

Port institutional responses and sustainability performance:  
A moderated mediation model

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## Port institutional responses and sustainability performance: A moderated mediation model

### **Abstract**

Drawing on the theory of institution, this research investigated the effects of institutional responses, employees' sustainability behavior, and sustainability transformational leadership on sustainability performance at seaports. Data were collected from 296 employees of port corporations in Taiwan, and a moderated mediation model was developed. Using exploratory and confirmatory factor analyses, this study identified four port institutional response dimensions: coercive policy, normative training, communication, and motivation. The results showed that sustainability transformational leadership, employees' sustainability behavior, and port institutional responses positively affect sustainability performance. Employees' sustainability behavior plays a mediating role between sustainability transformational leadership and sustainability performance. Specifically, this study found that port institutional responses play a moderated mediation effect on the relationship between sustainability transformational leadership and sustainability performance through employees' sustainability behavior. Lastly, implications for port sustainability practices and institution theory are discussed.

**Keywords:** Port institution; Sustainability transformational leadership; Employee sustainability behavior; Sustainability performance

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## 1. Introduction

Ports play an important role in supply chains and contribute to the economic development of countries, however, they have significant impacts on the environment, health, and quality of life in communities near the port regions (Chang and Lai, 2017; Lim et al., 2019; UNCTAD, 2019). Pollution from vessels burning dirty bunker and port cranes burning diesel significantly impacts air quality and the health of local residents. For example, ocean-going vessels (OGVs), locomotives, and harbor craft made up 84.7% of particulate matter emissions among all port-related sources at the Port of Los Angeles in 2018. Approximately 93.2% of SO<sub>2</sub> emissions came from OGVs, which also accounted for the majority of NO<sub>2</sub> emissions (44.3%), CO emissions (11.7%), and hydrocarbon emissions (31.3%) (The Port of Los Angeles, 2019). These pollutants increase the risks of lung cancer, asthma, cardiovascular disease, and premature death. According to estimations from the California Air Resources Board (2009), on average, 3,700 premature deaths per year can be related to fine particulate matter exposure from port activities and goods movement. Around 120 deaths per year are due to diesel particulate matter emissions from operations at the Port of Long Beach and Port of Los Angeles. The economic cost associated with premature deaths and hospitalizations is forecasted to be \$22 billion between 2021 and 2032 (United States Environmental Protection Agency, 2019).

Sustainability in the port sector has spurred increasing concern and growing attention among port authorities (IAPH, 2019) and researchers (Acciaro et al., 2014; Lu et al., 2016; Schipper et al., 2017; Oh et al., 2018; Ashrafi et al., 2019; Lim et al., 2019; Phan et al., 2021). Most research efforts in studying port sustainability have focused on sustainability practices and performance (Lu et al., 2016; Schipper et al., 2017; Oh et al., 2018; Lim et al., 2019) and their contribution to port operations performance, but only a few have explored the impact of port institution and organizational leadership on sustainability performance. Institutional theory refers to the processes by which certain social structures are recognized as defining and recommending social behaviors by an organization (Acciaro, 2015). DiMaggio and Powell (1983) developed institutional theory based on network connections that transmit normative or coercive pressures from institutional agents such as mimetic influences stemming from related or similar organizations. Scott (2005) contributed to the theory of institution and emphasized the effects of institution on organizational structure and its connections with organizational strategy, entrepreneurship, human resources, organizations, and the natural environment. The theory of institution focuses on legitimation and accepts that organizations and individuals within a firm seek perception and are formed constantly by traditions and habits (Acciaro, 2015). Thus, institutional theory is an important foundation as seen in the literature for explaining why ports are motivated to execute sustainability practices (Wong et al., 2009; Santos et al., 2016; Vejvart et al., 2018).

Sustainability practices tend to be more complex tasks for organizational leadership to respond to the concerns of multiple stakeholders, both inside and outside the business. Ports are more likely to use these practices, due to different types of operations, locations, environment, and risks of incidents (Santos et al., 2016). A leader's sustainability behavior in a firm can affect the behavior of subordinates. When a leader involves in sustainability activities, it can impact others to use the same practices, and this may create a pattern of sustainability behavior. Sustainability transformational leadership (SL) is a leader's behaviors that have the intention and effect of helping people to achieve social or environmental outcomes. There is thus a need for a theoretical assessment on how sustainability transformational leadership affects employees' behavior and sustainability performance.

