). Comparatively, this lower leverage ratio was more favourable for PBPL, as the higher the leverage ratio, the more the risk the firm has.

Investment intensity (FinCEA) was not statistically significant after privatisation.

Even though there was a decrease of the values of FinCEA (which is positive), still it was statistically insignificant from MANOVA outcome due to the low reservation of finance on capital expenditure and the revaluation of fixed assets during the post-privatisation. It has been seen that the capital expenditure to acquire or upgrade PBPL's fixed assets such as expenditures on property, plant or equipment had not been reserved during the first period of the private management (3rd period, 2012-2014). This can be seen even in the notes for accounts area of the financial reports during this period. Simultaneously, the new management had revaluated the fixed assets of PBPL.

Investment intensity of PBPL was higher before the privatisation and then it decreased gradually during the second period (4th period of the analysis) of private ownership of PBPL. As per the interviews, this was due to two major investments that PBPL had done after privatisation, especially in 2015/16. A comment for the land reclamation section is provided below to highlight the value the company put on these types of activities.

1. *Port Drive upgrade- a $110 million upgrade to Port Drive and the local road network, delivering safer and more efficient port roads. This will ensure the PBPL continues to meet the needs of industry and customers as trade grows*

As a part of the original privatisation contract, PBPL had to complete the AUS $110 million worth Port Drive project by August 2018. This investment included 4.2 kilometers of duplication of Port Drive; a construction of new overpass, an advanced connector access, a few entry/exit accesses to surrounded highways, and a new shared path. At the end of the completion, this project adds values to the stakeholders as the longest pre-cast and pre-stressed concrete bridge in Australia. Also, it is the largest EME2 (Enrobés á Module Elevé) asphalt placement which is the latest French technology of building heavy load bearing roads, in Australia. Further, this project was incorporated with PBPL's offsite stormwater management projects and in 2018, this project was awarded as the "Excellent" sustainability rating for its design by the Infrastructure Sustainability Council of Australia.

2. The use of world's most advanced Under-Keel Clearance (UKC) system in the sea channel- As a part of the Nonlinear Channel Optimisation Simulator System (NCOS Online system), UKC is probably the most sophisticated, safest and accurate clearing forecast systems in the world.

These acquisitions may increase the dropped investment intensity (higher value of FinCEA) during the second period of privatisation (2015-2017). In addition to that, the firm had invested on Nonlinear Channel Optimisation Simulator System (NCOS Online security system), Brisbane International Cruise Terminal (BICT), future port expansion projects, and offsite stormwater projects. The impact of new investments showed on PBPL's financial reports as the total assets on the balance sheets from 2015 to 2017 were increased. Even though, the new investments of PBPL after privatisation, had slightly increased its revenues, while such investments had decreased operational expenses especially in 2015 and in 2016. This was not strange as Psarouthakis (2013) explained, usually the anticipated gains from a privatised firm would take a few years as the transition of a privatised firm may take one year or more.

Further, the decline of the total number of employees affected to lower the investment intensity ratio. During the state ownership the average employment of PBPL was 314 during 2005 and 2010. This created PBPL a considerable amount of labour cost which affected to increase the investment intensity number. However, during the private ownership from 2012 to 2017, PBPL had a significant labour redundant averaging 200 employees per annum and as a result of it, the cost of labour too declined. Consequently, the investment intensity of PBPL declined under private management.

Overall, the assets impairment of PBPL and absence of major investment during the first three years after privatisation were the major reasons for the increase of ROA and ROE and the decline of leverage and investment intensity of PBPL under private ownership. When the net carrying values (acquisition cost- accumulated depreciation) of assets are greater than the future undiscounted cash flow, firms usually, impair their assets. This could happen when there are changes in regulations and business climate or technological changes within a firm. With the privatisation process, PBPL had regulations, business climate changes and technological changes in the firm and as a result, the new ownership impaired its assets. The new management had reported assets impartment losses in their income statements each year. Due to an impairment, long term assets on the balance sheet declines, creating a deferred tax asset. Also, an impairment loss in the income statement reduces the shareholders' equity resulting in a lower debt to equity ratio.

A decrease in the book value of assets reduces the firm's net income. Consequently, a decrease in the carrying amount of assets declines ROA and ROE in the particular year. A lower assets value and smaller depreciation expenses increase the future net income and current and future fixed assets turnover. This will also, decrease the debt to assets ratios (leverage) as well. However, cashflow based ratios will remain unaffected.

Total Container Throughputs (TEUs) were statistically mounted.

The number of TEUs of PBPL in 2005 doubled at the end of the survey period as it reached its maximum number of containers handled during the year 2017. The TEUs increased evidently in each year right from the beginning of the privatisation and until the end of the study period 2017. The heavy investments on new technology by private ownership after 2014, was the main reason for the growth of the TEUs of PBPL during the post-privatisation. All in all, private ownership of PBPL was adequately able to increase its port operations. Below are some interview findings for the rapid increase of TEUs of PBPL after privatisation.

According to the interviews, the game changer of PBPL's financial and environmental performance under the private ownership was the implementation of the new Nonlinear Channel Optimisation Simulator System (NCOS) in the port precinct which boosted the capacity of larger vessels handling facilities of the port without compromising safety. The application increased the operational flexibility, environmental protection protocols, and the efficiency of port operations while adding value to its customers. For instance, in 2017, the port welcomed the longest-ever 347 metre, container ship; 'Susan Maersk' to its quays with a capacity of 9500TEU. According to the port records, PBPL experienced a significant uplift in the number of large cargo vessels calling due to the introduction of NCOS. Typically, the calling number of deep drafted bulk carrier ships above 14 metres was tripled while the calling number of carries above 13 metres was doubled. The application of NCOS has led the firm to win the Innovative Support Services award in 2017 and the Smart Infrastructure award in 2018.

The other most important reason for the increased performance of PBPL was that the port implemented a new decentralised digital ledger technology system called 'Blockchain' which connects its way through banking business and technology firms internationally. This sophisticated system can hold information as a database while sharing and continually reconciling facilities. Also, when the privatisation deal was negotiated, the new ownership of PBPL entered into an agreement with a condition of investing AUS $ 110 million to upgrade the Port Drive and other local road network projects which have already been finished. Additionally, the extended and dedicated freight and rail connection to the port was another reason to enhance the accessibility to the port precinct. These upgraded Port Drive, local road network and extended rail and freight connections to the port have significantly reduced the travel time of trucks, movers and trains lowering the traffic congestions, road accidents and environmental pollutions around Brisbane city and its vicinity suburbs.

According to the Transport and Main Road Minister of Queensland, Mark Baily, PBPL handles around $50 billion in international trade annually, provides business opportunities to 70 entrepreneurs while supporting thousands of jobs to the community. Adding to it, he claimed that as more than 3.1 million of vehicles travel on port roads annually, therefore, it is vital to invest in road, rail and waterside infrastructure which would support the growth of State. Further, the minister stated that this is a typical example of private industry working with the state to deliver a project which will benefit all Queenslanders in a way of saving their time and money (Lannunzio, 2018).

Total Trade Throughput has been increased after privatisation.

As described above, there were many reasons for the increase in the number of Total Container Throughputs (TEUs) after the privatisation of PBPL. With the increase of TEUs of PBPL, the total tonnage was increased gradually right after privatisation. In addition to the above-mentioned reasons for the increase of TEUs which even affected to increase the total throughputs of PBPL, there were some other reasons the study had revealed during the interview sessions. One important reason was that during this period, PBPL had exported a considerable number of

agricultural products due to the improvements in the agricultural sector in Queensland. Agriculturally favourable weather, extensive research and developments and new investments in the agricultural sector, new settlements in Queensland, proper irrigational and water management systems during the period, increased government assistance in the agriculture sector, increased investments in the offsite stormwater management projects, and increased demand for the Queensland based agricultural products in the local and international markets were some of the determinants of the development of the Queensland agriculture sector (DAF 2018).

According to the reports of the Department of Agriculture and Fisheries, in 2016, the contribution of the Agriculture and food industries was $19.87 billion-Gross Value of Production (GVP), Horticulture $4.5 billion GVP, livestock and livestock products-$9.3 billion GVP. A 3.6% of State economy was from the agriculture industry. These industries produce around $ 20 billion in output annually and half of which was exported, providing more than 17% of Queensland's exports of goods. Growth in total agricultural volumes accelerated to 1.1% per year since 2006–07.

The number of ships handled has been increased after the privatisation of PBPL.

The above-mentioned reasons which enhanced the total TEUs, and the total tonnages of PBPL also involved in enhancing the total number of ships handled in PBPL after its privatisation. Other than that, there were some other reasons for these increases were found during the interview sessions. Compulsory pilotage service for the ships that have an overall length of 50 metres or above encouraged the shipping lines to accommodate the precinct more than ever before. Maintaining a 24-hour listening watch on VHF channel 12 and confirming the Estimated Time of Arrival (ETA) of a ship two hours before via the channel, PBPL had provided value -added services to its stakeholders.

Also, for the safety purpose, the new management of PBPL launched a 24 hours Vessels Traffic Service called REEFVTS in the Great Barrier Reef and Torres Strait areas. Further, the use of Mudmaster vessel expedited the dredging and drying

process allowing more ships to be served at the precinct. The significance of this Mudmaster was that this dredging vessel had advanced technology to remove mud, and silts efficiently while protecting the flora and fauna in the area. Moreover, PBPL had a partnership with the University of Queensland to investigate sediment transport pathways in Moreton Bay. This included monitoring and assessing the dredged material placement area in the Mud Island. All these facilities encouraged the shipping lines to visit the port while providing them with the highest safety for the ships and their contents. As a result, these initiatives were awarded by the Australian Shipping and Maritime medal for the environmental transport in 2016. A quote from the interviewee from the dredging department highlights the importance of these activities.

> We have seen reductions in emissions amongst many of our key measurables. We have in place a Target Zero program that is focusing on reducing our resource use and emissions to zero by the year 2030. We have a number of initiatives already in place including renewable energy, fuel management and upgrades to our dredging fleet to improve fuel economy and reduce emissions.

An increase of TEUs, an increase in the number of ships to the port and an increase in the number of tonnages shipped through the port have an interrelation to each other. Therefore, a reason which affected to change one of the above would affect to change the others as well.

The theory implication of these differences of financial ratios of PBPL is as explained by the theory of the firm, in correspondence to the increased profits, PBPL had increased its ROA, ROE, TEUs, tonnage, and the number of ships and had decreased its leverage and investment intensity. Therefore, the financial purpose of maintaining the port business by Q-Port Holdings shareholders (PBPL) is to maximise its profits.

A decline of the total number of employees of PBPL after privatisation.

The total employee number of PBPL was significantly high and increased before privatisation and it reached its maximum of 378 by 2009. Before the privatisation process, in 2010, PBPL had had 338 of full-time employment. After the privatisation, it gradually decreased until it reached its lowest 187 by the end of the survey period 2017. According to Megginson et al (1994), and Megginson and

Netter (2001), most privatised firms cut the number of employees' jobs with the purpose of enhancing the labour productivity right after transition. It was evident that during state ownership, PBPL had a high number of employees especially during the second period of state ownership (from 2008 to 2010) with an average of 354 employees. After privatisation, the average total number of employees was significantly lower at 200. The decline of the total number of employment increased the heavy use of modern technology in the port operations which in return created a difference in the financial performance of PBPL.

The study was unable to determine the full labour demography (male and female numbers of employees) of PBPL for the pre-privatisation period. However, below are the full-time employee demographic statistics of PBPL for the second period of the private ownership of PBPL.

2014-   Male- 142   Female – 29= 191   (4:1)
2015-   Male- 142   Female- 49= 191   (3:1)
2016-   Male- 158   Female- 53= 211   (3:1)
2017-   Male- 140   Female- 47= 187   (3:1)

As an equal employment opportunity provider by its HR policies, the company had provided opportunities for both males and females, although according to the above statistics the female participation in PBPL was still insignificant during the private ownership. The average of male to the female ratio which was 3:1 is not a balanced workforce as required in Australia under the Equal Opportunity for Women in the Workplace Amendment Bill 2012. While the specific industry sector stats are not available, Scutt (2018) provides male to female statistics that reveals there are some industry sectors where the male to female employment where an 'imbalance' occurs. According to the bill issued by the Federal Register of Legislation, Australian Ports may have a similar specific workplace gender imbalance

Also, more information about a labour retrenchment was not revealed during the interviews, though the analyses of PBPL financial reports clearly depict the gradual increase of the total number of employees under state control and the gradual decrease of that number during the private ownership. This phenomenon would be

accepted by the theory of the firm as profits-oriented firms are normally concerned with their labour productivity though, under stakeholder theory, the firm should be responsible for its employees and their career prospects. Even though privatisation offers opportunities for the redistribution of wealth, a labour retrenchment increases the unemployment rate and opens gaps in economic distribution. According to Megginson and Netter (2001), labour retrenchment is an unresolved issue in privatised firms. It would be important if this study was able to investigate the labour retrenchment at PBPL, the compensation they had been paid and the socio-economic issues they suffer after their job cut, though the interviews were unable to divulge such sensitive information.

Total energy consumption ratio has been declined.

MANOVA analysis revealed that the Total Energy Consumption ratio was significantly decreased after the privatisation of PBPL. Energy consumption is vital to a port as a healthier energy consumption would balance the environmental challenges with economic demands. Also, it would be important in port operations and port related activities. This low energy consumption practice of a port is called as the "Greenport" concept. During the interviews, it was revealed that PBPL had developed and had been working on an action plan to encourage energy efficiency solutions in order to achieve success in its operations after privatisation.

Firstly, PBPL installed an energy monitoring system in the port precinct and its terminal to assess current energy consumption and its costs. Accordingly, the port identified the energy consumption sources to discover its energy reduction potentials. The commissioner of the Department of the Environment and Energy advised PBPL the importance of the formulation of energy and reduction plan at the process level, in order to coordinate energy efficiency actions. This helped the port to demonstrate success terminals which encouraged PBPL to apply for energy efficiency certificates from recognised bodies to gain a competitive edge. These initiatives led PBPL to formulate long-term sustainability strategies in order to assist port and terminals to meet future energy needs. Also, low maintained energy consumption by a port assists the government to formulate energy efficiency strategies and policies for the future.

There were many projects and programs for a better environment which had been taken by private ownership. However, some of them had been initiated by state ownership before the privatisation process. For instance, PBPL had an Environmental Management System (EMS) which was externally certified to *ISO14001* in May 2000 (Before the privatisation). The system is audited every three (3) years for re-certification and surveillance audits are conducted annually.

The firm's Environmental Management System (EMS) was sophisticated as it concentrated on air and water quality, marine ecology (seagrass and mangroves), seawall, weeds, solar, fauna, and shorebirds. Therefore, the firm made decisions on top of the sustainability concept which related to the environment, society and economy. There were extensive monitoring programs in place to manage all processes and systems. Key operational areas of PBPL were measured by indexes such as Land Use Plan (LUP), Operational Environmental Management Plan (OEMP), State Planning Policy (SPP), and Construction Environmental Management Plan (CEMP). Also, the private management was conducting some regular programs such as Mangrove Health Monitoring Program (MHP), Seagrass Monitoring Program (SMP), and Land Reclamation process/Survey and in addition to those, the firm was considering the feedback of the community through the Community Consultative Committee (CCC).

In order to comply with the National Greenhouse and Energy Reporting System (NGERS), the firm also had a thorough tracking of fuel through vessel logs and fuel purchasing records. The company had a fuel management process in addition to the mechanical and technical upgrading of its dredging fleets such as Ken Harvey and TSHD Brisbane. Most importantly, PBPL used renewable energy in order to reduce the high level of energy consumption. Those systems and procedures were accurately maintained and as a result of proper maintenance, PBPL had achieved an enhanced environmental performance than pre-privatisation era.

The other environmental programs PBPL conducted were; the Land Use Plan (LUP), the Construction Environmental Management Plan (CEMP), the Operational Environmental Management Plan (OEMP), Healthy Waterways Erosion and Sediment Control toolkit, stormwater management design which

complies with the State Planning Policy (SPP), offsite stormwater management and quality investment payment scheme were some of its other important projects.

The Land Use Plan (LUP) is the primary and the most comprehensive instrument of PBPL which regulates the development of Brisbane core port land under the Transport Infrastructure Act 1994, approved by the Queensland State Government. This LUP came into effect in February 2014, under the private ownership of PBPL. According to the LUP, there were 4 strategic themes in its environmental management process. They were; economic development, essential facilities and infrastructure, natural environment and amenity, community and character. The LUP consists of five development use codes and three development standard codes. The development use codes focused on the land use activities whereas the development standard codes focused on the technical aspects of development proposals. According to the interviews, basically, the plan provides a strategic framework for the development activities on core port land identifying preferred land use outcomes. The plan illustrates strategies of port's infrastructure requirements, while working as a statutory document approved by the government with all the inputs from the Brisbane City Council, Community Consultative Committee, and industry stakeholders. As Freeman (1984) explained in his stakeholder theory, a firm has the responsibility of operating in the interest of not only the shareholders but also all its stakeholders. Accordingly, PBPL has been performing well after its privatisation as the firm has shown concerns about the expectations of shareholders as well as the stakeholders.

Moreover, PBPL engages in a number of offsite storm water management projects partnered with the Queensland government (Department of Environmental and Heritage Protection, Department of Infrastructure, Local Government and Planning, Department of Science, Information, Technology and Innovation), Plan-future, Alluvium, BMT WBM (a leading consulting firm in mechanical, water and environmental engineering, maritime, and hydraulics), Griffith University (Australian Rivers Institute), Healthy Land and Water, Mulgowie Farming Company, and Lockyer Valley Regional Council in stabilizing and rehabilitating eroded creek bank along Laidley Creek.

Queensland waterways and environment face significant issues of sediments runoff which impact the water quality and ecosystem health of Moreton bay and Brisbane River. According to the survey reports of PBPL and the Department of Environmental and Heritage Protection and the interview information received, it has been revealed that each year approximately 400000 tonnes of sediments come from lower Brisbane River in the Lockyer Valley. Heavy rains in the valley area bring sediments from catchments through degraded creeks with dirty water which then transfer those sediments to Brisbane river and into Moreton Bay. According to the interview sessions, news articles and other reports by the Department of Environmental and Heritage Protection, the devastating Queensland floods in 2013 had brought and deposited more than 2 million tonnes of sediments and silts in the port's navigational channels in the Moreton bay leading the port to close all its operations for more than 3 days requiring extensive maintenance dredging works to safely reopen the channels. The comment from the community relations section highlights the basis on which decisions were made.

> All of our decisions are made with environmental, social and economic considerations. All our development assessments elements of sustainability in construction and operation. PBPL have an extensive list of monitoring programs to manage the surrounding environment and have numerous community programs to ensure the local communities are involved with PBPL decisions and developments.

The relevance of the offsite storm water treatment projects is that such projects prevent the sediment runoff into Moreton bay resulting in saving a considerable amount of energy consumption on dredging, bed levelling, and other marine operations which are important to maintain safe navigable depths of the port's navigational channel. As interviewees mentioned, dredging and bed levelling activities are cost-effective. Also, they are highly regulated and are subject to strict State and Commonwealth operational and environmental legislations.

After the devastation, PBPL found the most effective way of treating sediment and silt runoff was to improve overall waterway health in order to reduce future flood events which would stop port operations. As per the interviewees, that key finding was expedited by the extensive research which suggested that tackling debris and sediment pollutions at their sources would deliver the most effective environmental outcomes. Consequently, PBPL had started conservations and invested considerably on Healthy waterways and Catchments projects with the expectation

of continuing the port activities and operations even during floods without turbulences.

Even though the firm has achieved a significant improvement of environmental performance after the privatisation, it was revealed during the interviews that the firm still does not work with the Queensland Climate Adaptation Strategy Q-CAS. Since the state ownership, the firm had an air quality monitoring program (2003-2011). This long-term air quality monitoring program values were compared against the Air Quality National Environmental Protection Measure (NEPM) guideline values. Under the state management, the firm had had roadside monitoring programs between 2006 and 2008 though, it was abandoned after the privatisation. Instead, the firm had started a new real Time Monitoring Program in 2013 and its results were compared against the National Environmental Protection Measure (NEPM) guideline values. However, the firm has been continuing the Nest Boxes Program (NBP) up to date and this program provides habitats and physical buffers for native as well as immigrant species. Also, some other critics about the environmental practices of PBPL will be discussed in the CO_2 emission section below.

Total Emission of CO_2 Tonnes had significantly reduced after privatisation.

It was revealed by the MANOVA analysis that the total emission of CO_2 tonnes of PBPL had significantly reduced after its privatisation. According to MANOVA analysis, there was an average of 12460 tonnes of CO_2 annually emitted during 2012 and 2017 (post-privatisation). This number was 17962 tonnes (annual average) during the state ownership between 2005 and 2010. Basically, the average difference of CO_2 emissions of PBPL between pre and post-privatisation was 6958 tonnes. The least emission under the state ownership which was 15514 tonnes was reported in 2010 and the maximum; 21490 tonnes were reported during 2008. There was a sudden decline in the CO_2 emission right after the privatisation and it was 13725 tonnes for the year 2012. For the next three years, this number was below 12000 tonnes annually until it rose up again over 12000 tonnes in 2016 and 2017.

As many of the interviewees revealed, the main reasons for these changes are as below. Air quality monitoring programs (2003-2011), Real-Time Monitoring Programs (2013), thorough log tracking and purchase records of fuel usage in

compliance to the National Greenhouse and Energy Reporting System (NGERS), considerations of the feedback of the community and other stakeholders through Community Consultative Committee (CCC), Mangrove Health Monitoring Program, comprehensive Environmental Management System (EMS), ISO 14001 certification and its audit process, complying with the National Guidelines for Dredging (NAGD), adherence to the Environmental Relative Activities (ERA) required by the Queensland Environmental Protection Act 1994, complying with the National Environmental Protection Measures (NEPM), "Target-Zero by 2030" emission program, complying with the RAMSAR convention to protect seabirds, extensive research on coastal seascapes for commercial fisheries productions, complying with State Planning Policy (SPP), parented with Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA), complying with the department of Environment and Heritage Protection (DEHP), complying with the Environmental Protection (Air) Policy 2008, partnered with the Queensland Wader Study Group (QWSH) to protect seabirds, and shorebird monitoring programs are some of them.

However, in 2016, both total emission of CO_2 and total energy consumption ratios of PBPL were higher than to the values in any other years between 2010 and 2017. The interviewees revealed this was due to the Port Drive upgrade project conducted by PBPL in 2015/16. However, according to the Land Use Plan 2015, the purpose of upgrading the port drive was to reduce the impact of the largest landside CO_2 emission source (container handling equipment) recommended by both 2007/08 and 2010 environmental surveys. However, it is expected to yield the positive outcomes of port drive upgrade in future.

During the discussions, the authorities emphasised that they undertake landside and waterside emissions inventory and air quality modelling in the precinct though, it should be mentioned here that the last Landside Emission Survey was done in 2010 which was before the change of ownership of PBPL. Since then, no recent survey has been conducted. Also, there was a previous survey in 2007/2008 done by PBPL under the state ownership, and its recommendations were as below.

o Required new and updated emission estimation methods for different transport modes to the port area.

- Required further examination and analysis of Cargo Handling Equipment (CHE) activity data to verify emission standard equivalences of the CHE equipment in the country.
- Required the port to review CHE emission factor models in the USA, Japan and Europe
- Required a driver survey
- Required a sophisticated calculation of truck emissions
- Required a thorough examination on the contribution to N_2O emissions from rails as the current value was very high (50%)
- Required to review overseas models

Also, the report revealed that container handling equipment in the port precinct was the largest landside emission. However, according to the interview information, PBPL has not taken any actions for the above-mentioned recommendations.

It is noteworthy to mention that the interviewees of PBPL asserted that they have not performed any benchmarking to compare the use of natural resources by PBPL compared to other ports in Australia. According to the interviews, PBPL had the overall CO_2 measurements though it did not have measurement, reporting and verification process in monitoring and reducing non-CO_2 and Green House Gas (GHG) such as Methane (CH_4), Nitrous Oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6). One reason for not having or measuring these gases could be that PBPL does not comply with ISO 14064-1 which is for the global standard for developing Carbon footprints and GHG Protocol. However, ports such as Rotterdam and Oslo measure their carbon footprints and as a result, those ports have become one of the most efficient ports in the world (WPCI, 2010).

As revealed during the interviews, PBPL does not disclose its CO_2 emissions or reduction initiatives. The interviewees stated that the firm has an emission target though, PBPL does not obtain any third-party verification of CO_2 emissions. PBPL has CO_2 emission action plans (such as NPI and NGERS), a responsible person, and energy effective designs (solar on operations base buildings and Practical Completion Inspection-PCI, Greenstar rated buildings). Also, PBPL does not have the technology to improve truck and cargo handling equipment efficiency. The

other initiatives that PPBPL does not have are, shore-side power availability for ships, measures to minimise train/truck/ship waiting times, and policies for carries to reduce emissions. The firm has waste reduction targets, facilities for ship waste disposal, policies and measurements against targets though, it does not have policies for public disclosure of performance. Further, the interviewees stated that the firm does not have policies to manage wastewater, no measures of wastewater management and water conservation and public disclosure of information. Moreover, they asserted that the firm does not have oil and water separator at the precinct.

According to the interviews, the land reclamation process of PBPL had not identified some important things such as the potential risks, benefits or impacts of chemical use reduction targets, policies and procedures for the reduction of construction equipment noise, storages for hazardous goods, disposal of regulated waste (fuel, oil, chemicals and sewage), rubbish, general waste and site clean-up, impacts on flora and fauna.