Despite a growing number of prior studies examining sustainability practices (Acciaro et al., 2014; Santos et al., 2016; Vejvart et al., 2018) and sustainability performance (Lu et al., 2016; Schipper et al., 2017; Oh et al., 2018; Ashrafi et al., 2019; Lim et al., 2019), only a very few have discussed sustainability transformational leadership and employee behavior in the port sector. Thus, the questions that need to be addressed are: What are the crucial institutional response factors that impact the implementation of sustainability practices at ports? What is the role of sustainability transformational leadership in port operations? How do port institutional responses and sustainability transformational leadership influence employees' behaviors and the success of port sustainability? We answer these questions by investigating the influence of institutional responses and sustainability transformational leadership on employees' sustainability behaviors and the performance of sustainability in the port sector. Specifically, this research examines the moderating role of port institutional responses in the linkage between sustainability transformational leadership, employee behavior, and sustainability performance.

The remainder of this paper runs as follows. Section 2 describes the theoretical background for the development of research hypotheses. Specifically, we address the theory of institution, the definition of port sustainability, sustainability performance, and sustainability transformational leadership. Section 3 explains the methodology, including data collection, measures, and analytical methods. Section 4 presents the empirical results from the analyses. Section 5 offers a conclusion, implications, and the limitations of this study and future research.

## 2. Theoretical background and hypotheses' development

### 2.1 The theory of institution

The theory of institution has risen to prominence as an important and useful explanation to organizational and individual behaviors (Dacin et al., 2002). Institutions can be

defined as the formal rules of a society, which are the humanly devised constraints that result in organizational human interaction. North et al. (2014) emphasized the relationship between institutions and organizations and further explored specifically the role of institutions as the rules of the game and the role of organizations as agents of institutional change.

From an organization theory perspective, the important implication is that each institution is associated with distinctive prescriptions of organizational archetypes and leaderships (Greenwood et al., 2014). The theory of institution has been commonly used in the management literature and has recently begun to be applied in port sustainability and operations. Wong et al. (2009) used the theory of institution to examine institutional pressures and mindful IT management in a container terminal. They discovered that the main institutional forces are from customers, customs, and competitors. Acciaro (2015) reviewed the extant studies on corporate responsibility at ports based on the theory of institution. Results indicated that the development of corporate responsibility in the port sector has a strong effect via normative and mimetic structures. When environmental regulations are reinforced, ports will emphasize corporate responsibility issues. Vejvar et al. (2018) adopted the theory of institution to investigate the influence of five institutional antecedents from inland port operations: cause, content, constituents, context, and control.

Prior studies have explored the role of leadership with the upper echelons theory (UET) (Dubey et al., 2019) and the commitment of top management as a crucial driving force to the success of sustainability (DiMaggio and Powell, 1983; Liang et al., 2007; Colwell and Joshi, 2013; Dubey et al., 2016; Dubey et al., 2019). Top management commitment is identified by various scholars as a prerequisite for the implementation of sustainable practices. Institutional theory explains how isomorphism influences sustainability behaviour, however, diverse sustainability behaviour occurs under similar institutional arrangements (Dubey et al., 2016). A rich body of research suggests top management commitment, with a particular focus on the impacts of institutional pressure on organizational performance and sustainable supply chain practices (DiMaggio and Powell, 1983; Acciaro, 2015; Dubey et al., 2015), such as coercive forces, mimetic forces, normative forces, and competitive structure (Acciaro, 2015).

Previous studies focused specifically on the top management committee (e.g., top management participation and top management belief) as an important variable to explain organizational performance (Colwell and Joshi, 2013), supplier-relationship management (Dubey et al., 2019), and information sharing in sustainable consumption and production implementation (Dubey et al., 2016). Given that many interactions and communications between leaders and employees in an organization tend to occur in the relationship of “interpersons”, we suggest that leadership is considered as one of the most critical factors to stimulate employee sustainability behaviour and performance,

particularly transformational leadership (Singh et al., 2020). More specifically, sustainability transformational leadership is defined as behaviours of leaders who motivate employees to achieve sustainability goals and inspire employees to perform beyond expected levels of sustainability performance (Chen and Chang, 2013). To the best of our knowledge, it seems relative little literature that examines how sustainability leadership influences employees' sustainability behavior in the port sector. Therefore, this study investigated the relationships among sustainability leadership, employee sustainability behavior, institutional response, and sustainability performance based on institutional theory.

## 2.2 Research hypotheses

### 2.2.1 *Sustainability transformational leadership and employees' sustainability behavior*

From the conceptual model displayed in Figure 1, transformational leadership plays an important role in delivering values and norms that further help their subordinates to achieve individual performance (Graves et al., 2013). Transformational leadership stimulates the intellectual thinking that motivates employees to find new ways to face challenges and solve problems, and thus they will be more devoted to completing the organizational vision (Jiang et al., 2017). Extending the traits of transformational leadership to leadership on the sustainability issue, we expect leaders who exhibit *sustainability transformational leadership* to transform a clear and coherent sustainability vision to their area of responsibility. They might act as a role model for employees by expressing their value and mission, discussing the importance of sustainability and committing to take actions to resolve sustainability problems. They might inspire and motivate employees to work in a more environmentally sustainable way, inform employees what must be done in the future, and foster confidence in employees' work capabilities (Graves et al., 2013). Singh et al. (2020) addressed that green transformational leadership in an organization plays a vital aspect in the formulation of supportive green practices to inspire, stimulate, and motivate employees to achieve organizational goals. Accordingly, this research proposes the following hypothesis.

H1: Sustainability transformational leadership positively influences employees' sustainability behavior in the port sector.

### 2.2.2 *Sustainability transformational leadership and sustainability performance*

A growing number of prior studies and technical reports have demonstrated and developed crucial sustainability performance in the port sector (Hiranandani, 2014). There are three general sustainability metrics in port operations: environmental, economic, and social. Regarding the environmental metric, indicators consist of air

quality, greenhouse gas emissions, soil and land resources, debris, light, noise problems, water, and climate change (Chang and Wang, 2012; Shiau and Chuang, 2015; Lu et al., 2016; Chang and Lai, 2017; Oh et al., 2018; Lim et al., 2019). On the other hand, sustainability indicators with respect to the economic metric include benefits to port users, fair competition, employment, local area economic development, tourism, and port investment (Lu et al., 2016; Oh et al., 2018; Lim et al., 2019). Performance indicators with respect to the social metric have been identified as population growth, port area availability, security and safety, and neighboring relationships (Lu et al., 2016; Oh et al., 2018; Lim et al., 2019).

Numerous studies have demonstrated the positive association between sustainability transformational leadership and sustainability performance (Jiang et al., 2017; Singh et al., 2020; Yuen et al., 2019). Sustainability transformational leadership provides support, encourage employees to resolve problems using an innovative way, and promote a view (Chen and Chang, 2013). Sustainability transformational leadership motivates employees to involve and engage in sustainability practices and process innovation to improve organizational sustainable development (Boiral et al., 2014; Chen and Chang, 2013; Chen et al., 2014; Lin et al., 2014; Singh et al., 2020). Chen and Chang (2013) found that green transformational leadership positively influences both green innovation and green performance. Lin et al. (2014) explored that green leadership provides support and vision and positively influences competitive advantage and economic and environmental performances. Yuen et al. (2019) found that sustainable shipping management leads the increase of business performance among shipping companies. Singh et al. (2020) demonstrated the indirect effect of green transformational leadership on environmental performance in the manufacturing sector. Specifically, numerous studies in the logistics and supply chain literature suggested an important linkage between sustainability transformational leadership and sustainability performance. Firms often adopt a style of transformational leadership that is incentivized, inspired, and intellectually stimulating and that creates a shared vision, which tends to encourage the implementation of sustainability initiatives (Alinaghian et al., 2020) and plays a vital role at promoting their sustainability performance (Defee et al., 2009; Kähkönen et al., 2018). Consistent with the theoretical support discussed above, we therefore propose the following hypothesis.

H2: Sustainability transformational leadership positively influences sustainability performance in the port sector.

### *2.2.3 Employees' sustainable behavior and sustainability performance*

Employees' behaviors and involvement at work play a crucial role in driving sustainable development within an organization (Norton et al., 2014; Carmeli et al., 2017; Freese et al., 2019). Norton et al. (2014) explored that green behavior in the workplace can be divided into *required* and *voluntary*. *Required green behavior* refers

to green behavior acted within the area of individuals' required job duties, whereas *voluntary green behavior* involves individual initiative that is higher than organizational expectations. Individual green behavior is positively associated with green performance (Norton et al., 2014). In the context of work organizations, we expand the concept of employees' green behavior, which is only defined based on the present job to satisfy one's present needs. In the context of this study, we define sustainability behaviors as "the extent to which one makes an effort and acts to enhance organization-related sustainability actions" (Carmeli et al., 2017). Accordingly, we posit the following hypothesis.