As a summary, PBPL had environmental programs since state ownership though, such programs were more regulated and emphasised under the private management and this led the firm to achieve a significant environmental performance after its privatisation. As a result, the firm won the Healthy Waterways award-2016, Australian Engineering Excellence award-2016, Australian Shipping and Maritime Industry award-2016. As stakeholder theory states, a firm has the responsibility on all stakeholders during its business including the community and the environment. Accordingly, the study has been convinced by the reports, interview information and sites observations that under the private ownership, PBPL engaged its business in a responsible manner not only to its shareholders but also to all its stakeholders. However, the firm has significant environmental performance initiatives yet to commence.

5.3 Chapter summary

A MANOVA test was run to check the null hypothesis of no group mean difference in the sample after the privatisation of PBPL, in order to determine to what extent has privatisation impacted upon the financial and environmental performance of

PBPL. There were no outliers in the data set as assessed by inspection of a boxplot. All financial and environmental data of PBPL were normally distributed during both state and private ownership as assessed by Shapiro-Wilks test ($p > 0.05$). Multivariate tests result of MANOVA was statistically significant and the Pillai's Trace value for the independent variable showed a significant value and therefore, the null hypothesis of no group mean difference in the sample was therefore rejected. The null hypothesis; homogeneity of variances, of Levene's test of Equality of Variances was accepted as the variances of the two groups are equal. However, out of twelve in two occasions, the test satisfied the homogeneity of variances among the data. According to the literature, this situation is neglected as the literature explains that such a difference is possible in a small number of observations in a sample. Also, if the normality assumption (here the Shapiro-Wilks test results) is satisfied then such insignificance can be ignored. Also, the graphical method; Q-Q plots here show the normality of distribution. Further, if the Multivariate test already has proven that there is a difference between groups, the conclusion can be drawn on the Multiple Comparisons test results of MANOVA. Additionally, a new Levene's test with trimmed data is attached to Appendix 3 section. Therefore, this study would not intend to correct for this violation using an adjustment to the degree of freedom with the support of a t-Test such as Welch-Satterthwaite method. Multiple Comparisons test showed an overall statistical significance of the difference of ten out of twelve indicators. Except for the number of ships and the investment intensity of PBPL all other selected performance indicators have statistical significance during the private ownership. This has been precisely explained by the Homogeneous subsets and qualitative interview outcomes. Therefore, comparatively, the financial and environmental performance of PBPL under private ownership overwhelmed the state ownership as the results of the test show that those differences laid in the private ownership periods of PBPL.

The qualitative analysis has used the significant and non-significant results of MANOVA as an investigative analysis tool to frame the open-ended questions to gather the reasons for such differences from interviewees. Overall, both the financial and environmental performances of PBPL were improved during private ownership (between 2012 and 2017) compared to state ownership (between 2005

and 2010). FinROA and FinROA had been improved in ten times during private management than to state management as the change of capital structure of the firm. FinDTA also, had an increase during the post-privatisation period though that increase was not statistically significant as the new management had not spent on major investments during the first three years right after the privatisation. They had heavily invested in acquiring long term assets after 2014. Investment intensity (FinCEA) values of PBPL were considerably higher before the privatisation and it reduced gradually during the post-privatisation periods. However, it had become statistically insignificant as both the low reservation of capital expenditure during the first three years after privatisation and the revaluation of fixed assets by the private ownership.

Total Container Throughputs (TEUs) had been statistically increased during private ownership because the new management had heavily invested in new technology during 2014 and 2017. Also, Total Trade Throughput (FinTonnes) and the total number of ships have been increased after privatisation. One reason for these increases is that the heavy investment of private ownership on the port operations after privatisation was forefront. There was a decline in the total number of employees of PBPL after privatisation as PBPL had redundant employees after the change of ownership of PBPL in 2011. The total energy consumption ratio and the total Emission of CO_2 values of PBPL after privatisation had been significantly reduced as the private ownership of PBPL had been practising significant environmental protection and conservation policies and procedures in their daily operations.

In conclusion, both the financial and environmental performances of PBPL have been improved during private ownership than it was owned by the State. Also, the improvement had begun after 2014 and it can be expected more positive outcomes in future.

CHAPTER 6

6.0 CONCLUSIONS

This research has investigated the impact of privatisation on the financial and environmental performance of Port of Brisbane under pre and post-privatisation conditions. Thus, based on the theory of the firm and stakeholder theory, this study investigated the potential impact of privatisation of PBPL. Using twelve indicators which represented both financial and environmental performance as dependent variables, this study performed quantitative MANOVA tests and qualitative interview sessions in order to determine the impact of the change of ownership of PBPL on its financial and environmental performance. The two variables; financial and environmental were represented by 12 indicators. Prior to conduct MANOVA, tests (i.e., Shapiro-Wilks test, Mahalanobis Distance test, Pearson correlation, Q-Q plots analysis, Scatterplot matrices, and Levene's F test) were conducted to satisfy the MANOVA assumptions of the selected dataset.

A one-way MANOVA was conducted to test the null hypothesis to prove that there were no changes in the financial and environmental performance of Port of Brisbane under either private ownership or state ownership. A statistically significant MANOVA effect was obtained by, Pillai's Trace=0.003α, F (24, 9) = 6.55, P<0.05; Pillai's Trace =2.84, Partial η^2 0.95. However, it was still unclear where the difference lies. Therefore, the study performed Multiple Comparison Tuckey's post-hoc test for the areas of differences and found that both financial and environmental performance of PBPL under private ownership was better than to state ownership.

As the overall multivariate test was statistically significant, this study concluded that the respective effect of change of ownership of PBPL from state ownership to private ownership has statistically significantly changed the financial and environmental performance of the firm. However, there were some indicators which violated the completion of MANOVA tests assumptions, and therefore, this study cannot reject the null hypothesis. Instead, the null hypothesis of 'no

differences in the financial and environmental performance of Port of Brisbane under either private ownership or state ownership', has not been accepted as true.

This situation aligns with the theory of the firm as PBPL performs and makes decisions to maximise profits creating as much of a gap between its revenues and costs under private ownership after the privatisation. However, the magnitude of profit maximisation of PBPL after privatisation is not significant as the theory of the firm expects and therefore, this can be concluded as PBPL's goal is to maximise profits in the long-term and not in the short-term. This is because, the firm adheres to stakeholder theory as the private management is aware of a strong focus on profit maximisation would yield with a level of risk in regarding public perception and a loss of goodwill between PBPL, investors, consumers, government and the public.

The interview sessions revealed that private sector management had undoubtedly led to cut costs, heavily depended on modern technology in port operations and environmental protection initiatives. Private ownership actively participated in protecting the environment including not only flora and fauna but also most of the hinterlands attached to the Brisbane River while actively engaged in profit-seeking port operation activities. The guiding lights for these were an amalgamation of the competition, the recognition of the goals that represent the public interest by the private management and the obligations of the privatisation agreement. However, in this study, both qualitative and quantitative analyses did not focus on the link between the compensation of private managers and the improved financial and environmental performance of PBPL.

The private management of PBPL has invested more capital (not borrowed money) on Property, Plant and Equipment (PPE) during the period. This approach is supported by stakeholder theory which demonstrates that stakeholders to not react well when companies over rely on borrowings. Also, PBPL has used new technology in their port operations during the period and this involved in enhancing the TEUs, the number of ships served, and the total tonnage handled. Also, the sustainability concept of private management of PBPL sufficed to increase environmental performance after privatisation. It has been revealed during the interviews that the implementations of environmentally friendly policies and procedures at the port precinct have been forced by the heavy use of new

technology especially after 2015 and the port management had to comply with the standards of the service and technology providers of state-of-the-art technology in order to subscribe to their services. The increase of using new technology had reduced the total number of employments of PBPL after privatisation and as a result, the productivity of the human resources had been improved during the private ownership.

The success of profits maximisation of PBPL lays on the perfect balance between the heavy cost-cutting and the considerable amount of capital investment on assets of PBPL by the private management. Such a perfect balance between cost cutting and investment on assets did not hurt PBPL's the short -run profits but would assist with the long-run viability of the firm signifying the difference of the ownership between the government and the private sector of PBPL. Profit maximisation aligns with the goals of stakeholder theory suggesting that PBPL has been focused on improving profitability to meet the needs of stakeholders and to ensure the continuing success of the company. PBPL privatisation process involved the displacement of one set of state management entrusted by the shareholders (government-ministry) with another set of private management who may have answered to a completely different set of shareholders (the stakeholders). At the beginning, private ownership of PBPL may not have compunction about adopting profit-making business strategies or corporate practices which create sustainable port service though, the private management was heavily influenced by the terms and conditions of the PBPL privatisation agreement, corporate governance (consonance), accountability, the competitions created by the vicinity ports, the advantages of the geographical location of PBPL, and organisational mechanism (financial strength of the new investors) As a result, PBPL ensured its business affairs and operational activities in meeting its financial, operational and environmental strategic objectives in order to achieve long term sustainability.

For this, it was revealed in the interview sessions that the new management of PBPL had generated a sharp increase in its shareholder value through correct market anticipations of improvements in performance, heavy use of modern technology in port operations and services, and general managerial effectiveness. These might come from the elimination of unnecessary staff employed during the state ownership and the cessation of unprofitable port activities inherited from state

ownership. Therefore, it is important to research thoroughly, under what conditions did private management of PBPL perform in the public's interest while maximising profits in a sustainable manner.

Additionally, the firm was in contract with the government to implement new policies and procedures in order to achieve and maintain the rules and regulations of the government and other assessment bodies. As a result, the company had reduced its total energy consumption and the total Carbon emissions levels after privatisation. Also, the contribution to the conservation of flora and fauna around the port precinct, and managing wetlands were immense. Even though, there were some environmental performance activities available for PBPL to concern. Measurements to report and verify Green House Gas (GHG) and actions for achieving ISO 14064-1 which was for the global standard for developing Carbon footprints and GHG Protocol were some of the initiatives that PBPL could consider in future. This is also aligned with stakeholder theory, in that, achieving these goals, has provided assurance to one of the major stakeholders (the government) that they are able to meet the agreed targets and achieve positive environmental impacts.

Overall, it was interesting that some of the stakeholders' responsibilities especially the environment and the public had been emphasised by the private management of PBPL after privatisation. This could be a typical example of a privatised firm, which seemed to operate under stakeholder theory after privatisation while generating profits.

Therefore, this study concluded that overall, both financial and environmental performance of PBPL were improved due to the change of ownership of PBPL. It was evident that the port's throughputs, during the private ownership was increased incredibly and this indicated as the financial and operational performance of PBPL were increased during 2012 and 2017. However, as per Talley (2007), it was doubtful to conclude as PBPL has reached its optimum throughput (economic or engineering) during this period unless the study revealed the actual throughput of PBPL.

6.1 Limitations of the study

As a case study, this research performed a single-port evaluation approach and the findings of this study cannot be necessarily applicable to all privatised ports in Australia unless the same political and environmental situations arise. Also, some argue that case studies are narrow fields of investigation and the results cannot be generalised or extrapolated to fit an entire population. Also, as PBPL has procedures of no public disclosure of performance some information cannot be accessed and it would be an issue for the methodology and conclusion. However, to overcome this limitation, the study followed various strategies including interview sessions and cross-sectional data refereeing through various sources. If this study could have an opportunity to select more environmental performance indicators which could perhaps balance the selection of criteria in between the financial and environmental performance, and then the outcome may be more significant.

Further, some of the unsatisfied MANOVA assumptions and their impact on the study could be the most important limitation of this research. When the assumptions were not satisfied, the study has always conducted any available option as an alternative. Accordingly, tests such as Levene's, Multiple Compression tests and Test of Between-subject Effect tests have a second analysis in Appendix 3 and 4 as when the indicators did not satisfy the test assumptions, the study has selected the second-best option in order to satisfy the test assumptions. In a situation when some of the indicators did not satisfy the test hypothesis, while the majority does, the study has chosen to represent the outcome of the majority indicators. This situation can be justified as being this a case study (single firm's performance), some of the assumptions could not be met when analysing differences of variables by a general testing method such as MANOVA.

While the MANOVA results provide support for improvements in performance occurring during the private sector ownership, it should be acknowledged that there may be a possible "history effect"; there improvements in these measures may have occurred regardless of ownership change. However, this would require an examination of another port that has remained in government ownership to provide a benchmark, which is beyond the scope of this Master's thesis project.

6.2 Suggestions and recommendations

Shleifer (1998), suggests the social goals that private ownership fails to address, can be handled by state regulations and contracting without resort to state ownership. Further, he states that whether regulated or not, the benefits of private delivery of many goods and services are just beginning to be realised and public interests can probably be provided cheaper and attractively by private ownership than state ownership. This study's finding, therefore, suggests a model of evaluating the impact of privatisation based on stakeholder theory.

Also, it should be interesting to conduct future research based on the real purpose of the privatisation is as the profit maximisation or the stakeholder satisfaction or a combination of both as suggested under the ethical branch of stakeholder theory. In other words, it would be worth to investigate what makes the government to privatise its firms. That is the decision to privatise a firm motivated by the theory of the firm or stakeholder theory (either ethical branch or managerial branch), or is it possible for both to occur simultaneously? Also, it is important for future studies to test the model from this study for a multi-port performance evaluation approach on the same topic with reference to other ports in Australia such as Port of Melbourne and Fremantle. If this future multi-port performance evaluation research is conducted, it could be significant as an Australian multiport analysis would reveal a comparison of the performance or the efficiency of the selected major ports in Australia.

Further, it has been revealed during the interview sessions that PBPL does not have adequate environmental protection procedures for Greenhouse Gas (GHG), energy, construction equipment noise, storage of hazardous goods, chemical use reduction targets, and policies to manage water. It could be, therefore vital to research on the economic, environmental, social cost and benefits of waste and waste related activities of PBPL. Also, it is important to study on anti-incumbency of PBPL privatisation issues related to trade unions, corporate social responsibilities, protecting stakeholders' and shareholders' rights and PBPL's preparedness to address those issues. Again, this study emphasises PBPL, the importance of taking partnership in the Queensland Climate Adaptation Strategy (Q-CAS) as being instrumental in the development of the Queensland climate strategy would ensure

the betterment of diverse economies, landscapes and communities in the State. Also, apart from this study, none of the empirical research in Australia has studied the environmental impact of privatisation of any industry including ports. Extending the scope of future studies to include the environmental impact of privatisation of any industry including ports would be warranted and timely.

Moreover, in future privatisation of state-owned assets, the intervention of government after the privatisation process, and the terms and conditions of the privatisation agreement with the new management can be suggested as two fundamentals of achieving the success of privatised SOEs. If these conditions were not met, continued state involvement may likely be necessary. In conclusion, the simple transfer of ownership from state ownership to private ownership will not necessarily reduce the costs, enhance the quality of services, and improve performance.

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UNIVERSITY OF SOUTHERN QUEENSLAND

TOOWOOMBA CAMPUS

Interview Lines of Enquiry

Interview of Privatised Enterprise

Interviewer's instruction:

The objective of this research is to examine how privatisation has been implemented in Port of Brisbane Proprietary Limited (PBPL) and its impact on the financial operational and environmental performance. In this interview, we are interested in exploring the effect of privatisation on the performance of State-Owned Enterprises (SOEs) particularly, in relation to profitability, investment, port operations, employment, and environmental management. Information obtained here will be treated strictly confidentially and your name will not be used in any publications or reports.

COMMUNITY RELATIONS

Participant's background information-*Nadene Perry*- Environmental Advisor

Has the respondent been working in the firm both before and after privatisation?

Yes……………………………   No…No…………………….

1. What relationship with the community does PBPL have?
    PBPL has an active and positive relationship with our community. We have quarterly meetings through our Community Consultative Committee (CCC) where we received feedback and continually improve our operations to minimize impacts on our local community.

    Notes- N says that CCC grants local NGOs and charities funding of up to $2500.

    Contacted Hemmant Flexible Learning; one of the community learning Centres to reassure their grants for the year 2017, to operate 'Besty the coffee Cart and established a pop-up cinema enterprise, though they haven't replied yet (Did not reply).

2. What are the other organisations you working with in?

PBPL works with numerous organisations ranging from government, NGOs and universities.

Notes- For instance; The Smith Family, PA research Foundation, Crime Stoppers, Queensland University of Technology-QUT -International Laboratory for Air quality and Health, Research on intermodal terminal Systems

Also, Volunteer Marine Rescue, Tangalooma Eco Marines, Moreton Bay Environmental Education Centre and Yulu-Burri-Ba Aboriginal Corporation for Community Health.

3. How does PBPL facilitate the trade and economic growth of the state while contributing to protecting, enhancing and sustaining the environment people and the community?

All of our decisions are made with environmental, social and economic considerations. All our development assessments elements of sustainability in construction and operation. PBPL have an extensive list of monitoring programs to manage the surrounding environment and have numerous community programs to ensure the local communities are involved with PBPL decisions and developments.

Notes- Offsite storm water management projects- partnered with the Queensland government-(Department of Environment and Heritage Protection, Department of Infrastructure, Local government and Planning, Department of Science, Information Technology and Innovation), Planfuture, Alluvium, BMT WBM-(BMT WBM is a leading edge consultancy in mechanical, maritime, water and environmental engineering and hydraulics), Griffith University (Australian Rivers Institute), Healthy Waterways and Catchments, and Mulgowie Farming Company, Lockyer Valley Regional Council-In stabilising and rehabilitating eroded creek bank along Laidley Creek –

Awards won

- *2016 Healthy Waterways Awards - Sustainable Water Management Award and the Minister's Grand Prize*

- *2016 Australian Engineering Excellence Awards - Queensland Environmental Excellence Award*

- *2016 Australian Shipping and Maritime Industry Awards - Environmental Transport Awards*

  , Port drive and local road network upgrade- $110 million, Air quality monitoring programmes, provide habitat and physical buffers for native species-nest boxes, Weed Surveys, maintaining mangrove ecosystems in Moreton Bay, Mangrove health assessments programmes, Research on Coastal Seascapes for Commercial Fisheries Production, In 2014- Future Port Expansion Seawall Ecological Assessment, Following the RAMSAR convention to protect seabirds, also to protect seabirds, PBPL partnered with the Queensland Wader Study Group (QWSG), 2017 Shorebird Monitoring Report, provide habitat to migratory shorebirds under the Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA),

4. What are the community welfare programmes, initiatives or grants does PBPL contribute to?
   https://www.portbris.com.au/Community/Partnerships/
   Notes- as above in Q 2,

5. What does the company expect from such programmes?

   PBPL expect the company to link to PBPLs organizational values of safety, people, innovation, integrity and accountability. Provide a platform for PBPL to communicate its commitment to being socially and environmentally responsible and engage with its stakeholders such as customers, government, environment and community groups.

Note- to comply with the government regulations, to bring stakeholder, community and government output together

DREDGING DEPARTMENT

Participant's background information-*Michael Linde-* Environmental Advisor

Has the respondent been working in the firm both before and after privatisation?
Yes…………………………   No………No……………….

1. What are the ground improvement techniques that PBPL uses to speed up the consolidation of the dredged mud and deep deposits of soft clay which underlie the area?
   PBPL has trialed the use of a Mudmaster to speed up the drying process. The Mudmaster moves over the mud via the use of rotating scrolls, which turns the mud and speeds the drying process. Once the mud is dry the ponds are overlain with 2 of clean sand. Wick drains are then installed across the site to allow the dredged mud and in-situ soft clays to consolidate.

2. What are the issues needed to be addressed during the process?
   Management of tail water, large amounts of planning works prior to works starting, appropriate mitigation, acid sulphate soils, identifying, monitoring and managing potential environmental values as well as flora and fauna.

3. Does the company operate under an Environmental Management System? **Yes**

4. How is the EMS of PBPL certified?
   PBPL's EMS was externally certified to ISO14001 in May 2000. The system is audited for re-certification every three (3) years and surveillance audits are conducted annually.

5. What does PBPL environmental policy specify about the protection of environment?
   https://www.portbris.com.au/About/Stateernance/Business-Policies/

   Notes- Environment Policy

   "The Health & Safety, Environment and Quality Policies outline our commitment to minimising harm to persons, property, process and the environment, and to continuous improvement of our planning and practices"

Environmental- we will ensure we protect our environment by incorporating environmental considerations into all decision making. We will meet all our obligations and ensure continual improvement in our environmental performance by, at a minimum, adopting the following principles-

- *Develop measurable environmental objectives and targets, including prevention of pollution, through a risk-based approach to environmental management*
- *Conduct regular reviews of the company's environmental performance and implement improvements as required*
- *Keep up-to-date of trends in technology, regulations and community attitudes and adapt and innovate in response to a rapidly changing society, including planning for climate change*
- *Provide adequate resources, equipment and training for employees at all levels to fulfil their responsibilities in relation to the environment and their work practices*
- *Implement systems, standards and processes to enable all activities to be carried out with regard to our environmental responsibilities*
- *Report internally on all the company's environmental performance measured against environmental objectives and targets*
- *Strategically promote the outcome of selected environmental and sustainability initiatives and results of monitoring programs*

In practice-   Include environmental and climate change considerations in our decision-making and business planning

♣ *Assess and seek to eliminate or minimise the environmental impacts of all of our activities*

♣ *Identify and, where appropriate, implement opportunities for environmental improvement and enhancement of local biodiversity and ecosystems*

♣ *Identify and report to senior management and the Board environmental hazards, near misses, incidents and impacts, and corrective/preventative actions taken*

♣ *Ensure compliance with all applicable environmental laws, regulations, policies and procedures*

♣ *Maintain our ISO 14001 accreditation and associated environmental management systems*

♣ *Strive to use resources efficiently and sustainably, minimise waste and prevent pollution*

♣ *Monitor and protect our land and the surrounding environment from contamination*

♣ *Monitor our environmental performance*

♣ *Maintain emergency, fire protection and security systems and facilities to protect the environment*

For these we partner with people/ organisations-with appropriate skills and experience to carry out their work in a manner that is compatible with sound environmental performance and this policy

♣ *Engage and partner with relevant key stakeholders in relation to government policy, the company's activities, particularly in relation to significant proposed development projects, and in relation to broader environmental/sustainability initiatives that affect the port's business*

♣ *Employees, contractors and visitors who work at or make use of company facilities, have an obligation to operate in a manner that fulfils the organisation's environmental obligations and requirements*

6. Does PBPL conduct an Environmentally Relevant Activity (ERA) which requires an Environmental Authority under the Queensland Environmental Protection Act 1994? **Yes**
7. How do you manage dredging and dredged material?
- **Pre-dredging survey to determine where dredging is required to allow continued safe access to the Port**
- **Sediment sampling and analysis of sediment to be dredged to determine suitability for offshore disposal – sediment that meets the requirements of the NAGD is placed at the Mud Island Dredged Material Placement Area, unless it is required for beneficial reuse PBPL's reclamation area. All sand dredged from the shipping channels is beneficially reused at the reclamation areas.**
- **TSHD Brisbane or the Ken Harvey, both dredging vessels operated by PBPL, are used to conduct dredging under approvals issued by various regulatory bodies and are operated in accordance with vessel and site-specific environmental management plans.**
- **The reclamation areas are also managed in accordance approvals issued by regulatory bodies and an approved environmental management plan.**

8. Are emissions to air, water and soil within the restrictions set locally and internationally? **PBPL Monitoring air quality 24/7 from multiple areas around the port. We compare our data against the NEPM guidelines to ensure compliance. https://www.portbris.com.au/Environment/Air-Quality/**

   Note- Due to various operations, dust issue is forefront of all issues, Dust is a component of particulate matter (PM) in the air. PM is characterised by particle size and composition. The particle size ranges from 0.005μm to 100μm and the particles are typically categorised into <u>two size classes</u>. (μm- means micrometer or micron),

<u>PM10 coarse particulate matter</u> (10μm – 2.5μm in aerodynamic diameter)

Bulk materials handled on bare surfaces can result in dust levels within the PM10 range. PM10 particles are derived from suspension and re-suspension of dust, soil and other material from roads, farming, mining, and dust storms.

<u>PM2.5 fine particulate matter</u> (<2.5 – 0.1μm in aerodynamic diameter)

This is derived from combustion processes (petrol and diesel vehicle, wood burning, coal burning for power etc.) and industrial activities (such as cement plants, paper mills, steel mills)

POB-PBPL- conducts a few air quality monitoring programmes from 1999 to 2017

1. *Long-term programme from 2003-2011- Results demonstrate that the dust deposition measured at the port is generally within the <u>Air Quality National Environmental Protection Measure (NEPM) guideline values</u>*
2. *Road-side monitoring projects-To check the impact of road transport corridors on air quality- from 2006-2008-Results show no indication of a prominent source of fine dust particles from PBPL activities*
3. *Real-time monitoring project on 2013- at three locations within the port precinct, PM10 and PM2.5 measurements were collected through an e-sampler and a 24-hour average was calculated for each site to compare against the NEPM guidelines to ensure compliance*

9. Have emissions, changed since privatisation? Why? **Yes, we have seen reductions in emissions amongst many of our key measurables. We have in place a Target Zero program that is focusing on reducing our resource use and emissions to zero by the year 2030. We have a number of initiatives already in place including renewable energy, fuel management and upgrades to our dredging fleet to improve fuel economy and reduce emissions.**

10. What are the arrangements you have taken to ensure that development occurs sustainably? **Technical guidelines apply to all developments - https://www.portbris.com.au/Property/Land-Use-Planning/**

Note- PBPL manages developments at the precinct through the Brisbane Port Land Use Plan (LUP) 2015 which complies with State legislation requirements, PBPL technical guidelines & infrastructure plans. LUP has been developed and reviewed with community inputs and stakeholder expectations and then approved by the State in order to assure that PBPL development activities are sustainable and responsive to the legislative changes and industry suitability

11. How do you comply with the key components of GBRMPA (Great Barrier Reef Marine Park Authority) requirements? **We do not work with GBRMPA as the Port of Brisbane is not within the Great Barrier Reef area**

12. How do you work with GBRMPA's industry specific position papers (about shipping and ports) and guidelines? **We do not work with GBRMPA as the Port of Brisbane is not within the Great Barrier Reef area**

13. What steps you have taken to improve management of dredge material disposal?

UQ partnership including project to investigate sediment transport pathways in the Moreton Bay, including the Mud Island Dredged Material Placement Area. UQ partnership also includes projects looking into dust suppression in reclamation areas.