H3: Employees' sustainability behavior positively influences sustainability performance in the port sector.

#### *2.2.4 Port institutional response and sustainability performance*

Drawing on the theory of institution, responses to institution in the port sector consist of coercive isomorphism, normative training, communication, mimetic isomorphism, and motivation (DiMaggio and Powell, 1983; Acciaro, 2015; Santos et al., 2016; Vejvar et al., 2018). Coercive isomorphism is the outcome of pressure from governmental regulation or international conventions (DiMaggio and Powell, 1983; Akpinar and Sahin, 2020). Gillman (2003) explored that port policy is brought into line with government policy for sustainable development. Acciaro (2015) proposed that when government emphasizing national and international regulations related to environmental management, port authorities might participate in corporate responsibility.

Normative training refers to the norms that are developed by the approach through which individuals are educated and trained or by codes that are adopted for achieving certifications and standards (Acciaro, 2015). Tsai et al. (2017) found that employee training has a positive impact on green innovation and green performance. Green training is vital in the quality management, ethical compliance, safety assurance, and organizational environmental sustainability of organizations. Sustainability communication refers to the communication of environmental, economic, and social issues by a firm to its employees, shareholders, and managers (Santos, 2016). Santos (2016) showed that communication is important to drive the success of sustainability practices in European seaports. If organizations maintain close contact with external interested parties (i.e., governments, environmental groups, social media, and communities), then they will be able to achieve good environmental performance and reduce environmental risks. It is therefore vital to communicate with governments and non-governmental organizations regarding green and environmental protection.

Despite coercive isomorphism, mimetic isomorphism and sustainability motivation are also vital for organizations to act behaviors and operations that are



similar to those acted by other equal organizations (Acciaro, 2015). Mimetic isomorphism is derived from environmental uncertainty. It is the result of imitative behaviors that organizations implement in view of the perceived pressure from competitors even though they are uncertain about their success (DiMaggio and Powell, 1983). The more certain that sustainability activities are recognized and implemented among different ports, whether they are relevant to sustainability, the more likely that such activities will be adopted by other port operators. One example is the use of the certification of EcoPort or Green Port in the brochures or newsletter.

Sustainability motivation of an organization, referring to is a clear linkage between specific practices and rewards that are comprehensible and fair to the workers, indicates the individual's contribution to the organization. Appraisal and rewards are possible ways to motivate employees' sustainability behaviors and reinforce their work attitudes. Therefore, if the network between actions and rewards shows a clear policy to sustainability issues, then it can motivate workers to pursuit for effective solutions to improve the performances of social, economic, and environmental issues. Accordingly, this research proposes the following hypothesis.

H4: Institution response positively influences sustainability performance in the port sector.

#### *2.2.5 Sustainability transformational leadership and sustainability performance: the mediating role of employees' sustainability behavior*

A rich number of previous studies has suggested that transformational leadership plays an important role within an organization (Graves et al., 2013). Transformational leadership drives employees' sustainability behavior to engage in increasing sustainability performance through intellectual stimulation and inspiration motivation (Singh et al., 2020). Graves et al. (2013) posited that environmental transformational leadership positively affects employees' behaviors such as autonomous motivation and external motivation to perform pro-environmental behavior. Singh et al. (2020) also proposed that green human resource management practices have a mediating effect on the relationship between green transformational leadership and environmental performance. Accordingly, we suggest that employee sustainability behavior can be influenced and controlled by sustainability transformational leadership, whereas employee sustainability behavior is positively associated with the success of sustainability practices. Thus, we hypothesize the following.

H5: Employees' sustainability behavior mediates the relationship between sustainability transformational leadership and sustainability performance in the port sector.

#### *2.2.6 Moderating effect of port institution*

As mentioned earlier, the theory of institution plays an vital role in the fields of port

operations and management (Acciaro, 2015; Vejvar et al., 2018). According to Acciaro (2015), institutional theory suggests that external forces motivate port operators to undertake strategic actions in order to meet the requirements of environment, social, and economic issues. Under institutional theory, port operators are not only profit-seeking organizations, but also need to recognize the importance of achieving environmental and social legitimacy. Thus, port institution acts as a driver for successful sustainability practices. Government and regulatory pressures, including environmental and social pressures, help an organization to influence its sustainability policy and behaviors.