14. What shipping safety initiatives you have taken? **Safety is in the forefront of everyone's minds at the port 24/7. Our most recent shipping safety initiative is our non-linear, channel optimization simulator (NCOS)**

Notes- NCOS- Since August 2017- PBPL has worked with DHI and FORCE Technology to use the Port's 90km shipping channel as a 'living laboratory' to develop the worlds' most advanced under keel clearance technology – NCOS Online (Nonlinear Channel Optimisation Simulator system).

NCOS Online is world-leading software that provides a seven-day detailed forecast of a vessel's under keel clearances (UKC) and environmental conditions with a web interface, allowing for dynamic vessel scheduling. (Under-keel clearance (UKC) means the minimum clearance available between the deepest point on the vessel and the bottom in still water.

Its introduction means PBPL and key stakeholders including the Harbour Master can more safely and accurately determine the UKC required to cater for larger vessels, providing safety and flexibility benefits for customers.
("Its introduction means the port can more safely and accurately determine the UKC required to cater for larger vessels, providing safety and flexibility benefits for customers and reducing the need for additional, expensive dredging).

NCOS Online is the only vessel UKC forecast system in the world to have the same high level of accuracy as a Full Mission Bridge Ship Simulator. It combines state-of-the-art technology with decades of operational port experience and leverages the ability to do quick field trials to ensure an accurate and reliable operational solution.

By incorporating forecast and real time environmental data, vessel specifications and transit information, NCOS Online allows vessels of all classes to maximise its cargo and sailing windows while maintaining optimal safety. It is compatible with any vessel design and size.

Benefits- Since NCOS went 'live' at the Port of Brisbane in August 2017, the number of deep drafted bulk carriers above 14.0m calling at the Port draft has tripled and deep drafted containers above 13.0m has more than doubled (as at May 2018)

Operational since 1 August 1 2017, NCOS has already helped Port of Brisbane welcome the longest-ever container ship to visit Queensland, the 9500TEU, 347m long Susan Maersk.

Awards- 1. Smart Infrastructure Award – Infrastructure Partnerships Australia 2018

2. Innovative Support Services Award – Dredging and Port Construction Innovation Awards (DPC)-2017 (London)

3. Port of Brisbane was named the 2017 Australian Port of the Year.

FINANCIAL DEPARTMENT

Participant's background information- *Jessica Rudd-*Infrastructure Coordinator

Has the respondent been working in the firm both before and after privatisation?
Yes………………………… No………No……………….

1. How do you define the company accounting systems in keeping and managing accounts and financial data? **As same as to most sophisticated transport company accounting systems. Did not mention which software or any accounting systems they use.**

2. What changes in the financial department/ systems/ practices/ strategies have occurred after the privatisation – **Did not answer the question**

3. How do you facilitate trade and economic growth of PBPL while protecting, enhancing and sustaining the environment people and the community? **All of our decisions are made with environmental, social and economic considerations. All our development assessments elements of sustainability in construction and operation. PBPL have an extensive list of monitoring programs to manage the surrounding environment and have numerous community programs to ensure the local communities are involved with PBPL decisions and developments.**

Notes- Offsite storm water management projects- partnered with the Queensland government-(Department of Environment and Heritage Protection, Department of Infrastructure, Local Government and Planning, Department of Science, Information Technology and Innovation), Planfuture, Alluvium, BMT WBM, Griffith University (Australian Rivers Institute), Healthy Waterways and Catchments, and Mulgowie Farming Company, Lockyer Valley Regional Council-In stabilising and rehabilitating eroded creek bank along Laidley Creek –

Awards won

- *2016 Healthy Waterways Awards - Sustainable Water Management Award and the Minister's Grand Prize*

- *2016 Australian Engineering Excellence Awards - Queensland Environmental Excellence Award*

- *2016 Australian Shipping and Maritime Industry Awards - Environmental Transport Awards*

  , Port drive and local road network upgrade- $110 million, Air quality monitoring programmes, provide habitat and physical buffers for native species-nest boxes, Weed Surveys, maintaining mangrove ecosystems in Moreton Bay, Mangrove health assessments programmes, Research on Coastal Seascapes for Commercial Fisheries Production, In 2014- Future Port Expansion Seawall Ecological Assessment, Following the RAMSAR convention to protect seabirds, also to protect seabirds, PBPL partnered with the Queensland Wader Study Group (QWSG), 2017 Shorebird Monitoring Report, provide habitat to migratory shorebirds under the Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA),

4. Is PBPL an equal employment opportunity provider? How is this managed?
   Yes, through HR policies.

5. What is the demography of male and female employees (direct) of PBPL?
   Apologies, we don't have access to earlier data.

   2005 -, 2006 -, 2007 -, 2008 -, 2009 -, 2010 -, 2012-207, 2013-205,
   2014-184(49F,142M= 191), 2015-186, (49F, 142M= 191) 2016-184 (53F,158M=211)
   2017- 187
   Notes- As shown in brackets according to the final accounts, PBPL had sent to the Auditor General shows different numbers of employees.

7. If there are any differences in employment over the years, what could be the reason for it? Any labour retrenchment, compensation after privatisation? **No**

8. How do you monitor and measure the key areas of PBPL's operations related to the environment?
Environment index (measure and report all key environmental metrics)

Notes- Land Use Plan (LUP), The Construction Environmental Management Plan (CEMP), The Operational Environmental Management Plan (OEMP), The Healthy Waterways Erosion and

Sediment Control toolkit, Stormwater management design complies with the State Planning Policy State interest - Water Quality (SPP), The Offsite Stormwater Quality Investment Payment,

The sites should be managed to achieve the requirements of the Department of Environment and Heritage Protection (DEHP) Environmental Protection (Air) Policy 2008 as a minimum

INFRASTRUCTURE AND ENVIRONMENTAL DEPARTMENT

Participant's background information-*Jessica Rudd* (Infrastructure & Environmental Coordinator & Craig Wilson- Environmental Manager

Has the respondent been working in the firm both before and after privatisation?

Yes…………………………   No…No…………………..

1. How do you facilitate trade and economic growth of PBPL while protecting, enhancing and sustaining the environment, people and the community?
   All of our decisions are made with environmental, social and economic considerations. All our development assessments elements of sustainability in construction and operation. PBPL have an extensive list of monitoring programs to manage the surrounding environment and have numerous community programs to ensure the local communities are involved with PBPL decisions and developments.

2. What changes to the ecological footprint value each year from 2006 to 2016? **No data available**
3. How do you contribute to sustainable habitats and a green built environment? **Our Land Use Plan requires incorporation of principles of sustainability.**

Note-check the answer for the question number 8-environmental index,

FURTHER- the lands used by PBPL for the purposes such as industrial, transport operations, marine infrastructure, retail/commercial, and environmental buffers are overseen and managed by PBPL under Land Use Plan which represent the inputs of the community, stakeholders and the State regulations.

The plan is approved and gazetted in accordance with the requirements of the Transport Infrastructure Act 1994 (TIA).

LUP outlines key land uses, trade projections and future infrastructure requirements, dividing port land into specific development precincts, This includes a few 'Codes' - which specify the development requirements for each development.

Also includes a 'Contributions Schedule' and 'Priority Infrastructure Interface Plan' - which specify infrastructure charges and a range of plans/figures/drawings which help to spatially communicate the development vision for core port lands.

The LUP has 5 development "use" codes and three development "standards" codes

5 <u>use</u> codes are applied to land use activities whereas three <u>standards</u> codes are used as technical aspects of the individual development proposals.

5 Development use code-

<u>Port Development Codes</u>-to decide whether the development is 'core port infrastructure' or 'port related development - : wharves, loading and unloading facilities, terminals, warehouses or freight depots, motor vehicle processing activities, storage and distribution activities, special industry and general warehouses activities

<u>Commercial Code</u>- to identifies the specific nature of commercial development on core port lands and their particular architectural and urban design requirements- building design and articulation requirements are in accordance with port's central and commercial use purposes

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Land Preparation Code- to ensure any land preparation works achieve a satisfactory environmental performance standard and they are carried out safely and efficiently around operational port activities- pre-loading, surcharging, transitional movements of sand, mud and other quarry material and any relevant and supporting infrastructure i.e. pipelines, gantries, booster units and conduits

Reconfiguration Code- to regulate relevant reconfigurations of core port lands protecting access and ensuring connection to relevant services for each parcel of land resulting from reconfiguration,

Three land use types-

Port industry- terminals, Wharves/loading and unloading areas, Transport infrastructure, Dredge material rehandling, Port operational and support services

 Commercial- Port Central, Commercial uses and ancillary services

Environment- Conservation/buffers, investigations, and open spaces

4. What are the carbon footprint values since privatisation? **No data to provide**

Note-a sub question asked. 'Do you record carbon Footprint figures?' -**Yes, but data are unavailable at the moment.**

5.

Issue	Measurement	Item	Yes	No	How
GHG	Measurement, reporting & verification	Do you measure your overall CO_2 measurements?	x		Through estimation techniques (NPI, NGERS)
		Do you monitor and reduce your non-CO_2 and GHG emissions?			*Note*
		Methane (CH_4)		x	*N_2O emission by Rail transport was the highest % (50%) according to the 2010 survey*
		Nitrous Oxide (N_2O)		**x**	
		Hydrofluorocarbons (HFC_S)		x	
		Perfluorocarbons (PFC_S)		x	
		Sulfur Hexafluoride (SF_6)		x	
		Do you disclose your CO_2 emissions and/ or communicate your CO_2 emissions reduction initiatives? Please describe		x	
		Do you obtain third party verification of CO_2 emissions? If yes, provide the third-party verification firm.		x	
	Management systems	Do you have CO_2 emission reduction targets? If yes, what are they?	x		Target Zero – Zero landside emissions by 2030
		Is there a designated committee or individual responsible for CO_2 emission reduction?	x		

Category		Issue	Yes	No
		Do you have an action plan for carbon/energy management?	x	
		Does the committee/ person responsible for meeting the goals have a clear incentive to do so (e.g. KPI)?	x	
	Energy Efficiency	Have you adopted any energy-effective design features for your buildings? Please describe.	x	Solar on Ops base building, BMT buildings and PC1. Greenstar rated buildings.
		Have you adopted any technology or measures to improve the energy?	x	

6.

Category	Issue	Yes	No
GHG and Energy	Technology or measure for reefer energy efficiency		x
	Technology to improve truck and cargo handling equipment efficiency		x
	Renewable energy sources	x	
	Shore-side power available for ships		x
	Measures to minimise train/truck/ship waiting times		x
	Policies or incentives for carriers to reduce emissions		x
	What are the mode splits for onward transfer of freight	x	
SO_2	Do you use low-sulfur fuel in equipment	x	
NO_2	Any emission control technology or measures How often? What are they Do you have engine replacement policy or plan		x
Waste	Waste reduction targets	x	
	Waste management policy	x	
	Periodical measurement against targets	x	
	Public disclosure of performance		x
	Facilities for ship waste disposal	x	
Water	Policies to manage wastewater		x
	Do you have oil and water separator?		x
	Policies on storm water management	X	
	Approach to managing toxic spills	X	
	Water consumption reduction targets	x	
	Water conservation technologies	x	
	Periodic measurement of wastewater management and water conservation		x

	Public disclosure of performance		x
Chemicals	Chemicals management plan	x	
	Chemical use reduction targets		x
	Employee training on handling, disposal and emergencies	x	
Environmental Management System	Environmental policies	x	
	PIs there a process for identifying top issues	x	
	Top five issues	x	
	Environmental targets	x	
	Responsible committee or designated individual	x	
	Internal training	x	
	ISO 14001	x	
	Third-party verification of environmental impacts	x	
	Green procurement policies		
Biodiversity	Process to manage and track impacts	x	
	Policies or measures to minimise impacts	x	
Community	Track and manage noise	x	
	Technology or measures to reduce noise pollution	x	
	Track and manage light	x	
	Technology or measures to reduce light pollution	x	
	Proactive energy with local community	x	
	Top community issues	x	

7. What storm water treatment systems do you use? **Water sensitive urban design (bio retention basins, litter baskets etc.) and our offsite storm water procedure (more information found on our website https://www.portbris.com.au/Environment/Water-Quality/)**

Note- check previous answers

8. What are the arrangements you have taken to ensure that development occurs sustainably and does not impact on the environment? **PBPL undertakes a development approval process, within this process there are Construction Environmental Management Plans and Operational Environmental Management Plans that need approval before development works can begin.**

Notes- check the answer above for Q 8 and the answer for Q 3 (Infrastructure and Environmental Department)

Land Use Policy-LUP

9. How do you comply with its key components of GBRMPA (Great Barrier Reef Marine Park Authority) requirements? **N/A - We do not work with GBRMPA as the Port of Brisbane is not within the Great Barrier Reef area**

10. How do you work with GBRMPA's industry specific position papers (about shipping and ports) and guidelines? **As above**

11. What steps you have taken to improve management of dredge material disposal? **UQ partnership including project to investigate sediment transport pathways in the Moreton Bay, including the Mud Island Dredged Material Placement Area. UQ partnership also includes projects looking into dust suppression in reclamation areas.**

Notes- activities upstream of the Port to help reduce sediment run off into the Brisbane River and Moreton Bay such as Offsite Stormwater Project,

In operation of a fleet of vessels to conduct these essential operations such as TSHD Brisbane, Ken Harvey; a clamshell dredger, The Sea Lion/Alan M; a bed levelling spread

Dredging is highly regulated and is subject to strict State and Commonwealth operational and environmental legislations

12. What are the shipping safety initiatives you have taken? **Safety is in the forefront of everyone's minds at the port 24/7. Our most recent shipping safety initiative is our non-linear, channel optimization simulator (NCOS)**

Note- non-linear, channel optimization simulator (NCOS) Check the answer for Q 14 <u>Dredging Department</u>

Compulsory pilotage for every ship that is 50m LOA or more, or any ship if directed by the Harbour Master) (LOA Length overall (LOA, o/a, o.a. or oa) is the maximum length of a vessel's hull measured parallel to the waterline. This length is important while docking the ship)

Pilotage is done by a privately-operated company, Brisbane Marine Pilots Pty Ltd- Brisbane Marine Pilots maintains a 24-hour listening watch on VHF channel 12,

ETA at the boarding ground should be confirmed at least two hours before arrival by calling 'Brisbane Harbour' on VHF channel 12-The estimated time of arrival (ETA) is the time when a ship is expected to arrive at the port.

24-hours in service of THE GREAT BARRIER REEF AND TORRES STRAIT VESSEL TRAFFIC SERVICE (REEFVTS) to prevent collisions or incidents,

<u>LAND RECLAMATION</u>

Participant's background information- *Michael Linde*-Environmental Advisor

Has the respondent been working in the firm both before and after privatisation?

Yes……………………………No.……No………………….

1. How do you facilitate trade and economic growth of PBPL while protecting, enhancing and sustaining the environment, people and the community? **All of our decisions are made with environmental, social and economic considerations. All our development assessments elements of sustainability in construction and operation. PBPL have an extensive list of monitoring programs to manage the surrounding environment and have numerous community programs to ensure the local communities are involved with PBPL decisions and developments.**

Notes- Check below-Q3

2. How do you adhere to environmental protection with Future Port Expansion? **We operate under an Environmental Management Plan for our reclamation area.**

    Note-Check below-Q3

3. What are the recent Port Development projects? (Or ongoing Port Development projects)

    Brisbane International Cruise Terminal

    Port Drive upgrade

    Future Port Expansion (FPE) area

    Offsite storm water management projects

    NCOS Online (Nonlinear Channel Optimisation Simulator system)

Notes- @ Brisbane International Cruise Terminal – south-east Queensland's first mega cruise ship terminal is being constructed at Luggage Point

- *PBPL received government approval in October 2017*
- *On completion, the facility will be able to cater to cruise vessels of all sizes including mega cruise ships – vessels longer than 270 metres*
- *It is important to Queensland because, it is the 'missing link' in Brisbane's tourism infrastructure that is needed to ensure the State can attract and support the world's largest cruise ships, Also, internationally, vessels are increasing in size and by 2020 it is estimated that around 60% of the cruise vessels calling in Australia will be mega cruise ships. Currently, there is no dedicated cruise facility in south-east Queensland able to accommodate mega cruise ships – these vessels currently call at Brisbane's main cargo port.*

@ Port Drive upgrade- a $110 million upgrade to Port Drive and the local road network, delivering safer and more efficient port roads. This will ensure the PBPL continues to meet the needs of industry and customers as trade grows

- *upgrades will include the duplication of Port Drive, the construction of a four-lane overpass over the Port Drive and Kite Street intersection,*
- *upgrades to the Tanker Street/Osprey Drive road network as well as the duplication of Lucinda Drive Bridge on Fisherman Islands*
- *benefits for the port and local community- Safer and more direct access to the Whyte Island boat ramp- A separated shared path from the existing Port of Brisbane Motorway cycle path through to Port Gate, - Improved access to the Moreton Island ferry terminal*

@ Future Port Expansion (FPE) area – A 230 hectare of Future Port Expansion (FPE) area on Fisherman Islands will provide new port land and increased quay line. It is one of the largest reclamation activities in the southern hemisphere, equivalent in size to 200 football grounds. FPE activities are undertaken in accordance with PBPL's Land Use Plan (LUP), All work is completed under strict environmental management plans that include regular water quality and dust monitoring

This project includes geotechnically engineered sea wall and divided into a number of paddocks which are being progressively reclaimed over the long-term. Typically, material is progressively placed in the FPE and followed by ground improvement works to create land.

A range of innovative techniques in place. For instance, scroll technology to improve the strength of reclaimed material and sand capping without having to place equipment directly on a reclaimed paddock (Scroll Technology- spiral compressor to compress reclaimed material and sand capping in order to minimise the risks of working on soft reclaimed ground and improve the efficiency of reclamation and ground improvement activities.

@ Offsite storm water management projects- in the Lockyer Valley

In 2016, PBPL provided $500,000 to fund the pilot project and following its success, committed an additional $500,000 to continue the project, taking our total commitment to $1 million over three years.

We worked closely with a range of partners to implement the offsite storm water project including the Queensland Government, Healthy Land and Water, and Mulgowie Farming Company.

In total, the work has rehabilitated approximately 950m of degraded creek bank along Laidley Creek – adjoining some of the region's most valuable horticultural land. It also involved re-planting approximately 4000 native trees and grasses and constructing two cross-bed grade control structures.

@ NCOS Online (Nonlinear Channel Optimisation Simulator system)

NCOS Online is world-leading software that provides a seven-day detailed forecast of a vessel's under keel clearances (UKC) and environmental conditions with a web interface, allowing for dynamic vessel scheduling. PBPL & the Harbour Master now can more safely and accurately determine the UKC required to cater for larger vessels, providing safety and flexibility benefits for customers.

NCOS Online is the only vessel UKC forecast system in the world to have the same high level of accuracy as a Full Mission Bridge Ship Simulator. It combines state-of-the-art technology with decades of operational port experience and leverages the ability to do quick field trials to ensure an accurate and reliable operational solution.

By incorporating forecast and real time environmental data, vessel specifications and transit information, NCOS Online allows vessels of all classes to maximise its cargo and sailing windows while maintaining optimal safety. It is compatible with any vessel design and size.

The software has an easy-to-use interface, tailored to accommodate the specific requirements of the multiple user groups including the Harbour Master, VTS, pilots and port operations.

In August 2017, the number of deep drafted bulk carriers above 14.0m calling at the Port draft has tripled and deep drafted containers above 13.0m has more than doubled (as at May 2018) due to the use of NCOS. <u>Smart Infrastructure Award – Infrastructure Partnerships Australia 2018, Innovative Support Services Awdard – Dredging and Port Construction Innovation Awards 2017 (London)</u>

4. Is the use of natural resources by PBPL reasonable compared to other ports in Australia?

    We haven't done any benchmarking.

5. Has the use of natural resources changed? **No.**

6. Is the land reclamation process allowing a reasonable bio-diversity related to the marine flora and fauna? **Yes, since the development of our reclamation area sea grass has expanded by 400ha, for more information please visit: https://www.portbris.com.au/Environment/Marine-Ecology/ our website also has a list of our monitoring reports.**

    Notes- mangrove health- The most recent mangrove health monitoring was conducted in 2017-

    2016 Seagrass Monitoring Program (SMP)- results-
    The Port of Brisbane Seagrass Monitoring Program (SMP) was developed in 2002 to monitor the effects of FPE construction and operation.

    The Fisherman Islands area supports seagrass meadows of high biodiversity value. PBPL undertakes routine monitoring of seagrass meadows adjacent to the port at Fisherman Islands, Manly and Cleveland. SMP intends to provide port management with information on the condition and status of seagrass meadows, and to identify whether there is any evidence that port operations are affecting seagrass meadows.

The study involves

• A review of previous seagrass monitoring assessments to identify long-term changes in seagrass meadow extent • Field surveys to describe patterns in seagrass meadow distribution and assemblage structure along depth gradients, and patterns of change in time and space • Mapping of seagrass meadow distribution and extent based on field surveys and interpretation of satellite and aerial imagery

7. Has the biodiversity changed? **As above**

Note- key findings of the 2016 SMP survey

*Zostera muelleri formed dense meadows in the intertidal and shallow subtidal waters
*Halophila ovalis, H. spinulosa, H. decipiens and/or Halodule uninervis formed sparse mono-specific and
mixed meadows in subtidal waters at all sites
*Seagrass depth range (SDR) for Z. muelleri (a function of water quality and availability of suitable substrates) was higher at Fisherman Islands (-1.65 and -2.43 m) and Manly (-2.12 and -2.16 m) than Cleveland (-0.74 and -1.02 m)

*Since the commencement of the SMP, seagrass meadows at Manly have displayed the largest losses
and gains in extent, most likely in response to cyclic changes in water quality conditions
*The distribution of Halophila spinulosa declined in 2016 at the Manly and Cleveland control sites,
whereas the distribution of this species expanded over time at Fisherman Islands

8. Has the land reclamation process identified potential risks, benefits or impacts?

Potential impact	Yes	No	Remarks
Release of pollutants to waterways	x		
Construction equipment noise		x	
Dust generation	x		Undertaken research with UQ to minimize the dust
Storage of hazardous goods (fuel, Chemicals		x	
Disposal of regulated waste (fuel, oil, chemicals & sewage)		x	
Rubbish, general waste and site clean up		x	
Impacts upon flora and fauna		x	
Other activities which may impact on the environment	x		

9. Has PBPL identified those risks or areas of activities that have or can have impact/s on the environment? **Yes**

10. How often has PBPL done a landside emissions survey after 2010? **None**

Notes- The last landside emission was before the privatisation-2010

11. What is the project scope of the last survey? **Landside and waterside emissions in 2010**
12. What are the key findings of the survey?

https://www.portbris.com.au/getmedia/cbac55e2-d81e-4141-8231-64592a207708/2010-06-30-FINAL-REPORT-Landside-Emissions-Inventory-for-the-Port-of-Brisbane-Precinct-2007-2008-REPORT.pdf

Notes- The findings and recommendations of the report

* new and updated emission estimation methods for different transport modes to the Port area

For Cargo Handling Equipment-CHE

*Needed further examine and analysis of Cargo Handling Equipment activity (CHE) data in the port area to verify emission standard equivalencies of the CHE equipment used in Australia

* Port needed to review CHE emission factor models in Europe, Japan and the US

For Trucks

*To widen the data pool including the vehicle registration information to analyse more accurately

*Driver Surveys

*Needs more detailed and accurate calculation of truck emissions

For Rails

*Thorough examination on the contribution to N_2O emission (Nitrous Oxide) from Rail as the value is very high (50%)

* To perform a review of available overseas rail emission factor models

13. What is the largest (main) landside source of emissions? **Container handling equipment.**

Note- According to the 2010 survey, Rail transport is the main landside source of emission which accounted 50%

14. How do you work with the Q-CAS (The Queensland Climate Adaptation Strategy)? **We do not work with the Queensland Climate Adaptation Strategy**

15. Since when PBPL a Q-CAS Partners? **As above**

16. What are the arrangements you have taken to ensure that development occurs sustainably and does not impact unacceptably on matters of national environmental significance? **We have an extensive list of monitoring programs (https://www.portbris.com.au/Environment/) we operate under environmental management plans. Before any development occurs, there is a significant amount of planning involved that identified any impacts on the surrounding environment and how to mitigate the impacts.**

*Notes- **Air Quality-Monitoring programmes**-*

Long Term-2003-2011- Air quality values compared against the Air Quality National Environmental Protection Measure (NEPM) guideline values

Roadside monitoring programme-2006-2008

Real Time monitoring programme- 2013-results compared against the National Environmental Protection Measure (NEPM) guideline values

Nest Boxes Programme-

Provide habitat and physical buffers for native species- installed a number of nest boxes in two buffer areas, along Pritchard Street and Wynnum North Road

PORT OPERATIONS & POLLUTION

Participant's background information- *Craig Wilson-*Environmental Manager

Has the respondent been working in the firm both before and after privatisation?

Yes…………………………   No…No…………………….

1. What do you understand about the magnitude and source of emissions? **Good understanding. Undertaken both Landside and Waterside Emissions Inventory and air quality modelling**.

2. What emissions are linked with port operations? **Various gas and particulate emissions.**

3. How do you prioritise future emission reduction measures? **Through our management planning process.**

4. What are the trends of port emissions over time (between 2006 to 2016)? **General decrease.**

5. When was the last time PBPL did an emission survey? **2010**

    Notes- before privatisation- No survey has been done after privatisation

6. According to the Emission survey/s (If there are more surveys than one, then figures yearly) **Non**

7. How do Ocean-going vessels account for the waterside fuel use and emissions? **Significant**

8. How do dredgers account for the waterside fuel use and emissions?
    Fuel usage is tracked via vessel logs and fuel purchasing records – emissions are reported via NGERS.

9. How do tugs account for the waterside fuel use and emissions? **N/A**

10. Do Container vessels account for the waterside fuel use and emissions? **Yes**

11. If yes, then how? (annual %) **Not specifically know (shipping is counted as a whole)**

12. What are the steps that have been taken to monitor Cruise ships waterside fuel use and emissions? **N/A**

13. How do Tankers contribute to waterside fuel use and emissions? **N/A**

14. What is the dominant emission source in the port precinct (since 2006 to 2016)? **Commercial shipping.**

15. What is the Total Energy Consumption of Gigajoule each year within the precinct? (since 2005 to 2017)

**2005-265556,   2006-263158,   2007- 262570,   2008 -258849,   2009 - 222208,
2010 – 198708,   2012 – 181321, 2013 – 148143,   2014 – 151430,   2015–152483,
2016 – 185028,   2017-174837**

16. How many tonnes of CO_2 released each year within the precinct? (since 2005 to 2017)

**2005- 17025,   2006 – 16951,   2007 – 18752,   2008 – 21490,   2009 – 18038,
2010 – 15514,   2012 -13725,   2013 – 11516,   2014- 11504,   2015 – 11565,
2016 – 13604,   2017-12851**

17. What is the largest landside source of emissions?
    Non-road equipment, including cargo and bulk handling equipment

18. How do you balance environmental responsibilities with the trade impacts associated with the port? **Through our EMS.**
19. Are you aware of The Queensland Climate Adaptation Directions Statement? **Yes**

20. *If yes, do you follow its directions? and how?* **Incorporate principles into our management and planning -** *Note-Already answered as they do not work with the Q-CAS*

APPENDIX 2- Q-Q PLOTS FOR HOMOGENEITY OF VARIANCES

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Normal Q-Q plot 1 of ROA$_1$
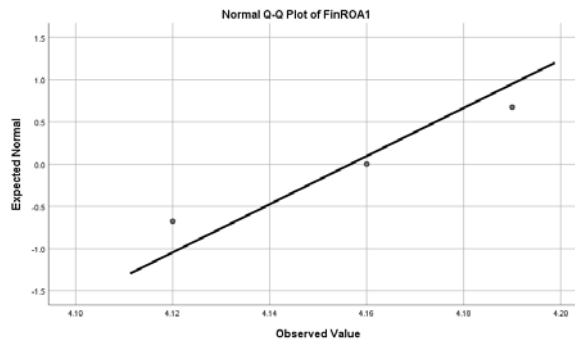
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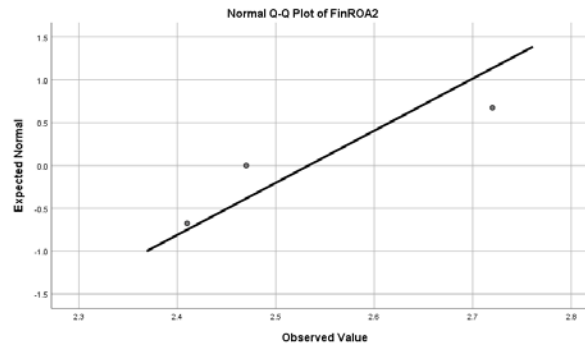
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Normal Q-Q plot 3 of ROE_1

Normal Q-Q Plot of FinROE1
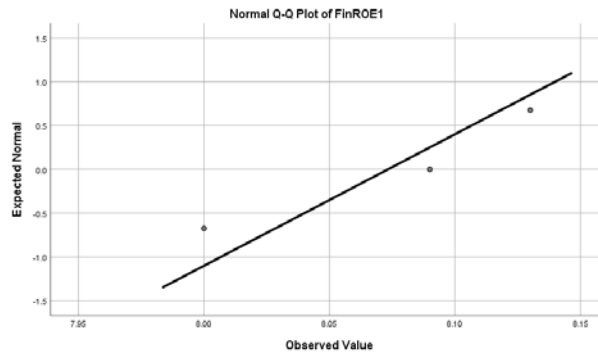
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Normal Q-Q plots 4 of ROE_2

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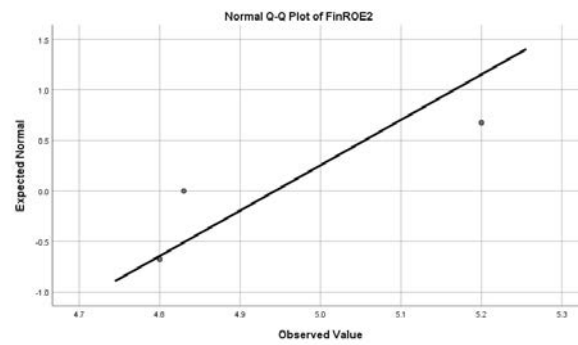
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Normal Q-Q plot 5 of DTA

Normal Q-Q Plot of FinDTA
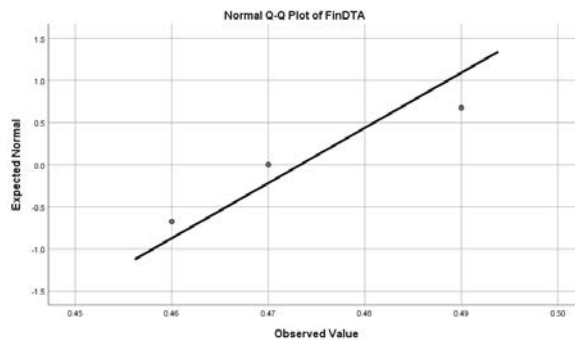
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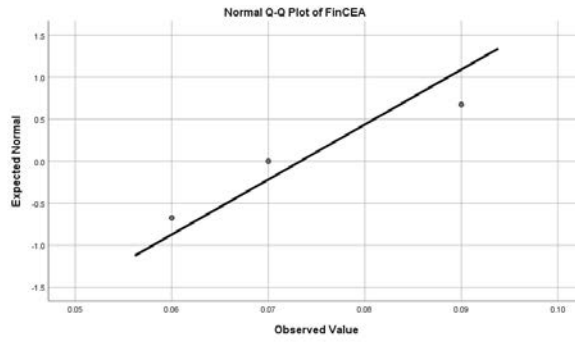
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Normal Q-Q plot 7 of TE

Normal Q-Q Plot of FinTE
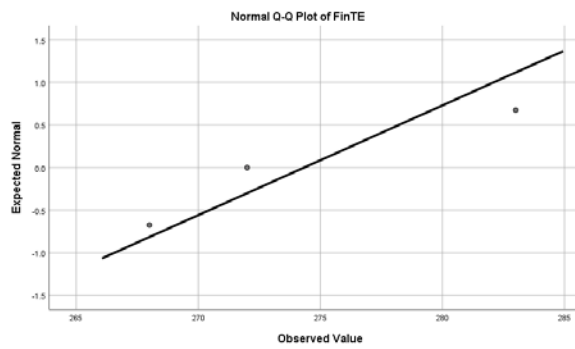
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Normal Q-Q plot 8 of TEUs

Normal Q-Q Plot of FinTUEs

151
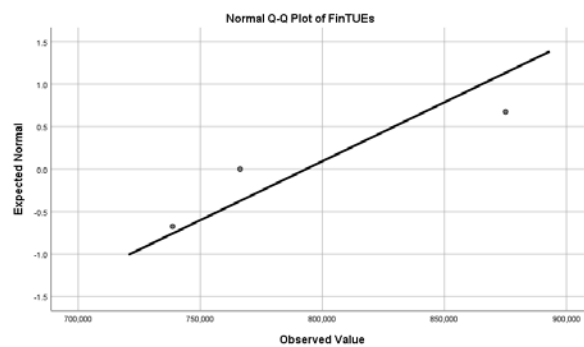
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Normal Q-Q plot 9 of Tonnes

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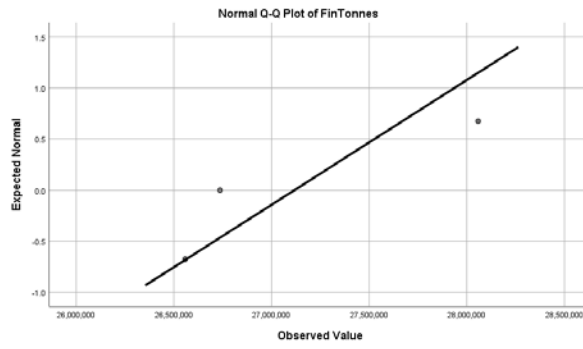
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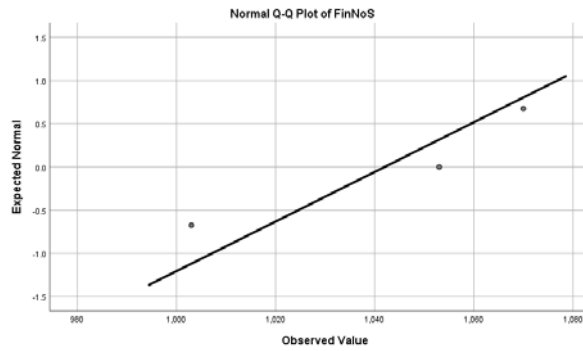
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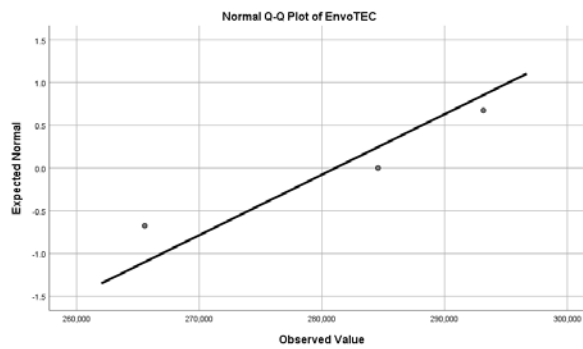
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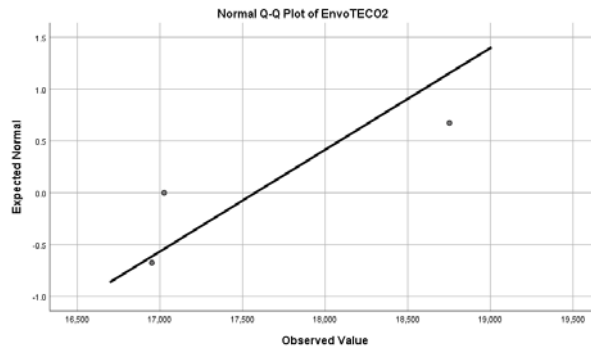
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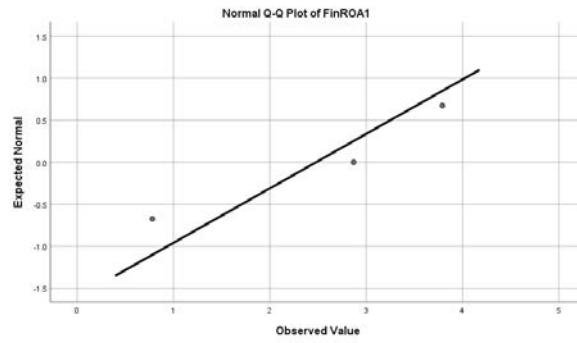
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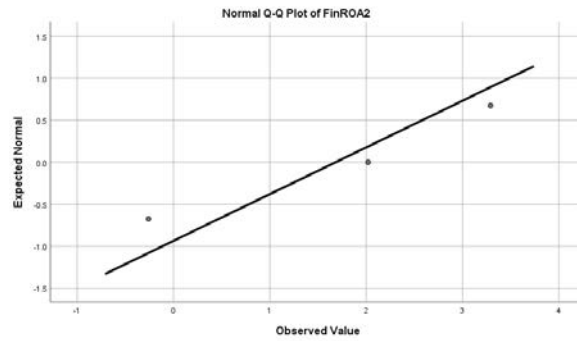
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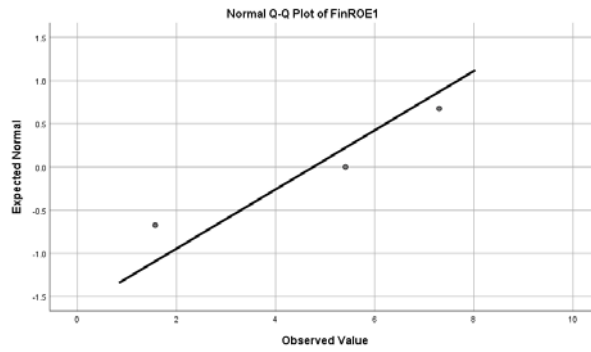
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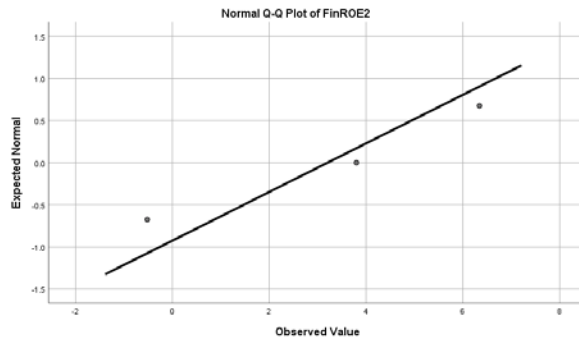
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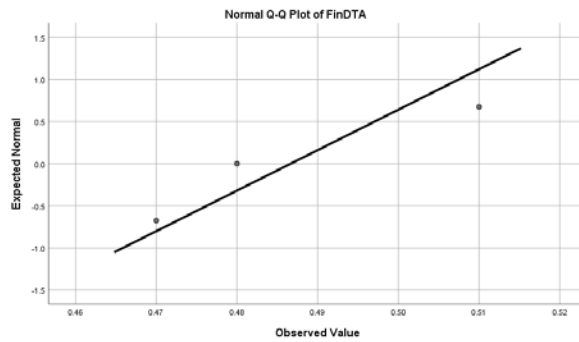
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Normal Q-Q plot 18 of CEA

Normal Q-Q Plot of FinCEA
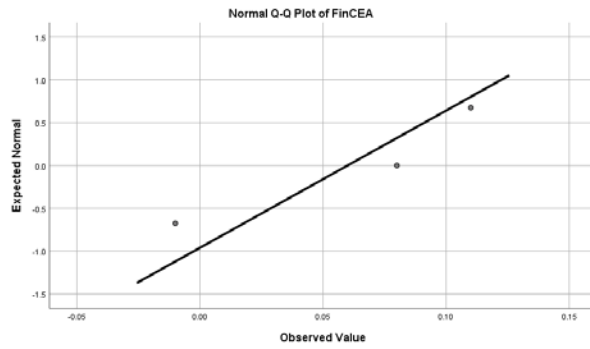
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Normal Q-Q plot 19 of TE

Normal Q-Q Plot of FinTE
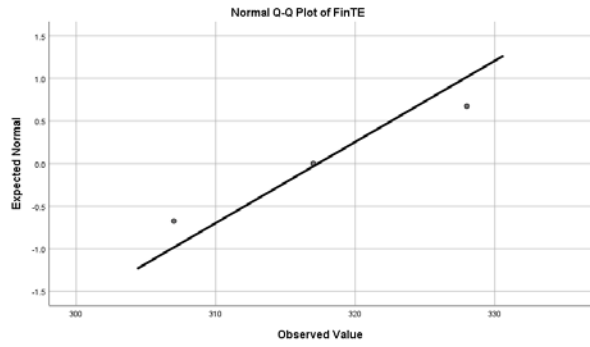
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Normal Q-Q plot 20 of TEUs

Normal Q-Q Plot of FinTUEs
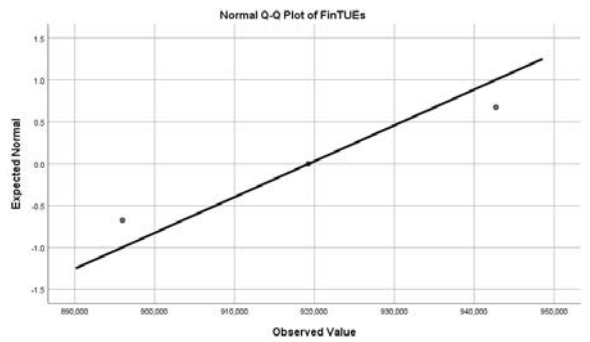
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Normal Q-Q plot 21 of Tonnes

Normal Q-Q Plot of FinTonnes
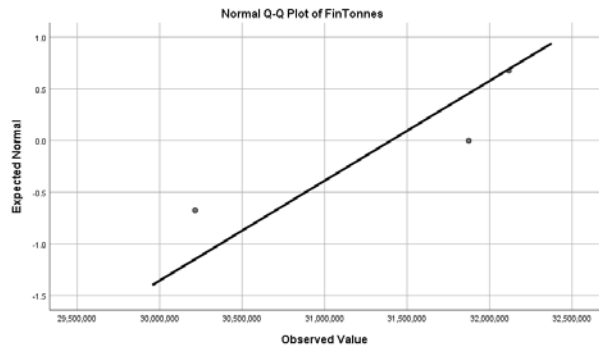
Ownership=State-08/09/10
Normal Q-Q plot 22 of NoS

Normal Q-Q Plot of FinNoS
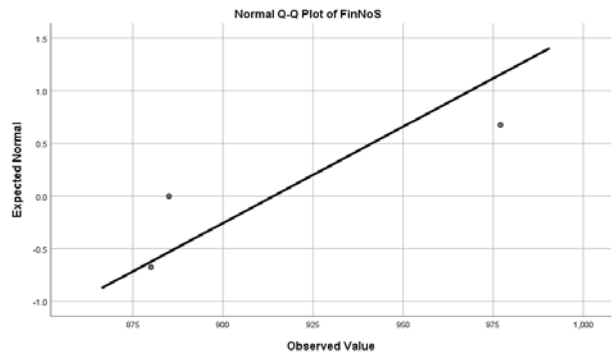
Ownership=State-08/09/10
Normal Q-Q plot 23 of TEC

Normal Q-Q Plot of EnvoTEC
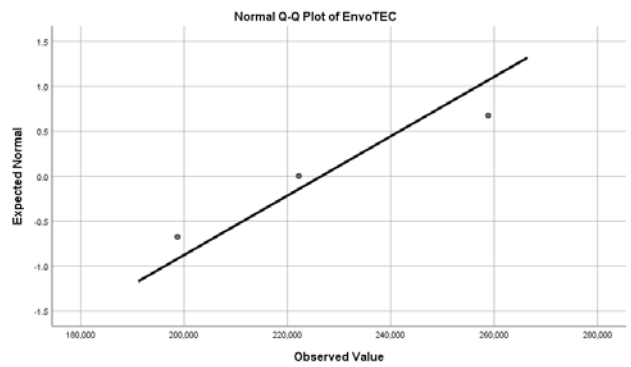
Ownership=State-08/09/10
Normal Q-Q plot 24 of TE CO_2
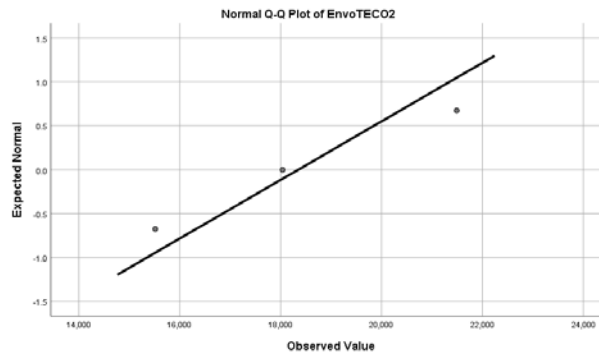
Ownership=Pty-12/13/14
Normal Q-Q plot 25 of ROA_1
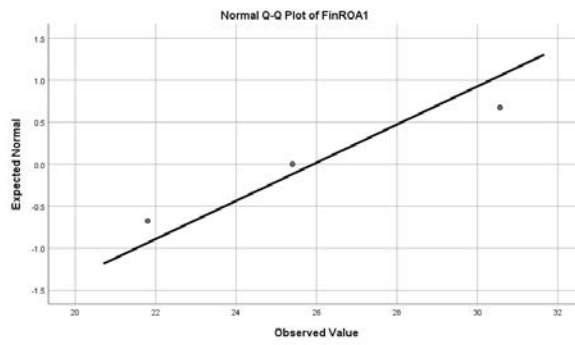
Ownership=Pty-12/13/14
Normal Q-Q plot 26 of ROA_2
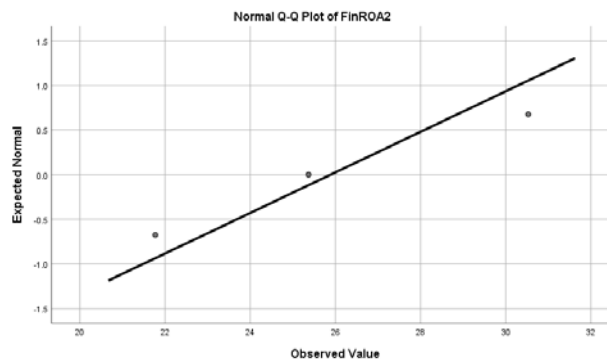
Ownership=Pty-12/13/14

Normal Q-Q plot 27 of ROE$_1$

Normal Q-Q Plot of FinROE1
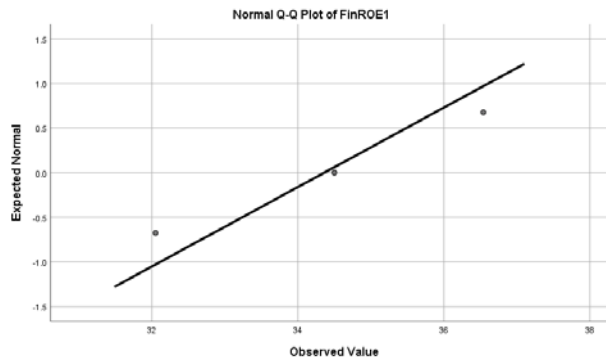
Ownership=Pty-12/13/14
Normal Q-Q plot 28 of ROE$_2$

Normal Q-Q Plot of FinROE2
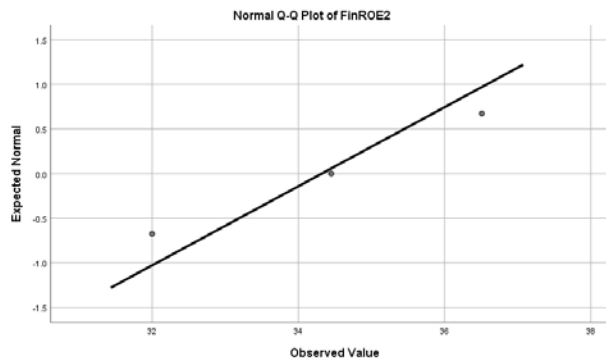
Ownership=Pty-12/13/14
Normal Q-Q plot 29 of DTA

Normal Q-Q Plot of FinDTA
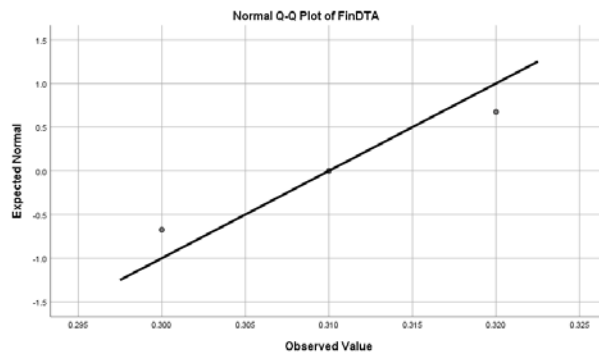
Ownership=Pty-12/13/14
Normal Q-Q plot 30 of CEA

Normal Q-Q Plot of FinCEA
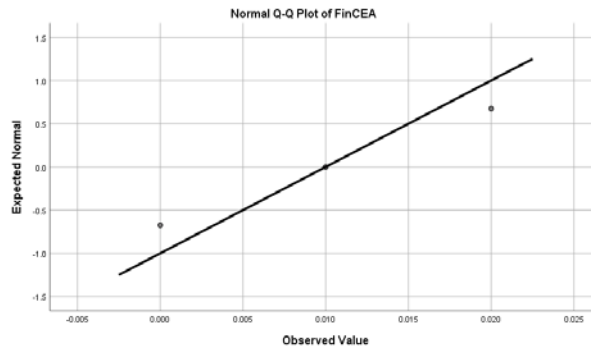
Ownership=Pty-12/13/14
Normal Q-Q plot 31 of TE