Numerous prior studies have addressed the moderating role of institution pressures. Wong et al. (2009) explored the moderating effect of institutional pressures in the practices of green supply chain management. Dubey et al. (2015) found that institutional pressures have moderation effects on the relationship between total quality management and environmental performance, as well as the relationship between supplier relationship management and environmental performance. Previous studies in the port sectors also pointed out that institutional pressures such as coercive, normative, and mimetic pressures will strengthen the adoption of corporate responsibility and sustainability practices (Acciaro, 2015; Santos et al., 2016; Vejvar et al., 2018). Accordingly, we therefore arrive at the next hypotheses.

H6: Institutional response moderates the impact of sustainability transformational leadership on sustainability performance in the port sector.

H7: Institution response moderates the impact of employees' sustainability behavior on sustainability performance in the port sector.

#### *2.2.7 Moderating mediation effect of port institution*

Through Hypotheses 1 and 3, we assume that employees' sustainability behavior (EB) mediates the relationship between SL and SP and that port institution moderates the relationship between EB and SP. In general, the proposed moderating impact of port institution should impact this mediation - that is, the mediating effect of EB between SL and SP, and the interaction between EB and PI influencing SP. When port institution is high, SL will contribute essentially to increased EB, promoting to more SP. Conversely, when port institution is low, SL will lead a lesser reduction in EB, causing to a lesser gain in SP. Thus, the reinforce of the indirect relationship SL on SP through EB will differ relying on the level of port institution, exploring an effect of moderated mediation between the variables. We therefore posit the following.

H8: Institutional response moderates the mediating effect of sustainability transformational leadership on sustainability performance through employees' sustainability behavior in the port sector, so that the indirect effect will be stronger among employees with high port institution.

### 3. Methodology

#### 3.1 *Sample*

This research is comprised of respondents working within the Taiwan International Ports Corporation (TIPC). TIPC includes four subsidiary corporations: Kaohsiung, Keelung, Taichung, and Hualien. In total, 350 questionnaires were distributed to participants. We received 209 questionnaires from the first wave. Two weeks later, we sent the second wave of questionnaire to those non-respondents. We received an additional 87 questionnaires. Thus, there were 296 valid questionnaires collected. The response rate was 84.57%.

Table 1 indicates that 35.1% of respondents were from the Port of Kaohsiung. Respondents with 5 years or less working of experience accounted for 44.6% of the sample, while those with 21 years or more of working experience accounted for 40.9%. Nearly 80% of respondents were clerks and assistant administrators. Respondents from departments relating to green port operation (for example, labor safety, port administration, warehousing, and field operations) accounted for 47.2% of the sample, while 28.4% of respondent came from the operating department. Since almost half of the respondents came from labor safety and warehousing departments, they were knowledgeable in green port operations and sustainability institution and therefore well able to answer the questions.

<Insert Table 1 about here>

#### 3.2 *Non-response bias test*

This study utilized cross-sectional data gathered by using a survey based instrument. Non-response bias could occur when respondents participating in a survey are inherently different from respondents who do not participate (Armstrong and Overton, 1977; Wagner and Kemmerling, 2010). A non-response bias test was conducted using *t*-tests (Armstrong and Overton, 1977; Dubey et al., 2016). The 296 respondents were therefore categorized into two groups in terms of their response waves (first:  $n = 209$ , 70.6% and second:  $n = 87$ , 29.4%). We found no difference at a 1% significance level between these two groups. Thus, we confirmed that non-response bias was not an issue in this study.

#### 3.3 *Measure*

Drawing on prior studies, sustainability transformational leadership was assessed using 8 items adapted from Chen and Chang (2013). For the measures of institution, four constructs consisting of 23 items were adapted from previous studies (Acciaro, 2015; Norton, et al. 2015; Santos et al., 2016; Tsai et al., 2017; Vejvar et al., 2018) – namely, coercive policy, normative training, communication, and motivation. Regarding employees' sustainability behavior measures, 6 items were derived from

Norton et al. (2015), while 6 sustainability performance measures were adapted from Shiau and Chuang (2015) and Zhu et al. (2007). All items were measured based on a five-point Likert scale that ranged from 1 “strongly disagree” to 5 “strongly agree.”