Normal Q-Q Plot of FinTE
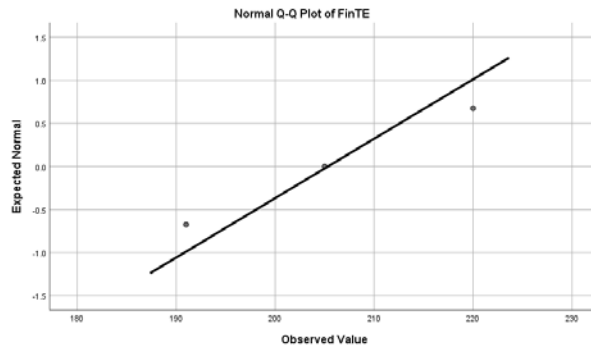
Ownership=Pty-12/13/14
Normal Q-Q plot 32 of TEUs

Normal Q-Q Plot of FinTUEs
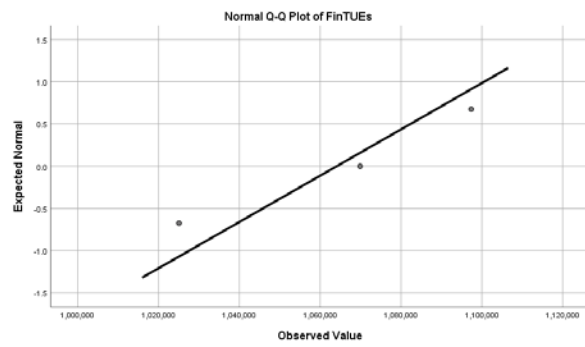
Ownership=Pty-12/13/14
Normal Q-Q plot 33 of Tonnes

Normal Q-Q Plot of FinTonnes
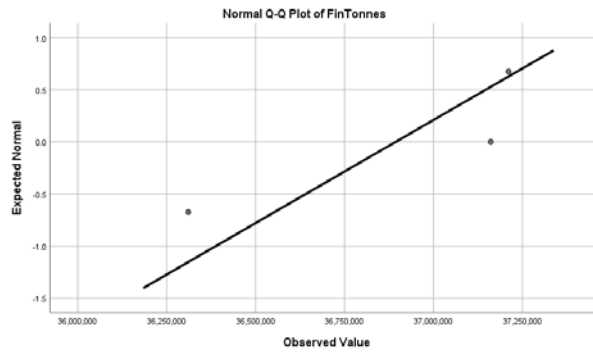
Ownership=Pty-12/13/14
Normal Q-Q plot 34 of NoS

Normal Q-Q Plot of FinNoS
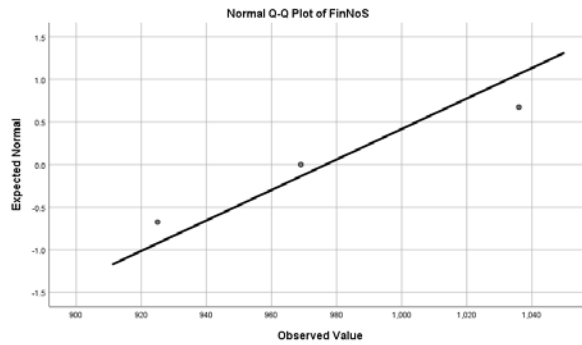
Ownership=Pty-12/13/14
Normal Q-Q plot 35 of TEC

Normal Q-Q Plot of EnvoTEC
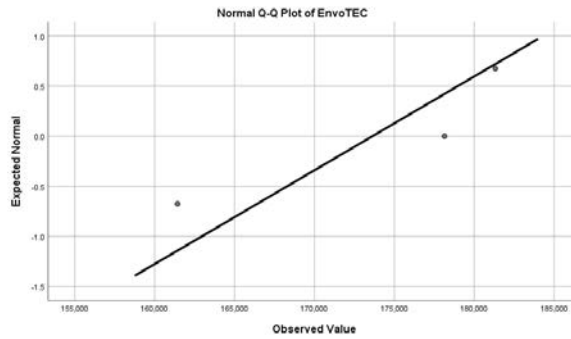
Ownership=Pty-12/13/14
Normal Q-Q plot 36 of TE CO_2

Normal Q-Q Plot of EnvoTECO2
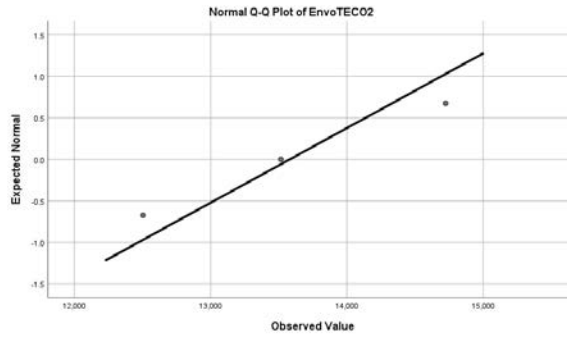
Ownership=Pty-15/16/17
Normal Q-Q plot 37 of ROA_1

Normal Q-Q Plot of FinROA1
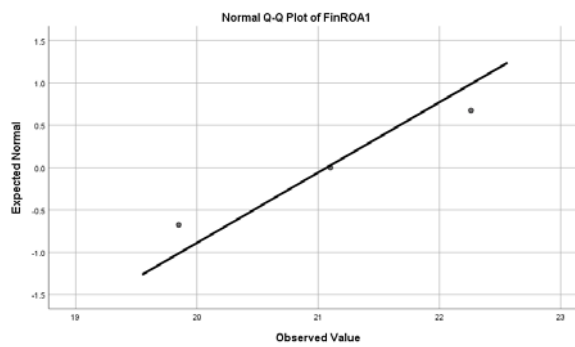
Ownership=Pty-15/16/17
Normal Q-Q plot 38 of ROA_2

Normal Q-Q Plot of FinROA2
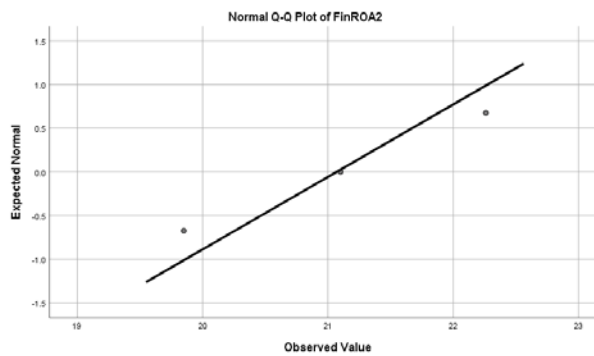
Ownership=Pty-15/16/17
Normal Q-Q plot 39 of ROE$_1$

Normal Q-Q Plot of FinROE1
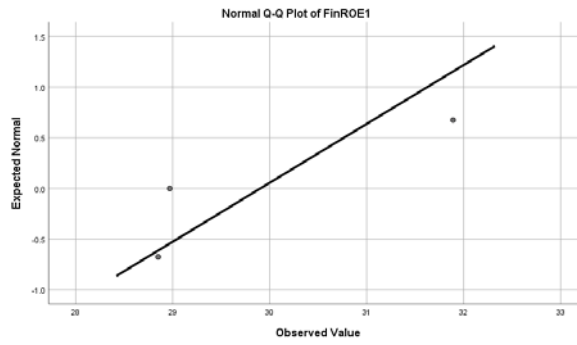
Ownership=Pty-15/16/17
Normal Q-Q plot 40 of ROE$_2$

Normal Q-Q Plot of FinROE2
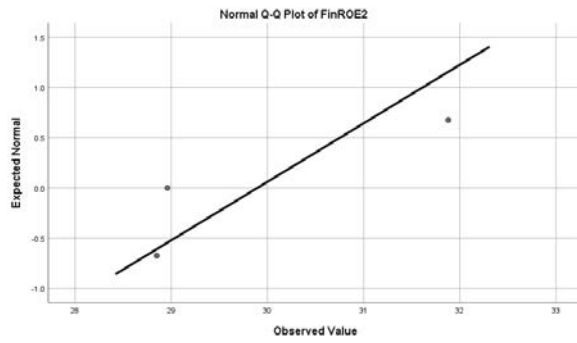
Ownership=Pty-15/16/17
Normal Q-Q plot 41 of DTA

Normal Q-Q Plot of FinDTA
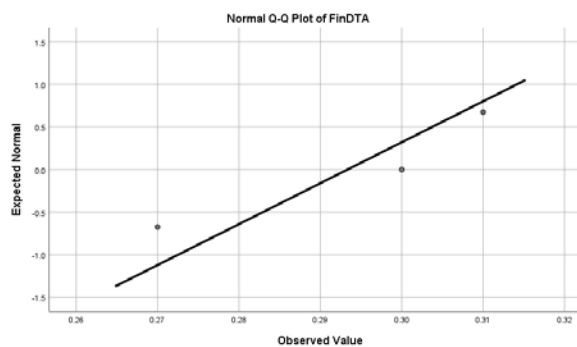
Ownership=Pty-15/16/17
Normal Q-Q plot 42 of CEA

Normal Q-Q Plot of FinCEA
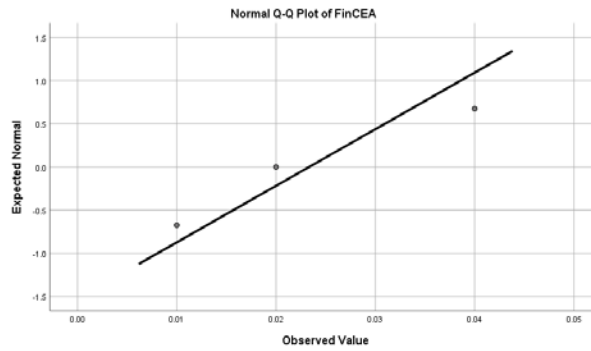
Ownership=Pty-15/16/17
Normal Q-Q plot 44 of TEUs

Normal Q-Q Plot of FinTUEs
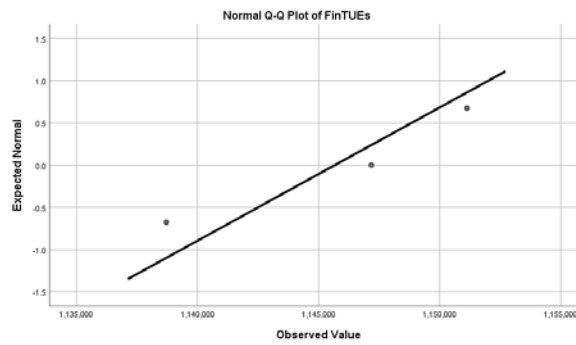
Ownership=Pty-15/16/17
Normal Q-Q plot 45 of Tonnes

Normal Q-Q Plot of FinTonnes
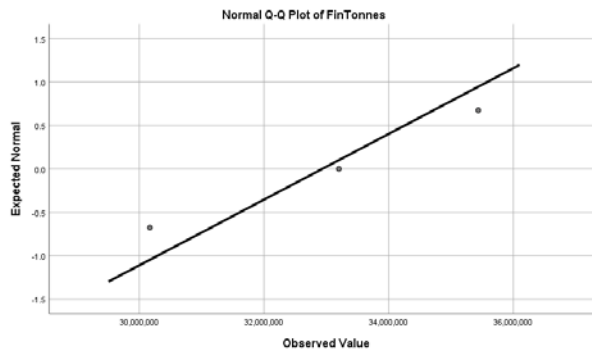
Ownership=Pty-15/16/17
Normal Q-Q plot 46 of NoS

Normal Q-Q Plot of FinNoS
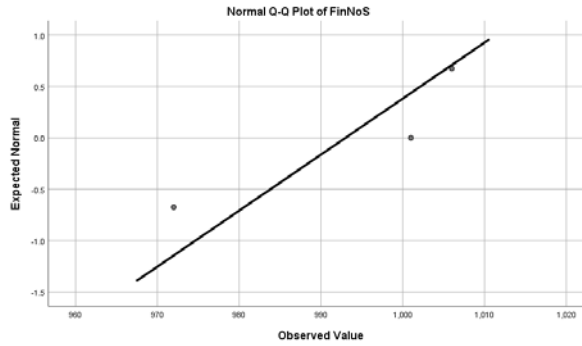
Ownership=Pty-15/16/17
Normal Q-Q plot 43 of TE

Normal Q-Q Plot of FinTE
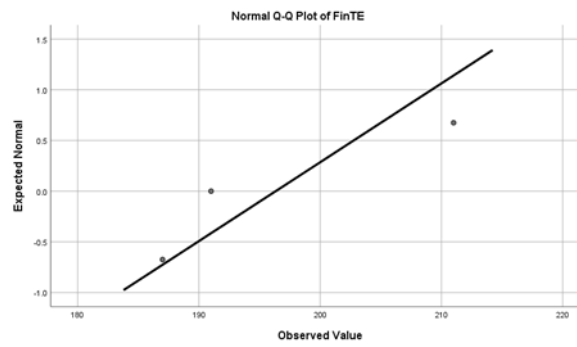
Ownership=Pty-15/16/17
Normal Q-Q plot 47 of TEC

Normal Q-Q Plot of EnvoTEC
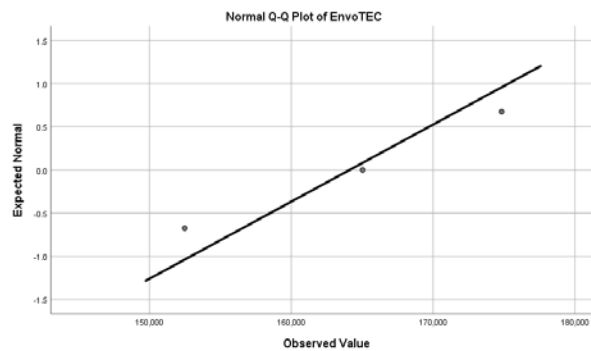
Ownership=Pty-15/16/17
Normal Q-Q plot 48 of TE CO$_2$

Normal Q-Q Plot of EnvoTECO2
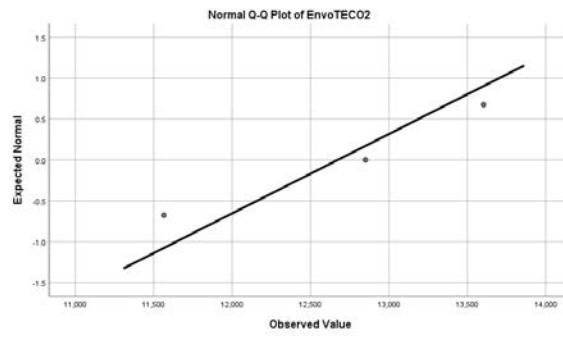
APPENDIX 3   TRIMMED MANOVA TESTS (FINCEA & FINTEUS)

Multivariate Tests[a] (without FinCEA and FinTEUs)

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	1.000	1748.034[b]	8.000	1.000	.018	1.000	13984.270	.993
	Wilks' Lambda	.000	1748.034[b]	8.000	1.000	.018	1.000	13984.270	.993
	Hotelling's Trace	13984.270	1748.034[b]	8.000	1.000	.018	1.000	13984.270	.993
	Roy's Largest Root	13984.270	1748.034[b]	8.000	1.000	.018	1.000	13984.270	.993
Ownership	Pillai's Trace	2.853	7.252	24.000	9.000	.002	.951	174.054	.995
	Wilks' Lambda	.000	11.734	24.000	3.502	.021	.986	242.826	.820
	Hotelling's Trace	.	.	24.000	.	.	.	.	.
	Roy's Largest Root	1065.445	399.542[c]	8.000	3.000	.000	.999	3196.334	1.000

a. Design: Intercept + Ownership

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects (Trimmed FinCEA and FinTEUs)

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[k]
Corrected Model	1	1260.794[a]	3	420.265	72.396	.000	.964	217.189	1.000
	FinROA2	1406.177[b]	3	468.726	77.788	.000	.967	233.365	1.000
	FinROE1	2030.346[c]	3	676.782	163.599	.000	.984	490.798	1.000
	FinROE2	2391.476[d]	3	797.159	158.406	.000	.983	475.218	1.000
	FinDTA	.096[e]	3	.032	106.769	.000	.976	320.306	1.000
	FinTonnes	146979120589987.530[f]	3	48993040196662.510	21.801	.000	.891	65.403	1.000
	FinNoS	25116.250[g]	3	8372.083	4.373	.042	.621	13.120	.658
	EnvoTEC	26250821016.917[h]	3	8750273672.306	25.776	.000	.906	77.329	1.000
	EnvoTECO2	72237538.917[i]	3	24079179.639	7.807	.009	.745	23.420	.898
	EnvoTE	29970.000[j]	3	9990.000	73.142	.000	.965	219.426	1.000
Intercept	1	2156.865	1	2156.865	371.549	.000	.979	371.549	1.000
	FinROA2	1964.288	1	1964.288	325.988	.000	.976	325.988	1.000
	FinROE1	4458.307	1	4458.307	1077.712	.000	.993	1077.712	1.000
	FinROE2	3927.701	1	3927.701	780.487	.000	.990	780.487	1.000
	FinDTA	1.833	1	1.833	6110.028	.000	.999	6110.028	1.000

			df			Sig.			
	FinTonnes	12355167825036366.000	1	12355167825036366.000	5497.800	.000	.999	5497.800	1.000
	FinNoS	11558144.083	1	11558144.083	6037.686	.000	.999	6037.686	1.000
	EnvoTEC	536064336390.083	1	536064336390.083	1579.121	.000	.995	1579.121	1.000
	EnvoTECO2	2899608852.083	1	2899608852.083	940.057	.000	.992	940.057	1.000
	EnvoTE	740033.333	1	740033.333	5418.182	.000	.999	5418.182	1.000
Ownership	1	1260.794	3	420.265	72.396	.000	.964	217.189	1.000
	FinROA2	1406.177	3	468.726	77.788	.000	.967	233.365	1.000
	FinROE1	2030.345	3	676.782	163.599	.000	.984	490.798	1.000
	FinROE2	2391.476	3	797.159	158.406	.000	.983	475.218	1.000
	FinDTA	.096	3	.032	106.769	.000	.976	320.306	1.000
	FinTonnes	146979120589987.600	3	48993040196662.530	21.801	.000	.891	65.403	1.000
	FinNoS	25116.250	3	8372.083	4.373	.042	.621	13.120	.658
	EnvoTEC	26250821016.917	3	8750273672.306	25.776	.000	.906	77.329	1.000
	EnvoTECO2	72237538.917	3	24079179.639	7.807	.009	.745	23.420	.898

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
	EnvoTE	29970.000	3	9990.000	73.142	.000	.965	219.426	1.000
Error	1	46.440	8	5.805					
	FinROA2	48.205	8	6.026					
	FinROE1	33.095	8	4.137					
	FinROE2	40.259	8	5.032					
	FinDTA	.002	8	.000					
	FinTonnes	17978344131321.332	8	2247293016415.167					
	FinNoS	15314.667	8	1914.333					
	EnvoTEC	2715759954.000	8	339469994.250					
	EnvoTECO2	24676018.000	8	3084502.250					
	EnvoTE	1092.667	8	136.583					
Total	1	3464.099	12						
	FinROA2	3418.670	12						
	FinROE1	6521.748	12						
	FinROE2	6359.436	12						
	FinDTA	1.932	12						
	FinTonnes	12520125289757680.000	12						
	FinNoS	11598575.000	12						

	EnvoTEC	565030917361.000	12						
	EnvoTECO2	2996522409.000	12						
	EnvoTE	771096.000	12						
Corrected Total	1	1307.235	11						
	FinROA2	1454.382	11						
	FinROE1	2063.440	11						
	FinROE2	2431.735	11						
	FinDTA	.098	11						
	FinTonnes	164957464721308.880	11						
	FinNoS	40430.917	11						
	EnvoTEC	28966580970.917	11						
	EnvoTECO2	96913556.917	11						
	EnvoTE	31062.667	11						

a. R Squared = .964 (Adjusted R Squared = .951)

b. R Squared = .967 (Adjusted R Squared = .954)

c. R Squared = .984 (Adjusted R Squared = .978)

d. R Squared = .983 (Adjusted R Squared = .977)   e. R Squared = .976 (Adjusted R Squared = .966)

f. R Squared = .891 (Adjusted R Squared = .850)   g. R Squared = .621 (Adjusted R Squared = .479)

h. R Squared = .906 (Adjusted R Squared = .871) i. R Squared = .745 (Adjusted R Squared = .650)

j. R Squared = .965 (Adjusted R Squared = .952)   k. Computed using alpha = .05

Multiple Comparisons Tests (Trimmed FinCEA & FinTEUs)

Dependent Variable		(I) Ownership	(J) Ownership	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	Tukey HSD	Gov-05/06/07	Gov-08/09/10	1.68	1.967	.829	-4.62	7.98
			Pty-12/13/14	-21.76*	1.967	.000	-28.06	-15.46
			Pty-15/16/17	-16.91*	1.967	.000	-23.21	-10.61
		Gov-08/09/10	Gov-05/06/07	-1.68	1.967	.829	-7.98	4.62
			Pty-12/13/14	-23.44*	1.967	.000	-29.74	-17.14
			Pty-15/16/17	-18.59*	1.967	.000	-24.89	-12.29
		Pty-12/13/14	Gov-05/06/07	21.76*	1.967	.000	15.46	28.06
			Gov-08/09/10	23.44*	1.967	.000	17.14	29.74
			Pty-15/16/17	4.85	1.967	.141	-1.45	11.15
		Pty-15/16/17	Gov-05/06/07	16.91*	1.967	.000	10.61	23.21
			Gov-08/09/10	18.59*	1.967	.000	12.29	24.89
			Pty-12/13/14	-4.85	1.967	.141	-11.15	1.45
	Bonferroni	Gov-05/06/07	Gov-08/09/10	1.68	1.967	1.000	-5.17	8.52
			Pty-12/13/14	-21.76*	1.967	.000	-28.61	-14.92
			Pty-15/16/17	-16.91*	1.967	.000	-23.76	-10.07
		Gov-08/09/10	Gov-05/06/07	-1.68	1.967	1.000	-8.52	5.17

			Pty-12/13/14	-23.44*	1.967	.000	-30.28	-16.60
			Pty-15/16/17	-18.59*	1.967	.000	-25.43	-11.75
		Pty-12/13/14	Gov-05/06/07	21.76*	1.967	.000	14.92	28.61
			Gov-08/09/10	23.44*	1.967	.000	16.60	30.28
			Pty-15/16/17	4.85	1.967	.234	-1.99	11.69
		Pty-15/16/17	Gov-05/06/07	16.91*	1.967	.000	10.07	23.76
			Gov-08/09/10	18.59*	1.967	.000	11.75	25.43
			Pty-12/13/14	-4.85	1.967	.234	-11.69	1.99
FinROA2	Tukey HSD	Gov-05/06/07	Gov-08/09/10	.8500	2.00427	.973	-5.5684	7.2684
			Pty-12/13/14	-23.3567*	2.00427	.000	-29.7750	-16.9383
			Pty-15/16/17	-18.5367*	2.00427	.000	-24.9550	-12.1183
		Gov-08/09/10	Gov-05/06/07	-.8500	2.00427	.973	-7.2684	5.5684
			Pty-12/13/14	-24.2067*	2.00427	.000	-30.6250	-17.7883
			Pty-15/16/17	-19.3867*	2.00427	.000	-25.8050	-12.9683
		Pty-12/13/14	Gov-05/06/07	23.3567*	2.00427	.000	16.9383	29.7750
			Gov-08/09/10	24.2067*	2.00427	.000	17.7883	30.6250
			Pty-15/16/17	4.8200	2.00427	.153	-1.5984	11.2384
		Pty-15/16/17	Gov-05/06/07	18.5367*	2.00427	.000	12.1183	24.9550
			Gov-08/09/10	19.3867*	2.00427	.000	12.9683	25.8050
			Pty-12/13/14	-4.8200	2.00427	.153	-11.2384	1.5984
	Bonferroni	Gov-05/06/07	Gov-08/09/10	.8500	2.00427	1.000	-6.1226	7.8226
			Pty-12/13/14	-23.3567*	2.00427	.000	-30.3293	-16.3841
			Pty-15/16/17	-18.5367*	2.00427	.000	-25.5093	-11.5641

		Gov-08/09/10	Gov-05/06/07	-.8500	2.00427	1.000	-7.8226	6.1226
			Pty-12/13/14	-24.2067*	2.00427	.000	-31.1793	-17.2341
			Pty-15/16/17	-19.3867*	2.00427	.000	-26.3593	-12.4141
		Pty-12/13/14	Gov-05/06/07	23.3567*	2.00427	.000	16.3841	30.3293
			Gov-08/09/10	24.2067*	2.00427	.000	17.2341	31.1793
			Pty-15/16/17	4.8200	2.00427	.257	-2.1526	11.7926
		Pty-15/16/17	Gov-05/06/07	18.5367*	2.00427	.000	11.5641	25.5093
			Gov-08/09/10	19.3867*	2.00427	.000	12.4141	26.3593
			Pty-12/13/14	-4.8200	2.00427	.257	-11.7926	2.1526
FinROE1	Tukey HSD	Gov-05/06/07	Gov-08/09/10	3.3133	1.66069	.266	-2.0048	8.6314
			Pty-12/13/14	-26.2900*	1.66069	.000	-31.6081	-20.9719
			Pty-15/16/17	-21.8300*	1.66069	.000	-27.1481	-16.5119
		Gov-08/09/10	Gov-05/06/07	-3.3133	1.66069	.266	-8.6314	2.0048
			Pty-12/13/14	-29.6033*	1.66069	.000	-34.9214	-24.2852
			Pty-15/16/17	-25.1433*	1.66069	.000	-30.4614	-19.8252
		Pty-12/13/14	Gov-05/06/07	26.2900*	1.66069	.000	20.9719	31.6081
			Gov-08/09/10	29.6033*	1.66069	.000	24.2852	34.9214
			Pty-15/16/17	4.4600	1.66069	.104	-.8581	9.7781
		Pty-15/16/17	Gov-05/06/07	21.8300*	1.66069	.000	16.5119	27.1481
			Gov-08/09/10	25.1433*	1.66069	.000	19.8252	30.4614
			Pty-12/13/14	-4.4600	1.66069	.104	-9.7781	.8581
	Bonferroni	Gov-05/06/07	Gov-08/09/10	3.3133	1.66069	.487	-2.4640	9.0907
			Pty-12/13/14	-26.2900*	1.66069	.000	-32.0673	-20.5127

				Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
			Pty-15/16/17	-21.8300*	1.66069	.000	-27.6073	-16.0527
		Gov-08/09/10	Gov-05/06/07	-3.3133	1.66069	.487	-9.0907	2.4640
			Pty-12/13/14	-29.6033*	1.66069	.000	-35.3807	-23.8260
			Pty-15/16/17	-25.1433*	1.66069	.000	-30.9207	-19.3660
		Pty-12/13/14	Gov-05/06/07	26.2900*	1.66069	.000	20.5127	32.0673
			Gov-08/09/10	29.6033*	1.66069	.000	23.8260	35.3807
			Pty-15/16/17	4.4600	1.66069	.166	-1.3173	10.2373
		Pty-15/16/17	Gov-05/06/07	21.8300*	1.66069	.000	16.0527	27.6073
			Gov-08/09/10	25.1433*	1.66069	.000	19.3660	30.9207
			Pty-12/13/14	-4.4600	1.66069	.166	-10.2373	1.3173
FinROE2	Tukey HSD	Gov-05/06/07	Gov-08/09/10	1.7367	1.83164	.781	-4.1289	7.6022
			Pty-12/13/14	-29.3767*	1.83164	.000	-35.2422	-23.5111
			Pty-15/16/17	-24.9533*	1.83164	.000	-30.8189	-19.0878
		Gov-08/09/10	Gov-05/06/07	-1.7367	1.83164	.781	-7.6022	4.1289
			Pty-12/13/14	-31.1133*	1.83164	.000	-36.9789	-25.2478
			Pty-15/16/17	-26.6900*	1.83164	.000	-32.5556	-20.8244
		Pty-12/13/14	Gov-05/06/07	29.3767*	1.83164	.000	23.5111	35.2422
			Gov-08/09/10	31.1133*	1.83164	.000	25.2478	36.9789
			Pty-15/16/17	4.4233	1.83164	.151	-1.4422	10.2889
		Pty-15/16/17	Gov-05/06/07	24.9533*	1.83164	.000	19.0878	30.8189
			Gov-08/09/10	26.6900*	1.83164	.000	20.8244	32.5556
			Pty-12/13/14	-4.4233	1.83164	.151	-10.2889	1.4422
	Bonferroni	Gov-05/06/07	Gov-08/09/10	1.7367	1.83164	1.000	-4.6354	8.1087

			Pty-12/13/14	-29.3767*	1.83164	.000	-35.7487	-23.0046
			Pty-15/16/17	-24.9533*	1.83164	.000	-31.3254	-18.5813
		Gov-08/09/10	Gov-05/06/07	-1.7367	1.83164	1.000	-8.1087	4.6354
			Pty-12/13/14	-31.1133*	1.83164	.000	-37.4854	-24.7413
			Pty-15/16/17	-26.6900*	1.83164	.000	-33.0621	-20.3179
		Pty-12/13/14	Gov-05/06/07	29.3767*	1.83164	.000	23.0046	35.7487
			Gov-08/09/10	31.1133*	1.83164	.000	24.7413	37.4854
			Pty-15/16/17	4.4233	1.83164	.253	-1.9487	10.7954
		Pty-15/16/17	Gov-05/06/07	24.9533*	1.83164	.000	18.5813	31.3254
			Gov-08/09/10	26.6900*	1.83164	.000	20.3179	33.0621
			Pty-12/13/14	-4.4233	1.83164	.253	-10.7954	1.9487
FinDTA	Tukey HSD	Gov-05/06/07	Gov-08/09/10	-.0133	.01414	.784	-.0586	.0320
			Pty-12/13/14	.1633*	.01414	.000	.1180	.2086
			Pty-15/16/17	.1800*	.01414	.000	.1347	.2253
		Gov-08/09/10	Gov-05/06/07	.0133	.01414	.784	-.0320	.0586
			Pty-12/13/14	.1767*	.01414	.000	.1314	.2220
			Pty-15/16/17	.1933*	.01414	.000	.1480	.2386
		Pty-12/13/14	Gov-05/06/07	-.1633*	.01414	.000	-.2086	-.1180
			Gov-08/09/10	-.1767*	.01414	.000	-.2220	-.1314
			Pty-15/16/17	.0167	.01414	.656	-.0286	.0620
		Pty-15/16/17	Gov-05/06/07	-.1800*	.01414	.000	-.2253	-.1347
			Gov-08/09/10	-.1933*	.01414	.000	-.2386	-.1480
			Pty-12/13/14	-.0167	.01414	.656	-.0620	.0286

				Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
	Bonferroni	Gov-05/06/07	Gov-08/09/10	-.0133	.01414	1.000	-.0625	.0359
			Pty-12/13/14	.1633*	.01414	.000	.1141	.2125
			Pty-15/16/17	.1800*	.01414	.000	.1308	.2292
		Gov-08/09/10	Gov-05/06/07	.0133	.01414	1.000	-.0359	.0625
			Pty-12/13/14	.1767*	.01414	.000	.1275	.2259
			Pty-15/16/17	.1933*	.01414	.000	.1441	.2425
		Pty-12/13/14	Gov-05/06/07	-.1633*	.01414	.000	-.2125	-.1141
			Gov-08/09/10	-.1767*	.01414	.000	-.2259	-.1275
			Pty-15/16/17	.0167	.01414	1.000	-.0325	.0659
		Pty-15/16/17	Gov-05/06/07	-.1800*	.01414	.000	-.2292	-.1308
			Gov-08/09/10	-.1933*	.01414	.000	-.2425	-.1441
			Pty-12/13/14	-.0167	.01414	1.000	-.0659	.0325
FinTonnes	Tukey HSD	Gov-05/06/07	Gov-08/09/10	-4284335.00*	1224007.902	.033	-8204039.16	-364630.84
			Pty-12/13/14	-9776487.67*	1224007.902	.000	-13696191.83	-5856783.51
			Pty-15/16/17	-5818339.67*	1224007.902	.006	-9738043.83	-1898635.51
		Gov-08/09/10	Gov-05/06/07	4284335.00*	1224007.902	.033	364630.84	8204039.16
			Pty-12/13/14	-5492152.67*	1224007.902	.009	-9411856.83	-1572448.51
			Pty-15/16/17	-1534004.67	1224007.902	.614	-5453708.83	2385699.49
		Pty-12/13/14	Gov-05/06/07	9776487.67*	1224007.902	.000	5856783.51	13696191.83
			Gov-08/09/10	5492152.67*	1224007.902	.009	1572448.51	9411856.83
			Pty-15/16/17	3958148.00*	1224007.902	.048	38443.84	7877852.16
		Pty-15/16/17	Gov-05/06/07	5818339.67*	1224007.902	.006	1898635.51	9738043.83
			Gov-08/09/10	1534004.67	1224007.902	.614	-2385699.49	5453708.83

				Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
			Pty-12/13/14	-3958148.00*	1224007.902	.048	-7877852.16	-38443.84
	Bonferroni	Gov-05/06/07	Gov-08/09/10	-4284335.00*	1224007.902	.048	-8542510.62	-26159.38
			Pty-12/13/14	-9776487.67*	1224007.902	.000	-14034663.29	-5518312.05
			Pty-15/16/17	-5818339.67*	1224007.902	.009	-10076515.29	-1560164.05
		Gov-08/09/10	Gov-05/06/07	4284335.00*	1224007.902	.048	26159.38	8542510.62
			Pty-12/13/14	-5492152.67*	1224007.902	.012	-9750328.29	-1233977.05
			Pty-15/16/17	-1534004.67	1224007.902	1.000	-5792180.29	2724170.95
		Pty-12/13/14	Gov-05/06/07	9776487.67*	1224007.902	.000	5518312.05	14034663.29
			Gov-08/09/10	5492152.67*	1224007.902	.012	1233977.05	9750328.29
			Pty-15/16/17	3958148.00	1224007.902	.072	-300027.62	8216323.62
		Pty-15/16/17	Gov-05/06/07	5818339.67*	1224007.902	.009	1560164.05	10076515.29
			Gov-08/09/10	1534004.67	1224007.902	1.000	-2724170.95	5792180.29
			Pty-12/13/14	-3958148.00	1224007.902	.072	-8216323.62	300027.62
FinNoS	Tukey HSD	Gov-05/06/07	Gov-08/09/10	128.00*	35.724	.029	13.60	242.40
			Pty-12/13/14	65.33	35.724	.328	-49.07	179.73
			Pty-15/16/17	49.00	35.724	.548	-65.40	163.40
		Gov-08/09/10	Gov-05/06/07	-128.00*	35.724	.029	-242.40	-13.60
			Pty-12/13/14	-62.67	35.724	.359	-177.07	51.73
			Pty-15/16/17	-79.00	35.724	.200	-193.40	35.40
		Pty-12/13/14	Gov-05/06/07	-65.33	35.724	.328	-179.73	49.07
			Gov-08/09/10	62.67	35.724	.359	-51.73	177.07
			Pty-15/16/17	-16.33	35.724	.966	-130.73	98.07
		Pty-15/16/17	Gov-05/06/07	-49.00	35.724	.548	-163.40	65.40

				Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
			Gov-08/09/10	79.00	35.724	.200	-35.40	193.40
			Pty-12/13/14	16.33	35.724	.966	-98.07	130.73
	Bonferroni	Gov-05/06/07	Gov-08/09/10	128.00*	35.724	.043	3.72	252.28
			Pty-12/13/14	65.33	35.724	.629	-58.95	189.61
			Pty-15/16/17	49.00	35.724	1.000	-75.28	173.28
		Gov-08/09/10	Gov-05/06/07	-128.00*	35.724	.043	-252.28	-3.72
			Pty-12/13/14	-62.67	35.724	.705	-186.95	61.61
			Pty-15/16/17	-79.00	35.724	.348	-203.28	45.28
		Pty-12/13/14	Gov-05/06/07	-65.33	35.724	.629	-189.61	58.95
			Gov-08/09/10	62.67	35.724	.705	-61.61	186.95
			Pty-15/16/17	-16.33	35.724	1.000	-140.61	107.95
		Pty-15/16/17	Gov-05/06/07	-49.00	35.724	1.000	-173.28	75.28
			Gov-08/09/10	79.00	35.724	.348	-45.28	203.28
			Pty-12/13/14	16.33	35.724	1.000	-107.95	140.61
EnvoTEC	Tukey HSD	Gov-05/06/07	Gov-08/09/10	54506.33*	15043.714	.028	6331.07	102681.60
			Pty-12/13/14	107463.33*	15043.714	.000	59288.07	155638.60
			Pty-15/16/17	116978.67*	15043.714	.000	68803.40	165153.93
		Gov-08/09/10	Gov-05/06/07	-54506.33*	15043.714	.028	-102681.60	-6331.07
			Pty-12/13/14	52957.00*	15043.714	.032	4781.73	101132.27
			Pty-15/16/17	62472.33*	15043.714	.014	14297.07	110647.60
		Pty-12/13/14	Gov-05/06/07	-107463.33*	15043.714	.000	-155638.60	-59288.07
			Gov-08/09/10	-52957.00*	15043.714	.032	-101132.27	-4781.73
			Pty-15/16/17	9515.33	15043.714	.919	-38659.93	57690.60

		Pty-15/16/17	Gov-05/06/07	-116978.67*	15043.714	.000	-165153.93	-68803.40
			Gov-08/09/10	-62472.33*	15043.714	.014	-110647.60	-14297.07
			Pty-12/13/14	-9515.33	15043.714	.919	-57690.60	38659.93
	Bonferroni	Gov-05/06/07	Gov-08/09/10	54506.33*	15043.714	.041	2171.07	106841.60
			Pty-12/13/14	107463.33*	15043.714	.001	55128.07	159798.60
			Pty-15/16/17	116978.67*	15043.714	.000	64643.40	169313.93
		Gov-08/09/10	Gov-05/06/07	-54506.33*	15043.714	.041	-106841.60	-2171.07
			Pty-12/13/14	52957.00*	15043.714	.047	621.74	105292.26
			Pty-15/16/17	62472.33*	15043.714	.019	10137.07	114807.60
		Pty-12/13/14	Gov-05/06/07	-107463.33*	15043.714	.001	-159798.60	-55128.07
			Gov-08/09/10	-52957.00*	15043.714	.047	-105292.26	-621.74
			Pty-15/16/17	9515.33	15043.714	1.000	-42819.93	61850.60
		Pty-15/16/17	Gov-05/06/07	-116978.67*	15043.714	.000	-169313.93	-64643.40
			Gov-08/09/10	-62472.33*	15043.714	.019	-114807.60	-10137.07
			Pty-12/13/14	-9515.33	15043.714	1.000	-61850.60	42819.93
EnvoTECO2	Tukey HSD	Gov-05/06/07	Gov-08/09/10	-771.33	1433.993	.947	-5363.48	3820.82
			Pty-12/13/14	3994.33	1433.993	.090	-597.82	8586.48
			Pty-15/16/17	4902.67*	1433.993	.037	310.52	9494.82
		Gov-08/09/10	Gov-05/06/07	771.33	1433.993	.947	-3820.82	5363.48
			Pty-12/13/14	4765.67*	1433.993	.042	173.52	9357.82
			Pty-15/16/17	5674.00*	1433.993	.018	1081.85	10266.15
		Pty-12/13/14	Gov-05/06/07	-3994.33	1433.993	.090	-8586.48	597.82
			Gov-08/09/10	-4765.67*	1433.993	.042	-9357.82	-173.52

				Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
			Pty-15/16/17	908.33	1433.993	.918	-3683.82	5500.48
		Pty-15/16/17	Gov-05/06/07	-4902.67*	1433.993	.037	-9494.82	-310.52
			Gov-08/09/10	-5674.00*	1433.993	.018	-10266.15	-1081.85
			Pty-12/13/14	-908.33	1433.993	.918	-5500.48	3683.82
	Bonferroni	Gov-05/06/07	Gov-08/09/10	-771.33	1433.993	1.000	-5760.02	4217.35
			Pty-12/13/14	3994.33	1433.993	.142	-994.35	8983.02
			Pty-15/16/17	4902.67	1433.993	.055	-86.02	9891.35
		Gov-08/09/10	Gov-05/06/07	771.33	1433.993	1.000	-4217.35	5760.02
			Pty-12/13/14	4765.67	1433.993	.063	-223.02	9754.35
			Pty-15/16/17	5674.00*	1433.993	.025	685.31	10662.69
		Pty-12/13/14	Gov-05/06/07	-3994.33	1433.993	.142	-8983.02	994.35
			Gov-08/09/10	-4765.67	1433.993	.063	-9754.35	223.02
			Pty-15/16/17	908.33	1433.993	1.000	-4080.35	5897.02
		Pty-15/16/17	Gov-05/06/07	-4902.67	1433.993	.055	-9891.35	86.02
			Gov-08/09/10	-5674.00*	1433.993	.025	-10662.69	-685.31
			Pty-12/13/14	-908.33	1433.993	1.000	-5897.02	4080.35
EnvoTE	Tukey HSD	Gov-05/06/07	Gov-08/09/10	-43.00*	9.542	.009	-73.56	-12.44
			Pty-12/13/14	69.00*	9.542	.000	38.44	99.56
			Pty-15/16/17	78.00*	9.542	.000	47.44	108.56
		Gov-08/09/10	Gov-05/06/07	43.00*	9.542	.009	12.44	73.56
			Pty-12/13/14	112.00*	9.542	.000	81.44	142.56
			Pty-15/16/17	121.00*	9.542	.000	90.44	151.56
		Pty-12/13/14	Gov-05/06/07	-69.00*	9.542	.000	-99.56	-38.44

			Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
		Gov-08/09/10	-112.00*	9.542	.000	-142.56	-81.44
		Pty-15/16/17	9.00	9.542	.784	-21.56	39.56
	Pty-15/16/17	Gov-05/06/07	-78.00*	9.542	.000	-108.56	-47.44
		Gov-08/09/10	-121.00*	9.542	.000	-151.56	-90.44
		Pty-12/13/14	-9.00	9.542	.784	-39.56	21.56
Bonferroni	Gov-05/06/07	Gov-08/09/10	-43.00*	9.542	.012	-76.20	-9.80
		Pty-12/13/14	69.00*	9.542	.001	35.80	102.20
		Pty-15/16/17	78.00*	9.542	.000	44.80	111.20
	Gov-08/09/10	Gov-05/06/07	43.00*	9.542	.012	9.80	76.20
		Pty-12/13/14	112.00*	9.542	.000	78.80	145.20
		Pty-15/16/17	121.00*	9.542	.000	87.80	154.20
	Pty-12/13/14	Gov-05/06/07	-69.00*	9.542	.001	-102.20	-35.80
		Gov-08/09/10	-112.00*	9.542	.000	-145.20	-78.80
		Pty-15/16/17	9.00	9.542	1.000	-24.20	42.20
	Pty-15/16/17	Gov-05/06/07	-78.00*	9.542	.000	-111.20	-44.80
		Gov-08/09/10	-121.00*	9.542	.000	-154.20	-87.80
		Pty-12/13/14	-9.00	9.542	1.000	-42.20	24.20

Based on observed means.

 The error term is Mean Square(Error) = 136.583.

*. The mean difference is significant at the .05 level.

Levene's Test of Equality of Error Variances[a] (Trimmed FinCEA & FinTEUs)

		Levene Statistic	df1	df2	Sig.
1	Based on Mean	3.432	3	8	.072
	Based on Median	2.114	3	8	.177
	Based on Median and with adjusted df	2.114	3	2.921	.281
	Based on trimmed mean	3.345	3	8	.076
FinROA2	Based on Mean	3.108	3	8	.089
	Based on Median	1.955	3	8	.199
	Based on Median and with adjusted df	1.955	3	3.046	.296
	Based on trimmed mean	3.032	3	8	.093
FinROE1	Based on Mean	2.586	3	8	.126
	Based on Median	.951	3	8	.461
	Based on Median and with adjusted df	.951	3	5.520	.478
	Based on trimmed mean	2.447	3	8	.139
FinROE2	Based on Mean	2.350	3	8	.149
	Based on Median	1.059	3	8	.419
	Based on Median and with adjusted df	1.059	3	5.204	.442
	Based on trimmed mean	2.253	3	8	.159
FinDTA	Based on Mean	.978	3	8	.450
	Based on Median	.204	3	8	.891
	Based on Median and with adjusted df	.204	3	6.000	.890
	Based on trimmed mean	.894	3	8	.485
FinTonnes	Based on Mean	2.328	3	8	.151
	Based on Median	1.276	3	8	.347
	Based on Median and with adjusted df	1.276	3	4.563	.385
	Based on trimmed mean	2.259	3	8	.159
FinNoS	Based on Mean	1.494	3	8	.288
	Based on Median	.330	3	8	.804
	Based on Median and with adjusted df	.330	3	4.965	.805
	Based on trimmed mean	1.358	3	8	.323
EnvoTEC	Based on Mean	1.607	3	8	.263
	Based on Median	.837	3	8	.511
	Based on Median and with adjusted df	.837	3	4.603	.533

	Based on trimmed mean	1.551	3	8	.275
EnvoTECO2	Based on Mean	1.699	3	8	.244
	Based on Median	1.055	3	8	.420
	Based on Median and with adjusted df	1.055	3	4.339	.455
	Based on trimmed mean	1.659	3	8	.252
EnvoTE	Based on Mean	.359	3	8	.784
	Based on Median	.182	3	8	.905
	Based on Median and with adjusted df	.182	3	6.323	.905
	Based on trimmed mean	.345	3	8	.794

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Ownership

Homogeneous subsets

Subset 1

FinROA1

Tukey HSD[a,b]

		Subset	
Ownership	N	1	2
Gov-08/09/10	3	2.4800	
Gov-05/06/07	3	4.1567	
Pty-15/16/17	3		21.0700
Pty-12/13/14	3		25.9200
Sig.		.829	.141

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 5.805.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 2

FinROA2

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	1.6833	
Gov-05/06/07	3	2.5333	
Pty-15/16/17	3		21.0700
Pty-12/13/14	3		25.8900
Sig.		.973	.153

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 6.026.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 3

FinROE1

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	4.7600	
Gov-05/06/07	3	8.0733	
Pty-15/16/17	3		29.9033
Pty-12/13/14	3		34.3633
Sig.		.266	.104

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 4.137.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 4

FinROE2

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	3.2067	
Gov-05/06/07	3	4.9433	
Pty-15/16/17	3		29.8967
Pty-12/13/14	3		34.3200
Sig.		.781	.151

Means for groups in homogeneous subsets are
displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 5.032.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 5

FinDTA

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Pty-15/16/17	3	.2933	
Pty-12/13/14	3	.3100	
Gov-05/06/07	3		.4733
Gov-08/09/10	3		.4867
Sig.		.656	.784

Means for groups in homogeneous subsets are
displayed.

 Based on observed means.

 The error term is Mean Square(Error) = .000.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 6

FinCEA

Tukey HSD[a,b]

Ownership	N	Subset 1
Pty-12/13/14	3	.0100
Pty-15/16/17	3	.0233
Gov-08/09/10	3	.0600
Gov-05/06/07	3	.0733
Sig.		.172

Means for groups in homogeneous
subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) =
.001.

a. Uses Harmonic Mean Sample Size =
3.000.

b. Alpha = .05.

Subset 7

FinTEUs

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
Gov-05/06/07	3	793344.33		
Gov-08/09/10	3		919308.33	
Pty-12/13/14	3			1064107.33
Pty-15/16/17	3			1145669.00
Sig.		1.000	1.000	.161

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 1779643176.000.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 8

FinTonnes

Ownership	N	Subset 1	Subset 2	Subset 3
Gov-05/06/07	3	27117548.33		
Gov-08/09/10	3		31401883.33	
Pty-15/16/17	3		32935888.00	
Pty-12/13/14	3			36894036.00
Sig.		1.000	.614	1.000

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 2247293016415.167.

 a. Uses Harmonic Mean Sample Size = 3.000.

 b. Alpha = .05.

Subset 9

FinNoS

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	914.00	
Pty-12/13/14	3	976.67	976.67
Pty-15/16/17	3	993.00	993.00
Gov-05/06/07	3		1042.00
Sig.		.200	.328

Means for groups in homogeneous subsets are
displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 1914.333.

 a. Uses Harmonic Mean Sample Size = 3.000.

 b. Alpha = .05.

Subset 10

EnvoTE

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
		1	2	3
Pty-15/16/17	3	196.33		
Pty-12/13/14	3	205.33		
Gov-05/06/07	3		274.33	
Gov-08/09/10	3			317.33
Sig.		.784	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 136.583.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 11

EnvoTEC

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
		1	2	3
Pty-15/16/17	3	164116.00		
Pty-12/13/14	3	173631.33		
Gov-08/09/10	3		226588.33	
Gov-05/06/07	3			281094.67
Sig.		.919	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 339469994.250.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 12

EnvoTECO2

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
Pty-15/16/17	3	12673.33		
Pty-12/13/14	3	13581.67	13581.67	
Gov-05/06/07	3		17576.00	17576.00
Gov-08/09/10	3			18347.33
Sig.		.918	.090	.947

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 3084502.250.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

APPENDIX 4- TRIMMED MANOVA TESTS (FINCEA) AND TESTS FOR CHANGES IN LEVELS OF OPERATIONS CONTROLS

GLM FinROA1 FinROA2 FinROE1 FinROE2 FinDTA FinTEUs FinTonnes FinNoS EnvoTEC
EnvoTECO2 EnvoTE BY
  Ownership
 /METHOD=SSTYPE(3)
 /INTERCEPT=INCLUDE
 /POSTHOC=Ownership(TUKEY)
 /PRINT=DESCRIPTIVE ETASQ OPOWER HOMOGENEITY
 /CRITERIA=ALPHA(.05)
 /DESIGN= Ownership.