### *3.4 Common method bias*

Following the studies of Podsakoff et al. (2003) and Liang et al. (2007), we performed statistical analyses to examine the issue of common method bias (CMB) (Ketokivi and Schroeder, 2004; Guide and Ketokivi, 2015). First, a Harmon one-factor test (Podsakoff et al., 2003; Liang et al., 2007) was conducted based on the four variables in the conceptual model, including sustainability leadership, employee sustainability behavior, port institutional response, and sustainability performance. Results from this analysis showed that all four factors are present, and the most covariance explained by one factor is 48.53%. The variance should be ideally less than 50% (Dubey et al., 2019). However, using the Harman’s test is an inferential tool to test common method bias (Guide and Ketokivi, 2015). Furthermore, following the research of Podsakoff et al. (2003) and Liang et al. (2007), we examined the main constructs’ indicators and analyzed each indicator’s variance explained by the main construct. The results indicate that the average explained variance of the substantive factor loading is 0.603, whereas the average method-based variance is 0.082 (see Appendix A). The ratio of substantive variance to method variance is 7.3:1. We concluded that the influence of CMB on our statistical analyses is not a serious concern.

## 4. Empirical Analysis Results

### *4.1 Exploratory factor analysis (EFA)*

In order to ascertain the dimensionality, exploratory factor analysis was conducted to identify the items of all constructs to a single factor. Table 2 shows that there is a single factor in each block with relatively high loading. The loadings of the sustainability transformational leadership block ranged from 0.847 to 0.902, while the loadings of employees’ sustainability behavior block ranged from 0.809 to 0.895. The loadings of the items under sustainability performance were between 0.829 and 0.922. Moreover, this study is based on the theory of institution to identify the factors that influence the performance of sustainability. Table 3 shows the results of EFA using the oblique rotation method with Oblimin. The number of factors identified was based on the eigenvalue for each factor, which should be greater than one and the cumulative percent of variation explained (Hair et al., 2010; Iacobucci and Churchill, 2018). The resulting exploratory solution indicates a four-factor solution, including coercive policy, normative training, communication, and motivation. Table 3 shows that items loaded greatly on their intended factors as the lowest factor loading stood at 0.651. The percentages of variance accounted for the four factors were 20.80, 20.49, 15.83, and 15.56. These four factors accounted for 75.99% of the variance.

The Cronbach's alpha value for each factor is shown in Table 2 and Table 3. The reliability value for each factor was well above the value of 0.915, which is recognized as satisfactory for basic research (Hair et al., 2010; Iacobucci and Churchill, 2018).

<Insert Table 2 about here>

<Insert Table 3 about here>

Although Cronbach's alpha is commonly used as a measure to assess reliability (Koufteros, 1999), it is unable to reflect unidimensionality among constructs (Gerbing and Anderson, 1988). The meaning of a measure proposed in the survey by the researcher may not be consistent with the respondent's perception. Thus, the scale development should include an evaluation of whether the multiple measures can be acceptably perceived as substitute features of the similar constructs (Gerbing and Anderson, 1988).

#### *4.2 Confirmatory factor analysis*

Figure 1 shows the path diagram for confirmatory factory analysis. Regarding the fitting test statistics,  $\chi^2$  (Chi-square value) was 619.273 and the degrees of freedom were 246. The goodness-of-fit index (GFI) value was 0.843 and adjusted goodness-of-fit index AGFI value was 0.808 in this study, which met the acceptable criteria. The root mean square residual (RMR) shows that the average residual correlation was 0.025. The root mean square error of approximation (RMSEA) was 0.073. The estimates of RMR and RMSEA were below 0.05, which reflects an evidence of model fit. The Tucker Lewis Index (TLI) was 0.934, whereas the Comparative Fit Index (CFI) was 0.941. Both values were higher than the recommended level of 0.90, further supporting the accuracy of the model. In addition, the normed Chi-square ( $\chi^2/df$ ) was 2.517, indicating overall goodness-of-fit for the model are deemed as acceptable.