Between-Subjects Factors

		Value Label	N
Ownership	1	Gov-05/06/07	3
	2	Gov-08/09/10	3
	3	Pty-12/13/14	3
	4	Pty-15/16/17	3

Descriptive Statistics

	Ownership	Mean	Std. Deviation	N
1	Gov-05/06/07	4.16	.035	3
	Gov-08/09/10	2.48	1.542	3
	Pty-12/13/14	25.92	4.403	3
	Pty-15/16/17	21.07	1.205	3
	Total	13.41	10.901	12
FinROA2	Gov-05/06/07	2.5333	.16442	3
	Gov-08/09/10	1.6833	1.79879	3
	Pty-12/13/14	25.8900	4.40309	3
	Pty-15/16/17	21.0700	1.20528	3
	Total	12.7942	11.49854	12
FinROE1	Gov-05/06/07	8.0733	.06658	3
	Gov-08/09/10	4.7600	2.91978	3
	Pty-12/13/14	34.3633	2.24812	3
	Pty-15/16/17	29.9033	1.72155	3
	Total	19.2750	13.69618	12
FinROE2	Gov-05/06/07	4.9433	.22279	3
	Gov-08/09/10	3.2067	3.46828	3
	Pty-12/13/14	34.3200	2.25781	3
	Pty-15/16/17	29.8967	1.71850	3
	Total	18.0917	14.86832	12
FinDTA	Gov-05/06/07	.4733	.01528	3
	Gov-08/09/10	.4867	.02082	3
	Pty-12/13/14	.3100	.01000	3

	Pty-15/16/17	.2933	.02082	3
	Total	.3908	.09462	12
FinTEUs	Gov-05/06/07	793344.33	72111.913	3
	Gov-08/09/10	919308.33	23374.571	3
	Pty-12/13/14	1064107.33	36493.905	3
	Pty-15/16/17	1145669.00	6345.792	3
	Total	980607.25	145653.684	12
FinTonnes	Gov-05/06/07	27117548.33	819363.855	3
	Gov-08/09/10	31401883.33	1035399.724	3
	Pty-12/13/14	36894036.00	505937.095	3
	Pty-15/16/17	32935888.00	2643821.100	3
	Total	32087338.92	3872484.107	12
FinNoS	Gov-05/06/07	1042.00	34.828	3
	Gov-08/09/10	914.00	54.617	3
	Pty-12/13/14	976.67	55.896	3
	Pty-15/16/17	993.00	18.358	3
	Total	981.42	60.626	12
EnvoTEC	Gov-05/06/07	281094.67	14125.369	3
	Gov-08/09/10	226588.33	30308.835	3
	Pty-12/13/14	173631.33	10685.472	3
	Pty-15/16/17	164116.00	11204.871	3
	Total	211357.58	51315.938	12
EnvoTECO2	Gov-05/06/07	17576.00	1019.118	3
	Gov-08/09/10	18347.33	2999.985	3
	Pty-12/13/14	13581.67	1111.955	3
	Pty-15/16/17	12673.33	1031.045	3
	Total	15544.58	2968.219	12
EnvoTE	Gov-05/06/07	274.33	7.767	3
	Gov-08/09/10	317.33	10.504	3
	Pty-12/13/14	205.33	14.503	3
	Pty-15/16/17	196.33	12.858	3
	Total	248.33	53.140	12

Multivariate Tests[a] (Trimmed FinCEA)

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	1.000	1939.625[b]	8.000	1.000	.018	1.000	15516.998	.996
	Wilks' Lambda	.000	1939.625[b]	8.000	1.000	.018	1.000	15516.998	.996
	Hotelling's Trace	15516.998	1939.625[b]	8.000	1.000	.018	1.000	15516.998	.996
	Roy's Largest Root	15516.998	1939.625[b]	8.000	1.000	.018	1.000	15516.998	.996
Ownership	Pillai's Trace	2.831	6.282	24.000	9.000	**.004**	.944	150.762	.987
	Wilks' Lambda	.000	15.304	24.000	3.502	**.014**	.989	314.066	.902
	Hotelling's Trace	.	.	24.000	.	.	.	.	.
	Roy's Largest Root	4023.633	1508.862[c]	8.000	3.000	.000	1.000	12070.900	1.000

a. Design: Intercept + Ownership

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Tests of Between-Subjects Effects (Trimmed FinCEA)

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[l]
Corrected Model	1	1260.794[a]	3	420.265	72.396	.000	.964	217.189	1.000
	FinROA2	1406.177[b]	3	468.726	77.788	.000	.967	233.365	1.000
	FinROE1	2030.346[c]	3	676.782	163.599	.000	.984	490.798	1.000
	FinROE2	2391.476[d]	3	797.159	158.406	.000	.983	475.218	1.000
	FinDTA	.096[e]	3	.032	106.769	.000	.976	320.306	1.000
	FinTEUs	219127807118.250[f]	3	73042602372.750	41.043	.000	.939	123.130	1.000
	FinTonnes	146979120589987.530[g]	3	48993040196662.510	21.801	.000	.891	65.403	1.000
	FinNoS	25116.250[h]	3	8372.083	4.373	.042	.621	13.120	.658
	EnvoTEC	26250821016.917[i]	3	8750273672.306	25.776	.000	.906	77.329	1.000
	EnvoTECO2	72237538.917[j]	3	24079179.639	7.807	.009	.745	23.420	.898
	EnvoTE	29970.000[k]	3	9990.000	73.142	.000	.965	219.426	1.000
Intercept	1	2156.865	1	2156.865	371.549	.000	.979	371.549	1.000
	FinROA2	1964.288	1	1964.288	325.988	.000	.976	325.988	1.000
	FinROE1	4458.307	1	4458.307	1077.712	.000	.993	1077.712	1.000
	FinROE2	3927.701	1	3927.701	780.487	.000	.990	780.487	1.000
	FinDTA	1.833	1	1.833	6110.028	.000	.999	6110.028	1.000
	FinTEUs	11539086945030.746	1	11539086945030.746	6483.933	.000	.999	6483.933	1.000
	FinTonnes	12355167825036366.000	1	12355167825036366.000	5497.800	.000	.999	5497.800	1.000
	FinNoS	11558144.083	1	11558144.083	6037.686	.000	.999	6037.686	1.000
	EnvoTEC	536064336390.083	1	536064336390.083	1579.121	.000	.995	1579.121	1.000

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		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
	EnvoTECO2	2899608852.083	1	2899608852.083	940.057	.000	.992	940.057	1.000
	EnvoTE	740033.333	1	740033.333	5418.182	.000	.999	5418.182	1.000
Ownership	1	1260.794	3	420.265	72.396	.000	.964	217.189	1.000
	FinROA2	1406.177	3	468.726	77.788	**.000**	.967	233.365	1.000
	FinROE1	2030.345	3	676.782	163.599	**.000**	.984	490.798	1.000
	FinROE2	2391.476	3	797.159	158.406	**.000**	.983	475.218	1.000
	FinDTA	.096	3	.032	106.769	**.000**	.976	320.306	1.000
	FinTEUs	219127807118.250	3	73042602372.750	41.043	**.000**	.939	123.130	1.000
	FinTonnes	146979120589987.600	3	48993040196662.530	21.801	**.000**	.891	65.403	1.000
	FinNoS	25116.250	3	8372.083	4.373	**.042**	.621	13.120	.658
	EnvoTEC	26250821016.917	3	8750273672.306	25.776	**.000**	.906	77.329	1.000
	EnvoTECO2	72237538.917	3	24079179.639	7.807	**.009**	.745	23.420	.898
	EnvoTE	29970.000	3	9990.000	73.142	**.000**	.965	219.426	1.000
Error	1	46.440	8	5.805					
	FinROA2	48.205	8	6.026					
	FinROE1	33.095	8	4.137					
	FinROE2	40.259	8	5.032					
	FinDTA	.002	8	.000					
	FinTEUs	14237145408.000	8	1779643176.000					
	FinTonnes	17978344131321.332	8	2247293016415.167					
	FinNoS	15314.667	8	1914.333					
	EnvoTEC	2715759954.000	8	339469994.250					
	EnvoTECO2	24676018.000	8	3084502.250					

	EnvoTE	1092.667	8	136.583					
Total	1	3464.099	12						
	FinROA2	3418.670	12						
	FinROE1	6521.748	12						
	FinROE2	6359.436	12						
	FinDTA	1.932	12						
	FinTEUs	11772451897557.000	12						
	FinTonnes	12520125289757680.000	12						
	FinNoS	11598575.000	12						
	EnvoTEC	565030917361.000	12						
	EnvoTECO2	2996522409.000	12						
	EnvoTE	771096.000	12						
Corrected Total	1	1307.235	11						
	FinROA2	1454.382	11						
	FinROE1	2063.440	11						
	FinROE2	2431.735	11						
	FinDTA	.098	11						
	FinTEUs	233364952526.250	11						
	FinTonnes	164957464721308.880	11						
	FinNoS	40430.917	11						
	EnvoTEC	28966580970.917	11						
	EnvoTECO2	96913556.917	11						
	EnvoTE	31062.667	11						

a. R Squared = .964 (Adjusted R Squared = .951)

b. R Squared = .967 (Adjusted R Squared = .954)

c. R Squared = .984 (Adjusted R Squared = .978)

d. R Squared = .983 (Adjusted R Squared = .977)

e. R Squared = .976 (Adjusted R Squared = .966)

f. R Squared = .939 (Adjusted R Squared = .916)

g. R Squared = .891 (Adjusted R Squared = .850)

h. R Squared = .621 (Adjusted R Squared = .479)

i. R Squared = .906 (Adjusted R Squared = .871)

j. R Squared = .745 (Adjusted R Squared = .650)

k. R Squared = .965 (Adjusted R Squared = .952)

l. Computed using alpha = .05

Multiple Comparisons (Trimmed FinCEA)

Tukey HSD

Dependent Variable	(I) Ownership	(J) Ownership	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	Gov-05/06/07	Gov-08/09/10	1.68	1.967	.829	-4.62	7.98
		Pty-12/13/14	-21.76*	1.967	.000	-28.06	-15.46
		Pty-15/16/17	-16.91*	1.967	.000	-23.21	-10.61
	Gov-08/09/10	Gov-05/06/07	-1.68	1.967	.829	-7.98	4.62
		Pty-12/13/14	-23.44*	1.967	.000	-29.74	-17.14
		Pty-15/16/17	-18.59*	1.967	.000	-24.89	-12.29

	Pty-12/13/14	Gov-05/06/07	21.76*	1.967	.000	15.46	28.06
		Gov-08/09/10	23.44*	1.967	.000	17.14	29.74
		Pty-15/16/17	4.85	1.967	.141	-1.45	11.15
	Pty-15/16/17	Gov-05/06/07	16.91*	1.967	.000	10.61	23.21
		Gov-08/09/10	18.59*	1.967	.000	12.29	24.89
		Pty-12/13/14	-4.85	1.967	.141	-11.15	1.45
FinROA2	Gov-05/06/07	Gov-08/09/10	.8500	2.00427	.973	-5.5684	7.2684
		Pty-12/13/14	-23.3567*	2.00427	.000	-29.7750	-16.9383
		Pty-15/16/17	-18.5367*	2.00427	.000	-24.9550	-12.1183
	Gov-08/09/10	Gov-05/06/07	-.8500	2.00427	.973	-7.2684	5.5684
		Pty-12/13/14	-24.2067*	2.00427	.000	-30.6250	-17.7883
		Pty-15/16/17	-19.3867*	2.00427	.000	-25.8050	-12.9683
	Pty-12/13/14	Gov-05/06/07	23.3567*	2.00427	.000	16.9383	29.7750
		Gov-08/09/10	24.2067*	2.00427	.000	17.7883	30.6250
		Pty-15/16/17	4.8200	2.00427	.153	-1.5984	11.2384
	Pty-15/16/17	Gov-05/06/07	18.5367*	2.00427	.000	12.1183	24.9550
		Gov-08/09/10	19.3867*	2.00427	.000	12.9683	25.8050
		Pty-12/13/14	-4.8200	2.00427	.153	-11.2384	1.5984
FinROE1	Gov-05/06/07	Gov-08/09/10	3.3133	1.66069	.266	-2.0048	8.6314
		Pty-12/13/14	-26.2900*	1.66069	.000	-31.6081	-20.9719
		Pty-15/16/17	-21.8300*	1.66069	.000	-27.1481	-16.5119
	Gov-08/09/10	Gov-05/06/07	-3.3133	1.66069	.266	-8.6314	2.0048
		Pty-12/13/14	-29.6033*	1.66069	.000	-34.9214	-24.2852

		Pty-15/16/17	-25.1433*	1.66069	.000	-30.4614	-19.8252
	Pty-12/13/14	Gov-05/06/07	26.2900*	1.66069	.000	20.9719	31.6081
		Gov-08/09/10	29.6033*	1.66069	.000	24.2852	34.9214
		Pty-15/16/17	4.4600	1.66069	.104	-.8581	9.7781
	Pty-15/16/17	Gov-05/06/07	21.8300*	1.66069	.000	16.5119	27.1481
		Gov-08/09/10	25.1433*	1.66069	.000	19.8252	30.4614
		Pty-12/13/14	-4.4600	1.66069	.104	-9.7781	.8581
FinROE2	Gov-05/06/07	Gov-08/09/10	1.7367	1.83164	.781	-4.1289	7.6022
		Pty-12/13/14	-29.3767*	1.83164	.000	-35.2422	-23.5111
		Pty-15/16/17	-24.9533*	1.83164	.000	-30.8189	-19.0878
	Gov-08/09/10	Gov-05/06/07	-1.7367	1.83164	.781	-7.6022	4.1289
		Pty-12/13/14	-31.1133*	1.83164	.000	-36.9789	-25.2478
		Pty-15/16/17	-26.6900*	1.83164	.000	-32.5556	-20.8244
	Pty-12/13/14	Gov-05/06/07	29.3767*	1.83164	.000	23.5111	35.2422
		Gov-08/09/10	31.1133*	1.83164	.000	25.2478	36.9789
		Pty-15/16/17	4.4233	1.83164	.151	-1.4422	10.2889
	Pty-15/16/17	Gov-05/06/07	24.9533*	1.83164	.000	19.0878	30.8189
		Gov-08/09/10	26.6900*	1.83164	.000	20.8244	32.5556
		Pty-12/13/14	-4.4233	1.83164	.151	-10.2889	1.4422
FinDTA	Gov-05/06/07	Gov-08/09/10	-.0133	.01414	.784	-.0586	.0320
		Pty-12/13/14	.1633*	.01414	.000	.1180	.2086
		Pty-15/16/17	.1800*	.01414	.000	.1347	.2253
	Gov-08/09/10	Gov-05/06/07	.0133	.01414	.784	-.0320	.0586

		Pty-12/13/14	.1767*	.01414	.000	.1314	.2220
		Pty-15/16/17	.1933*	.01414	.000	.1480	.2386
	Pty-12/13/14	Gov-05/06/07	-.1633*	.01414	.000	-.2086	-.1180
		Gov-08/09/10	-.1767*	.01414	.000	-.2220	-.1314
		Pty-15/16/17	.0167	.01414	.656	-.0286	.0620
	Pty-15/16/17	Gov-05/06/07	-.1800*	.01414	.000	-.2253	-.1347
		Gov-08/09/10	-.1933*	.01414	.000	-.2386	-.1480
		Pty-12/13/14	-.0167	.01414	.656	-.0620	.0286
FinTEUs	Gov-05/06/07	Gov-08/09/10	-125964.00*	34444.576	.027	-236267.66	-15660.34
		Pty-12/13/14	-270763.00*	34444.576	.000	-381066.66	-160459.34
		Pty-15/16/17	-352324.67*	34444.576	.000	-462628.32	-242021.01
	Gov-08/09/10	Gov-05/06/07	125964.00*	34444.576	.027	15660.34	236267.66
		Pty-12/13/14	-144799.00*	34444.576	.013	-255102.66	-34495.34
		Pty-15/16/17	-226360.67*	34444.576	.001	-336664.32	-116057.01
	Pty-12/13/14	Gov-05/06/07	270763.00*	34444.576	.000	160459.34	381066.66
		Gov-08/09/10	144799.00*	34444.576	.013	34495.34	255102.66
		Pty-15/16/17	-81561.67	34444.576	.161	-191865.32	28741.99
	Pty-15/16/17	Gov-05/06/07	352324.67*	34444.576	.000	242021.01	462628.32
		Gov-08/09/10	226360.67*	34444.576	.001	116057.01	336664.32
		Pty-12/13/14	81561.67	34444.576	.161	-28741.99	191865.32
FinTonnes	Gov-05/06/07	Gov-08/09/10	-4284335.00*	1224007.902	.033	-8204039.16	-364630.84
		Pty-12/13/14	-9776487.67*	1224007.902	.000	-13696191.83	-5856783.51
		Pty-15/16/17	-5818339.67*	1224007.902	.006	-9738043.83	-1898635.51

	Gov-08/09/10	Gov-05/06/07	4284335.00*	1224007.902	.033	364630.84	8204039.16
		Pty-12/13/14	-5492152.67*	1224007.902	.009	-9411856.83	-1572448.51
		Pty-15/16/17	-1534004.67	1224007.902	.614	-5453708.83	2385699.49
	Pty-12/13/14	Gov-05/06/07	9776487.67*	1224007.902	.000	5856783.51	13696191.83
		Gov-08/09/10	5492152.67*	1224007.902	.009	1572448.51	9411856.83
		Pty-15/16/17	3958148.00*	1224007.902	.048	38443.84	7877852.16
	Pty-15/16/17	Gov-05/06/07	5818339.67*	1224007.902	.006	1898635.51	9738043.83
		Gov-08/09/10	1534004.67	1224007.902	.614	-2385699.49	5453708.83
		Pty-12/13/14	-3958148.00*	1224007.902	.048	-7877852.16	-38443.84
FinNoS	Gov-05/06/07	Gov-08/09/10	128.00*	35.724	.029	13.60	242.40
		Pty-12/13/14	65.33	35.724	.328	-49.07	179.73
		Pty-15/16/17	49.00	35.724	.548	-65.40	163.40
	Gov-08/09/10	Gov-05/06/07	-128.00*	35.724	.029	-242.40	-13.60
		Pty-12/13/14	-62.67	35.724	.359	-177.07	51.73
		Pty-15/16/17	-79.00	35.724	.200	-193.40	35.40
	Pty-12/13/14	Gov-05/06/07	-65.33	35.724	.328	-179.73	49.07
		Gov-08/09/10	62.67	35.724	.359	-51.73	177.07
		Pty-15/16/17	-16.33	35.724	.966	-130.73	98.07
	Pty-15/16/17	Gov-05/06/07	-49.00	35.724	.548	-163.40	65.40
		Gov-08/09/10	79.00	35.724	.200	-35.40	193.40
		Pty-12/13/14	16.33	35.724	.966	-98.07	130.73
EnvoTEC	Gov-05/06/07	Gov-08/09/10	54506.33*	15043.714	.028	6331.07	102681.60
		Pty-12/13/14	107463.33*	15043.714	.000	59288.07	155638.60

		Pty-15/16/17	116978.67*	15043.714	.000	68803.40	165153.93
	Gov-08/09/10	Gov-05/06/07	-54506.33*	15043.714	.028	-102681.60	-6331.07
		Pty-12/13/14	52957.00*	15043.714	.032	4781.73	101132.27
		Pty-15/16/17	62472.33*	15043.714	.014	14297.07	110647.60
	Pty-12/13/14	Gov-05/06/07	-107463.33*	15043.714	.000	-155638.60	-59288.07
		Gov-08/09/10	-52957.00*	15043.714	.032	-101132.27	-4781.73
		Pty-15/16/17	9515.33	15043.714	.919	-38659.93	57690.60
	Pty-15/16/17	Gov-05/06/07	-116978.67*	15043.714	.000	-165153.93	-68803.40
		Gov-08/09/10	-62472.33*	15043.714	.014	-110647.60	-14297.07
		Pty-12/13/14	-9515.33	15043.714	.919	-57690.60	38659.93
EnvoTECO2	Gov-05/06/07	Gov-08/09/10	-771.33	1433.993	.947	-5363.48	3820.82
		Pty-12/13/14	3994.33	1433.993	.090	-597.82	8586.48
		Pty-15/16/17	4902.67*	1433.993	.037	310.52	9494.82
	Gov-08/09/10	Gov-05/06/07	771.33	1433.993	.947	-3820.82	5363.48
		Pty-12/13/14	4765.67*	1433.993	.042	173.52	9357.82
		Pty-15/16/17	5674.00*	1433.993	.018	1081.85	10266.15
	Pty-12/13/14	Gov-05/06/07	-3994.33	1433.993	.090	-8586.48	597.82
		Gov-08/09/10	-4765.67*	1433.993	.042	-9357.82	-173.52
		Pty-15/16/17	908.33	1433.993	.918	-3683.82	5500.48
	Pty-15/16/17	Gov-05/06/07	-4902.67*	1433.993	.037	-9494.82	-310.52
		Gov-08/09/10	-5674.00*	1433.993	.018	-10266.15	-1081.85
		Pty-12/13/14	-908.33	1433.993	.918	-5500.48	3683.82

EnvoTE	Gov-05/06/07	Gov-08/09/10	-43.00*	9.542	.009	-73.56	-12.44
		Pty-12/13/14	69.00*	9.542	.000	38.44	99.56
		Pty-15/16/17	78.00*	9.542	.000	47.44	108.56
	Gov-08/09/10	Gov-05/06/07	43.00*	9.542	.009	12.44	73.56
		Pty-12/13/14	112.00*	9.542	.000	81.44	142.56
		Pty-15/16/17	121.00*	9.542	.000	90.44	151.56
	Pty-12/13/14	Gov-05/06/07	-69.00*	9.542	.000	-99.56	-38.44
		Gov-08/09/10	-112.00*	9.542	.000	-142.56	-81.44
		Pty-15/16/17	9.00	9.542	.784	-21.56	39.56
	Pty-15/16/17	Gov-05/06/07	-78.00*	9.542	.000	-108.56	-47.44
		Gov-08/09/10	-121.00*	9.542	.000	-151.56	-90.44
		Pty-12/13/14	-9.00	9.542	.784	-39.56	21.56

Based on observed means.

 The error term is Mean Square (Error) = 136.583.

*. The mean difference is significant at the .05 level.

Levene's Test of Equality of Error Variances[a] (Trimmed FinCEA)

		Levene Statistic	df1	df2	Sig.
FinROA1	Based on Mean	3.432	3	8	**.072**
	Based on Median	2.114	3	8	.177
	Based on Median and with adjusted df	2.114	3	2.921	.281
	Based on trimmed mean	3.345	3	8	**.076**
FinROA2	Based on Mean	3.108	3	8	.089
	Based on Median	1.955	3	8	.199
	Based on Median and with adjusted df	1.955	3	3.046	.296
	Based on trimmed mean	3.032	3	8	**.093**
FinROE1	Based on Mean	2.586	3	8	.126
	Based on Median	.951	3	8	.461
	Based on Median and with adjusted df	.951	3	5.520	.478
	Based on trimmed mean	2.447	3	8	.139
FinROE2	Based on Mean	2.350	3	8	**.149**
	Based on Median	1.059	3	8	.419
	Based on Median and with adjusted df	1.059	3	5.204	.442
	Based on trimmed mean	2.253	3	8	.159
FinDTA	Based on Mean	.978	3	8	**.450**
	Based on Median	.204	3	8	.891
	Based on Median and with adjusted df	.204	3	6.000	.890
	Based on trimmed mean	.894	3	8	.485
FinTEUs	Based on Mean	4.385	3	8	**.042**
	Based on Median	.937	3	8	.467
	Based on Median and with adjusted df	.937	3	2.905	.523
	Based on trimmed mean	3.995	3	8	.052
FinTonnes	Based on Mean	2.328	3	8	**.151**
	Based on Median	1.276	3	8	.347
	Based on Median and with adjusted df	1.276	3	4.563	.385
	Based on trimmed mean	2.259	3	8	.159
FinNoS	Based on Mean	1.494	3	8	**.288**
	Based on Median	.330	3	8	.804

	Based on Median and with adjusted df	.330	3	4.965	.805
	Based on trimmed mean	1.358	3	8	.323
EnvoTEC	Based on Mean	1.607	3	8	**.263**
	Based on Median	.837	3	8	.511
	Based on Median and with adjusted df	.837	3	4.603	.533
	Based on trimmed mean	1.551	3	8	.275
EnvoTEC O2	Based on Mean	1.699	3	8	**.244**
	Based on Median	1.055	3	8	.420
	Based on Median and with adjusted df	1.055	3	4.339	.455
	Based on trimmed mean	1.659	3	8	.252
EnvoTE	Based on Mean	.359	3	8	**.784**
	Based on Median	.182	3	8	.905
	Based on Median and with adjusted df	.182	3	6.323	.905
	Based on trimmed mean	.345	3	8	.794

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Ownership

Homogeneous subsets- (Trimmed FinCEA)

Subset 1

1

Tukey HSD[a,b]

		Subset	
Ownership	N	1	2
Gov-08/09/10	3	2.48	
Gov-05/06/07	3	4.16	
Pty-15/16/17	3		21.07
Pty-12/13/14	3		25.92
Sig.		.829	**.141**

Means for groups in homogeneous subsets are

displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 5.805.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 2

FinROA2

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	1.6833	
Gov-05/06/07	3	2.5333	
Pty-15/16/17	3		21.0700
Pty-12/13/14	3		25.8900
Sig.		.973	**.153**

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 6.026.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 3

FinROE1

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	4.7600	
Gov-05/06/07	3	8.0733	
Pty-15/16/17	3		29.9033
Pty-12/13/14	3		34.3633
Sig.		.266	**.104**

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 4.137.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 4

FinROE2

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	3.2067	
Gov-05/06/07	3	4.9433	
Pty-15/16/17	3		29.8967
Pty-12/13/14	3		34.3200
Sig.		.781	**.151**

Means for groups in homogeneous subsets are
displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 5.032.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 5

FinDTA

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Pty-15/16/17	3	.2933	
Pty-12/13/14	3	.3100	
Gov-05/06/07	3		.4733
Gov-08/09/10	3		.4867
Sig.		.656	**.784**

Means for groups in homogeneous subsets are
displayed.

 Based on observed means.

 The error term is Mean Square(Error) = .000.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 6

FinTEUs

Tukey HSD[a,b]

Ownership	N	Subset		
		1	2	3
Gov-05/06/07	3	793344.33		
Gov-08/09/10	3		919308.33	
Pty-12/13/14	3			1064107.33
Pty-15/16/17	3			1145669.00
Sig.		1.000	1.000	**.161**

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 1779643176.000.

 a. Uses Harmonic Mean Sample Size = 3.000.

 b. Alpha = .05.

Subset 7

FinTonnes

Tukey HSD[a,b]

Ownership	N	Subset		
		1	2	3
Gov-05/06/07	3	27117548.33		
Gov-08/09/10	3		31401883.33	
Pty-15/16/17	3		32935888.00	
Pty-12/13/14	3			36894036.00
Sig.		1.000	**.614**	1.000

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 2247293016415.167.

 a. Uses Harmonic Mean Sample Size = 3.000.

 b. Alpha = .05.

Subset 8

FinNoS

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2
Gov-08/09/10	3	914.00	
Pty-12/13/14	3	976.67	976.67
Pty-15/16/17	3	993.00	993.00
Gov-05/06/07	3		1042.00
Sig.		**.200**	.328

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 1914.333.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 9

EnvoTE

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
Pty-15/16/17	3	196.33		
Pty-12/13/14	3	205.33		
Gov-05/06/07	3		274.33	
Gov-08/09/10	3			317.33
Sig.		**.784**	1.000	1.000

Means for groups in homogeneous subsets are displayed.

 Based on observed means.

 The error term is Mean Square(Error) = 136.583.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 10

EnvoTEC

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
		1	2	3
Pty-15/16/17	3	164116.00		
Pty-12/13/14	3	173631.33		
Gov-08/09/10	3		226588.33	
Gov-05/06/07	3			281094.67
Sig.		**.919**	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 339469994.250.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Subset 11

EnvoTECO2

Tukey HSD[a,b]

Ownership	N	Subset 1	Subset 2	Subset 3
		1	2	3
Pty-15/16/17	3	12673.33		
Pty-12/13/14	3	13581.67	13581.67	
Gov-05/06/07	3		17576.00	17576.00
Gov-08/09/10	3			18347.33
Sig.		.918	**.090**	.947

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 3084502.250.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = .05.

Appendix 4 continued - Tests for changes in levels of operations controls

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Ownership	Pillai's Trace	2.838	6.551	24.000	9.000	.003

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
	EnvoTEC	26250821016.917	3	8750273672.306	25.776	.000
	EnvoTEC/FinTUEs	.084	3	.028	56.026	.000
	EnvoTEC/FinTonnes	6.139E-5	3	2.046E-5	35.900	.000
	EnvoTECO$_2$	72237538.917	3	24079179.639	7.807	.009
	EnvoTECO$_2$/FinTUEs	.000	3	8.675E-5	28.036	.000
	EnvoTECO$_2$/FinTonnes	1.667E-7	3	5.556E-8	8.333	.008

Dependent Variable	(I) Ownership	(J) Ownership	Mean Difference (I-J)	Std. Error	Sig.
EnvoTEC	Gov-05/06/07	Gov-08/09/10	54506.33*	15043.714	.028
		Pty-12/13/14	107463.33*	15043.714	.000
		Pty-15/16/17	116978.67*	15043.714	.000
	Gov-08/09/10	Gov-05/06/07	-54506.33*	15043.714	.028
		Pty-12/13/14	52957.00*	15043.714	.032
		Pty-15/16/17	62472.33*	15043.714	.014
	Pty-12/13/14	Gov-05/06/07	-107463.33*	15043.714	.000
		Gov-08/09/10	-52957.00*	15043.714	.032
		Pty-15/16/17	9515.33	15043.714	.919
	Pty-15/16/17	Gov-05/06/07	-116978.67*	15043.714	.000
		Gov-08/09/10	-62472.33*	15043.714	.014
		Pty-12/13/14	-9515.33	15043.714	.919
EnvoTEC/ FinTUEs	Gov-05/06/07	Gov-08/09/10	.1095*	.01825	.001
		Pty-12/13/14	.1923*	.01825	.000
		Pty-15/16/17	.2125*	.01825	.000
	Gov-08/09/10	Gov-05/06/07	-.1095*	.01825	.001
		Pty-12/13/14	.0828*	.01825	.008
		Pty-15/16/17	.1030*	.01825	.002
	Pty-12/13/14	Gov-05/06/07	-.1923*	.01825	.000
		Gov-08/09/10	-.0828*	.01825	.008
		Pty-15/16/17	.0203	.01825	.694
	Pty-15/16/17	Gov-05/06/07	-.2125*	.01825	.000
		Gov-08/09/10	-.1030*	.01825	.002
		Pty-12/13/14	-.0203	.01825	.694
EnvoTEC/ FinTonnes	Gov-05/06/07	Gov-08/09/10	.0031*	.00062	.004
		Pty-12/13/14	.0057*	.00062	.000
		Pty-15/16/17	.0053*	.00062	.000
	Gov-08/09/10	Gov-05/06/07	-.0031*	.00062	.004
		Pty-12/13/14	.0026*	.00062	.013
		Pty-15/16/17	.0022*	.00062	.028
	Pty-12/13/14	Gov-05/06/07	-.0057*	.00062	.000
		Gov-08/09/10	-.0026*	.00062	.013
		Pty-15/16/17	-.0003	.00062	.946
	Pty-15/16/17	Gov-05/06/07	-.0053*	.00062	.000
		Gov-08/09/10	-.0022*	.00062	.028
		Pty-12/13/14	.0003	.00062	.946

Dependent Variable	(I) Ownership	(J) Ownership	Mean Difference (I-J)	Std. Error	Sig.
EnvoTECO2	Gov-05/06/07	Gov-08/09/10	-771.33	1433.993	.947
		Pty-12/13/14	3994.33	1433.993	.090
		Pty-15/16/17	4902.67*	1433.993	.037
	Gov-08/09/10	Gov-05/06/07	771.33	1433.993	.947
		Pty-12/13/14	4765.67*	1433.993	.042
		Pty-15/16/17	5674.00*	1433.993	.018
	Pty-12/13/14	Gov-05/06/07	-3994.33	1433.993	.090
		Gov-08/09/10	-4765.67*	1433.993	.042
		Pty-15/16/17	908.33	1433.993	.918
	Pty-15/16/17	Gov-05/06/07	-4902.67*	1433.993	.037
		Gov-08/09/10	-5674.00*	1433.993	.018
		Pty-12/13/14	-908.33	1433.993	.918
EnvoTECO22 FinTUEs	Gov-05/06/07	Gov-08/09/10	.0022	.00144	.452
		Pty-12/13/14	.0094*	.00144	.001
		Pty-15/16/17	.0111*	.00144	.000
	Gov-08/09/10	Gov-05/06/07	-.0022	.00144	.452
		Pty-12/13/14	.0071*	.00144	.005
		Pty-15/16/17	.0088*	.00144	.001
	Pty-12/13/14	Gov-05/06/07	-.0094*	.00144	.001
		Gov-08/09/10	-.0071*	.00144	.005
		Pty-15/16/17	.0017	.00144	.653
	Pty-15/16/17	Gov-05/06/07	-.0111*	.00144	.000
		Gov-08/09/10	-.0088*	.00144	.001
		Pty-12/13/14	-.0017	.00144	.653
EnvoTECO22 FinTonnes	Gov-05/06/07	Gov-08/09/10	.0000	.00007	.957
		Pty-12/13/14	.0003*	.00007	.017
		Pty-15/16/17	.0002*	.00007	.033
	Gov-08/09/10	Gov-05/06/07	.0000	.00007	.957
		Pty-12/13/14	.0002*	.00007	.033
		Pty-15/16/17	.0002	.00007	.067
	Pty-12/13/14	Gov-05/06/07	-.0003*	.00007	.017
		Gov-08/09/10	-.0002*	.00007	.033
		Pty-15/16/17	.0000	.00007	.957
	Pty-15/16/17	Gov-05/06/07	-.0002*	.00007	.033
		Gov-08/09/10	-.0002	.00007	.067
		Pty-12/13/14	.0000	.00007	.957

Ports of Australia
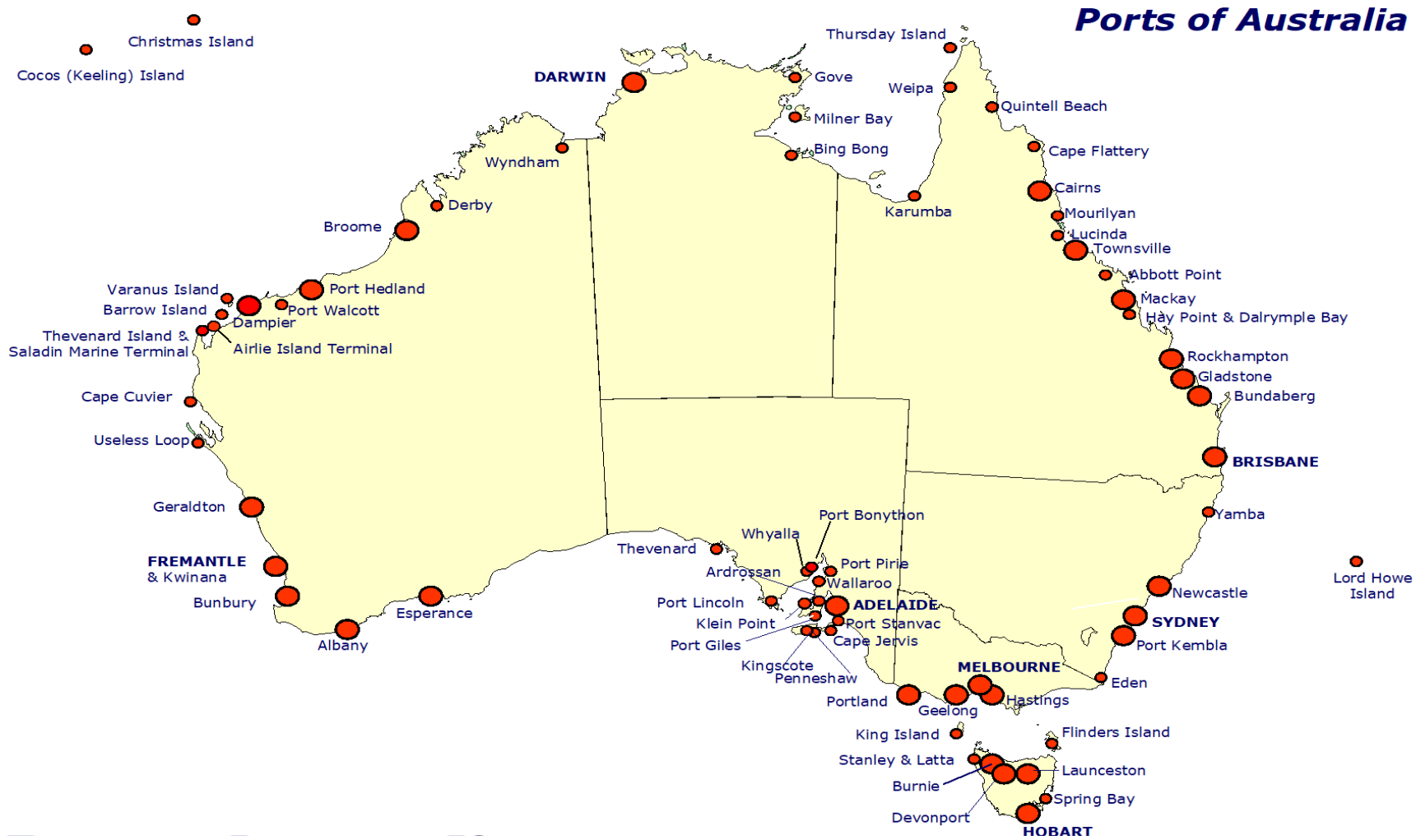
APPENDIX 6. A LIST OF PRIVATISED SOEs IN AUSTRALIA SINCE 1987 TO 2017

Year	Institute	Place	Method	Category	Sale value $m	Total $m
1987	Belconnen Mall Shopping Complex	Aus	T/S	Other	87.00	
	Williamstown Naval Dockyard	Aus	T/S	Manu	102.00	189.00
1988	Commonwealth Accommodation & Catering Services		T/S	Hous	15.00	
	Defence Services House Corp. Loan Portfolio		T/S	Hous	1515.00	1530.00
1989	AMDEL	Aus	T/S	Other	1.00	1.00
1990	Australian Industry Development Corporation-1	Aus	P/F	Fin	25.00	
	NSW Investment Corp.	NSW	T/S	Fin	65.00	
	NSW Egg Corporation	NSW	T/S	Agri	18.52	
	Kooragang Coal Loader	NSW	T/S	Port	20.20	
	Newcastle Wharfside Services	NSW	T/S	Port	18.00	
	Port Kembla Coal Loader	NSW	Lease	Port	2.5	149.22
1991	Australian Defence Force Home Loan Franchise	Aus	T/S	Fin	42.00	
	Commonwealth Housing Loan Assistance Scheme (In the ACT)	Aus	T/S	Fin	47.00	
	AUSSAT	Aus	T/S	Comm	504.00	
	State Bank of Victoria	VIC	T/S	Fin	1300.00	
	Commonwealth Bank-1	Aus	P/F	Fin	1311.00	3204.00
1992	Australian Airlines	Aus	T/S	Avi	400.00	
	Loy Yang B Power Station-1	VIC	T/S	Elec	544.00	
	Portland Smelter Unit Trust	VIC	T/S	Manu	171.00	
	State Insurance Office	VIC	T/S	Fin	125.00	
	Government Insurance Office-GIO	NSW	P/F	Fin	1260.00	
	First State Computing	NSW	T/S	Elec	11.00	
	NSW Grain Corporation	NSW	T/S	Agri	110.00	
	Western Basin Berth 3, Port of Newcastle	NSW	Lease	Port	n/a	
	Maritime Service Board Sydney Ports -Authority pilotage Service	NSW	Lease	Port	n/a	
	Glebe Island Berth 1 & 2, Sydney Ports	NSW	Lease	Port	n/a	
	Darling Harbour Berth 7	NSW	Lease	Port	n/a	2621.00
1993	Commonwealth Bank-2	Aus	P/F	Fin	1686.00	
	Qantas-1	Aus	T/S	Avi	665.00	
	Snowy Mountains Engineering Corp	Aus	T/S	Elec	1.60	
	Heatane Gas	VIC	T/S	Gas	130.00	
	State Insurance Office	TAS	T/S	Fin	42.00	
	NSW Grain Corp.	NSW	T/S	Other	96.00	
	SAGASCO	SA	T/S	Gas	417.00	
	State Statet. Insurance Office	WA	P/F	Fin	165.00	
	Maritimes Services Board Construction & Installation of Signs Business	NSW	T/S	Port	n/a	
	MSB Navigation Beacons Business	NSW	T/S	Port	n/a	
	MSB Waterfront Construction Services	NSW	T/S	Port	n/a	3202.60
1994	Sydney Fish Market	NSW	T/S	Other	5.00	
	SA Finance Trust	SA	T/S	Fin	8.00	
	Veterinary Laboratories	VIC	T/S	Other	2.00	
	Gladstone Power Station	QLD	T/S	Elec	750.00	
	Enterprises Investments	SA	T/S	Fin	38.00	
	Austrust Trustees	SA	T/S	Other	44.00	
	State Bank of NSW	NSW	T/S	Fin	250.00	
	Moomba-Sydney Pipeline	Aus	T/S	Gas	534.00	
	Commonwealth Serum Laboratories	Aus	P/F	Other	299.00	
	Grain Elevators Board	VIC	T/S	Other	52.00	
	BASS	VIC	T/S	Other	3.00	
	Pipeline Authority of SA	SA	T/S	Gas	304.00	
	Government Cleaning Services	NSW	T/S	Other	n/a	
	School Furniture Complex	NSW	T/S	Edu	5.35	2294.35

	Qantas-2	Aus	P/F	Avi	1450.00	
	VicRoads Equipment Supply Division	VIC	T/S	Other	60.00	
	TabCorp	VIC	P/F	Gamb	609.00	
	Port of Geelong	VIC	T/S	Trans	51.00	
	United Energy	VIC	T/S	Elec	1553.00	
	GFE Resources	VIC	T/S	Other	56.00	
	Solaris Power	VIC	T/S	Elec	950.00	
	Powercor	VIC	T/S	Elec	2150.00	
	Eastern Energy	VIC	T/S	Elec	2080.00	
	Citipower	VIC	T/S	Elec	1575.00	
1995	State Printing Division	WA	T/S	Other	n/a	
	Island Seaway	SA	T/S	Trans	3.00	
	Aerospace Technologies of Australia	Aus	T/S	Manu	40.00	
	Port of Portland	VIC	T/S	Trans	30.00	
	State Statet. Insurance Office	SA	T/S	Fin	175.00	
	Bank West	WA	T/S	Fin	900.00	
	Forwood Products- Timber	SA	T/S	Other	123.00	
	Gumly Gumly Irrigation District	NSW	M/T	Agri	n/a	
	Jemalong Wyldes Plains Irrigation Lts	NSW	M/T	Agri	n/a	
	Lower Murray Irrigation Areas Ltd	NSW	M/T	Agri	n/a	
	Murray Irrigation Ltd	NSW	M/T	Agri	n/a	**11805.00**
	Commonwealth Bank-3	Aus	P/F	Fin	3390.00	
	Commonwealth Funds Management	Aus	T/S	Fin	63.00	
	Radio 5 AA	SA	T/S	Comm	8.00	
	Sign Services	SA	T/S	Other	0.30	
	State Chemistry Laboratory	SA	T/S	Other	0.05	
	State Clothing	SA	T/S	Other	2.00	
1996	Yalloum Energy	VIC	T/S	Elec	2428.00	
	Hazelwood Energy Brix	VIC	T/S	Elec	2400.00	
	State Bank of SA	SA	T/S	Fin	720.00	
	Aximo Funds Management	NSW	T/S	Fin	240.00	
	Loy Yang A	VIC	T/S	Elec	4746.00	
	Hay Irrigation District	NSW	M/T	Agri	n/a	**13997.35**
	Australian Industry Development Corp.-2	Aus	T/S	Fin	200.00	
	Commonwealth Bank-4	Aus	P/F	Fin	1779.00	
	Loy Yang B Power Station-2	VIC	T/S	Elec	1150.00	
	Healthcare Linen	WA	T/S	Other	14.00	
	Samcor	SA	T/S	Other	8.00	
	Port Bulk Handling Services	SA	T/S	Trans	17.00	
	Suncorp-QLD Industry Development Group	QLD	T/S	Fin	698.00	
	Suncorp-Metway Ltd	QLD	P/F	Fin	610.00	
	Powernet	VIC	T/S	Elec	2555.00	
	Brisbane Airport	Aus	T/S	Avi	1387.00	
1997	Melbourne Airport	Aus	T/S	Avi	1307.00	
	Perth Airport	Aus	T/S	Avi	643.00	
	Australian National Railways	Aus	T/S	Tran	95.00	
	Avalon Airport-Geelong	VIC	T/S	Avi	1.50	
	DASFLEET & Businesses	Aus	T/S	Trans	437.00	
	Housing Loan Insurance Corp.	Aus	T/S	Fin	108.00	
	State Gas Pipeline	QLD	T/S	Gas	163.00	
	Southern Hydro	VIC	T/S	Elec	391.00	
	Telstra-1	Aus	P/F	Comm	14330.00	
	Sydney Market Authority	NSW	T/S	Fin	0.63	
						25893.50

Year	Entity	Region	Type	Sector	Value	Total
1998	Victoria Plantations Corp.	VIC	T/S	Other	550.00	
	Adelaide & Parafield Airports	Aus	T/S	Avi	362.00	
	Darwin, Tennent Creek & Alice Spring Airports	Aus	T/S	Avi	110.00	
	Australian Multimedia Enterprises	Aus	T/S	Comm	43.00	
	ANL	Aus	T/S	Trans	31.00	
	Totalisator Agency Board	NSW	P/F	Gamb	1017.00	
	Canberra Airport	Aus	T/S	Avi	65.00	
	Coolangatta Airport	Aus	T/S	Avi	106.00	
	Launceston Airport	Aus	T/S	Avi	18.00	
	Townsville & Mount Isa Airports	Aus	T/S	Avi	16.00	
	Moorabbin Airport	Aus	T/S	Avi	8.00	
	Jandakot Airport	Aus	T/S	Avi	7.00	
	Archerfield Airport	Aus	T/S	Avi	3.00	
	Dampier-Bunbury Gas Pipeline	Aus	T/S	Gas	2303.00	
	Auscript	Aus	T/S	Other	1.10	
	Aluvic	Aus	T/S	Manu	502.00	
	Australian National Lines	Aus	T/S	Trans	21.00	5146.10
1999	Telstra-2	Aus	P/F	Comm	16000.00	
	National Transmission Network	Aus	T/S	Elec	650.00	
	Ecogen	Vic	T/S	Elec	360.00	
	QLD Totalisator Agency Board	QLD	T/S	Gamb	268.00	
	V-Line Freight	VIC	T/S	Trans	194.00	
	Gascor	VIC	T/S	Gas	29.00	
	ETSA Transmission	SA	T/S	Elec	3500.00	
	Westar/ Kinetik	VIC	T/S	Gas	1630.00	
	Milinet/ Ikon	VIC	T/S	Gas	1970.00	
	Gasnet	VIC	T/S	Gas	1025.00	
	ADI	Aus	T/S	Manu	347.00	
	Murrumbidgee Irrigation Ltd	NSW	M/T	Agri	n/a	25973.00
2000	Removals Australia	Aus	T/S	Other	14.00	
	NT Totalisator Agency Board	Aus	T/S	Gamb	8.00	
	Broadcast Australia	Aus	T/S	Comm	650.00	
	Coleambally Irrigation Ltd	NSW	M/T	Agri	n/a	
	ElectraNet	SA	T/S	Elec	938.00	
	Torrens Island Power Station	SA	T/S	Elec	295.00	
	Alinta Gas	WA	P/F	Gas	971.00	672.00
2001	Essendon Airport	VIC	T/S	Avi	22.00	22.00
2002	SA Totalisator Agency Board	Aus	T/S	Gamb	44.00	
	National Rail Corp. & Freight Corp.	Aus	T/S	Trans	1050.00	
	Sydney Airport	Aus	T/S	Avi	5588.00	
	FreightCorp	NSW	T/S	Avi	669.00	
	Integral Energy Gas Pty Ltd	NSW	T/S	Gas	2.10	
	Powercoal Pty Ltd	NSW	T/S	Gas	323.60	6682.00
2003	Bankstown, Camden & Hoxton Park Airports	Aus	T/S	Other	211.00	
	Pacific Power (International) Pty Ltd	Aus	T/S	Avi		
		NSW	T/S	Elec	n/a	211.00
2004	Plug & Power (Pacific Solar Pty Ltd)	NSW	T/S	Elec	n/a	
	Pacific Solar Pty Ltd (Low cost solar cell)	NSW	T/S	Elec	n/a	-
2005	Statet. Printing Corp.	NSW	T/S	Other	5.00	
	Q stores & CM Solutions	NSW	T/S	Other	38.00	43.00
2006	Telstra-3	Aus	P/F	Comm	15400.00	
	DirectLink	NSW	T/S	Elec	170.00	
	Allgas Energy	QLD	T/S	Gas	535.00	
	Sun Retail	QLD	T/S	Elec	1200.00	
	Sun Gas	QLD	T/S	Gas	75.00	
	Emmlink (Country Energy)	NSW	T/S	Elec	85.00	17465.00
2007	Powerdirect	QLD	T/S	Elec	1200.00	
	Hobart Airport	Aus	T/S	Avi	350.00	
	ComLand	Aus	T/S	Other	165.00	
	Energy Australia Pty Ltd	NSW	T/S	Gas	207.00	1922.00

Year	Entity	State	Method	Sector	Value	Total
2010	NSW Lotteries	NSW	T/S	Gamb	1008.00	
	Country Energy-Gas Network	NSW	T/S	Gas	109.00	
	QR National	QLD	P/F	Trans	6222.00	
	Port of Brisbane	QLD	T/S	Trans	2100.00	**9439.00**
2011	Energy Australia	NSW	T/S	Elec	2035.00	
	Integral Energy & Country Energy-Retail Electricity	NSW	T/S	Elec	3250.00	
	WSN Environmental Solutions	NSW	T/S	Infra	234.00	**5519.00**
2012	SA Lotteries Commission	SA	T/S	Gamb	427.00	
	TOTE Tasmania	TAS	T/S	Gamb	103.00	
	Sydney Desalination Plant	NSW	T/S	Other	2072.00	**2602.00**
2013	Delta Electricity Power Stations	NSW	T/S	Elec	142.00	
	Port Botany	NSW	Lease	Port	4310.00	
	Port Kembla	NSW	Lease	Port	760.00	
	Eraring Energy	NSW	T/S	Elec	657.00	
	Mt. Piper & Wallerawang Power Stations	NSW	T/S	Elec	475.00	**6344.00**
2014	Port of Newcastle	NSW	Lease	Port	1075.00	
	Green State Power	NSW	T/S	Elec	72.00	
	Bayswater & Liddell Power Stations	NSW	T/S	Elec	1505.00	
	Hunter Water Australia	NSW	T/S	Water	6.82	
	Colongra Power Station	NSW	T/S	Elec	233.00	**2891.82**
2015	M7 Rental Payments	NSW	T/S	Other	174.20	
	Vales Point Power Station	NSW	T/S	Elec	21.30	
	Kooragang Island Advance Water -Treatment Plant	NSW	T/S	Water	35.50	
	Transgrid	NSW	Lease	Elec	10273.00	**10504.00**
2016	Brown Mountain Hydro Power Station & -Cochrane Dam	NSW	T/S	Elec	4.50	
	AusGrid	NSW	Lease	Elec	16.20	
	Construction Services Group NSW Public Works	NSW	T/S	Other	0.81	
	Pillar Superannuation Administration	NSW	T/S	Other	35.00	**56.51**
2017	Titling & Registry of Land & Property Information	NSW	Lease	Other	2600.00	
	Endeavour Energy	NSW	Lease	Elec	7624.00	**10224.00**

T/S-Trade Sale, P/F-Public Offer, L-Licence, M/T-Management Transfer

Sources: Reserve Bank of Australia Bulletin December 1997, Issues Backgrounder NSW 2017