<Insert Figure 2 about here>

#### *4.3 Convergent validity*

Convergent validity is in terms of the statistical significance of the standard factor load of each question, and t-statistic is used as a judgment index (Hair et al., 2010). The t-statistic refers to the critical ratio (CR), which is equal to the standard factor load divided by its standard error. According to the results in Table 4, the t-statistic of the standard factor load of each question was greater than 1.96 (threshold value under the significance level of 0.05).  $R^2$  value was used to measure the reliability of each question (Koufteros, 1999). When the  $R^2$  value of each item was greater than 0.5, it provides evidence of acceptable reliability (Hair et al., 2010). According to the results in Table 4, the standard load and  $R^2$  of each factor used in this study met the specified standards, indicating that the capability of explaining a latent variable by a single factor met the specified standard. According to the confirmatory factor analysis results, the questions

about each dimension were convergent at a single factor following confirmatory factor analysis; therefore, they possessed a certain degree of convergent validity.

<Insert Table 4 about here>

#### 4.4 Composite reliability

Construct reliability is a type of composite reliability that is used to measure whether a latent variable is reliable or has internal inconsistency. The higher the composite reliability is, the more internally consistent the variable is. As seen in Table 5, the composite reliability of sustainability transformational leadership, port institution, employees' sustainability behavior, and sustainability performance were 0.955, 0.787, 0.828, and 0.911, respectively. The results indicate that composite reliability values were higher than the recommended level of 0.70 (Hair et al., 2010). Table 5 shows that the construct of employee's sustainability behavior had the lowest value of 0.616, indicating that 61% of the variance in the particular items was explained by the construct. Results also indicate that AVE values of constructs were greater than the accepted level of 50%. Accordingly, the assessment of the goodness-of-fit of the model lent support to confirm the model.

#### 4.5 Discriminant validity

Discriminant validity is important to test the composite scales (Koufteros, 1999). A model can be constructed for all latent variables within each factor. Discriminant validity can be performed by comparing the average variance extracted (AVE) with the squared correlation between factors (Koufteros, 1999). The average variance extracted tests the amount of variation arising from the effective estimation of a latent variable by a group of observational variables and is equal to the average value of the square of the factor load. Table 5 shows that the AVE values for each construct are higher than the squared correlation between that construct and all other constructs. For example, the squared correlation between employees' sustainability behavior (EB) and sustainability performance (SP) was 0.334, which is significantly lower than the AVE value of 0.774. The results have addressed evidence of discriminant validity for the study constructs.

<Insert Table 5 about here>

We further conducted a discriminant validity test based on the *Heterotrait-monotrait (HTMT) approach* with  $HTMT_{0.90}$  criteria in a variance-based structural equation model (Henseler et al., 2015). The values of HTMT were based on Henseler et al.'s (2015) formula. Table 6 shows the results of HTMT analysis, indicating all HTMT values are less than 0.90. This reflects that this research does not have discriminant validity problems according to the  $HTMT_{0.90}$  criterion.

<Insert Table 6 about here>

#### 4.6 Hypothesis testing results

We used the version of SPSS 26.0 and PROCESS (Hayes, 2018) to test the hypotheses involving the relationships among sustainability transformational leadership (SL), port institution (PI), employee's sustainability behavior (EB), and sustainability performance (SP). Hypothesis 1 predicted that SL positively relates to EB. Table 6 shows that SL had a significant and positive relationship with EB ( $\beta=0.66$ ,  $SE=0.04$ ,  $p < 0.01$ ). Thus, the empirical results support H1.

Hypothesis 2 suggested that SL positively relates to SP. As indicated in Table 7, the results indicated that SL had a positive influence on SP ( $\beta=0.21$ ,  $SE=0.07$ ,  $p < 0.01$ ). Therefore, H2 also was supported in this study. Hypotheses 3 and 4 posited that EB and PI positively influence SP, respectively. Table 6 indicates that EB ( $\beta=0.24$ ,  $SE=0.07$ ,  $p < 0.01$ ) and PI ( $\beta=0.49$ ,  $SE=0.09$ ,  $p < 0.01$ ) were positively related to SP. H3 and H4 are thus supported.

<Insert Table 7 about here>

Hypothesis 5 suggested that EB mediated the relationship between SL and SP. A bootstrapping analyses with PROCESS (Model 15; Hayes, 2018) was tested. The results showed that SL is significantly and positively associated with EB ( $\beta=0.66$ ,  $SE=0.04$ ,  $p < 0.01$ ), and that EB significantly and positively predicts SP ( $\beta=0.24$ ,  $SE=0.07$ ,  $p < 0.01$ ). Furthermore, the mean of the confidence interval related to the indirect effect does not include zero ( $\beta = 0.16$ ,  $LLCI = 0.05$ ,  $ULCI=0.29$ ), which supports a significantly indirect relationship between SL and SP via EB. Accordingly, the mediation effect was proven, and therefore Hypothesis 5 is supported.

Table 6 shows the assessment of the moderated mediation analyses (PROCESS-Model 15; Hayes, 2018) to test Hypotheses 6 and 7. As indicated in Table 6 and Figure 3, the interaction between SL and PI significantly predicted SP ( $\beta= -0.30$ ,  $SE=0.10$ ,  $p < 0.01$ ). After the introduction of the moderator, the slope tests were significantly decreased when PI was at low levels ( $\beta= 0.40$ ,  $SE=0.09$ ,  $p < 0.01$ ) as compared to that at high levels ( $\beta= 0.21$ ,  $SE=0.07$ ,  $p < 0.01$ ). The results offer evidence that PI positively moderates the effect of SL on SP. Thus, Hypothesis 6 is supported.

<Insert Figure 3 about here>

As can be seen in Table 6 and Figure 4, the interaction between EB and PI significantly predicted SP ( $\beta= 0.35$ ,  $SE=0.09$ ,  $p < 0.01$ ). After the introduction of the moderator, the slope tests were significantly stronger when PI was at low levels ( $\beta= 0.24$ ,  $SE=0.07$ ,  $p < 0.01$ ) as compared to when it was at high levels ( $\beta= 0.46$ ,  $SE=0.11$ ,  $p < 0.01$ ). The results give evidence that PI positively moderates the effect of EB on SP. Thus, Hypothesis 7 is supported.

<Insert Figure 4 about here>

Hypothesis 8 predicted a moderated mediation effect that arises when the mediating process from SL to SP depends on the level of port institution (PI). Following Hayes (2018), we investigated the conditional indirect effect of SQ on CL through RQ at three values of RQ. The conditional indirect effect for SL was significant and stronger when port operators experienced high levels of port institution (i.e.,  $\beta=0.31$ ,  $SE=0.11$ ,  $p<0.01$ ,  $LLCI=0.10$ ,  $ULCI=0.59$ ) for one standard deviation above the mean than for port operators experiencing low levels of port institution for the mean standard deviation (i.e.,  $\beta=0.16$ ,  $SE=0.06$ ,  $p<0.01$ ,  $LLCI=0.05$ ,  $ULCI=0.29$ ). The index of moderated mediation (Hayes, 2018) was 0.23, and its confidence interval was between 0.01 and 0.513, which did not contain 0. These results hence showed the moderate mediation effect. Thus, H8 is supported.

## 5. Discussion and conclusions

Drawing on the theory of institution, we develop a moderated mediation model that is confirmed by the empirical results of data analysis. We found that port operators' sustainability transformational leadership, institutional response, and employees' sustainability behavior positively relates to sustainability performance, and that employees' sustainability behavior mediates sustainability transformational leadership and sustainability performance at seaports. Moreover, we extend the literature by proving that port institutional response moderate the relationship between sustainability transformational leadership and sustainability performance, and the linkage between employees' sustainability behavior and sustainability performance. Finally, we examined the moderated mediation model whereby the indirect effect of sustainability transformational leadership on sustainability performance through employees' sustainability behavior was moderated by the port institutional response.

### 5.1 Theoretical contributions

This study has the following theoretical contributions. First, it takes an interdisciplinary approach to integrate the theory of institution and leadership concepts into the port operations and management literature, in response to recent interests and needs for more relational strategies-based research in the context of port sustainability (Acciaro, 2015; Santos et al., 2016; Vejvar et al., 2018). While institutional theory in the port sector suggests that coercive isomorphism, normative isomorphism, and mimetic pressures affect ports in developing their sustainability efforts (Acciaro, 2015; Vejvar et al., 2018), this study postulated that sustainability transformational leadership, strategic responses to port institution, and employees' sustainability behavior are critical determinants of the success of sustainability. These strategic responses to port institution include coercive policy, normative training, communication with stakeholders, and motivation. Although a rich body of extant studies explored the role



of top management commitment in the relationships among institutional pressure, sustainability behavior, and corporate environmental responsiveness (Liang et al., 2007; Colwell and Joshi, 2013; Dubey et al., 2016), we argue that different sustainability performance exists in different types of leaderships when managers commit to support sustainability. Basically, the types of leaderships can be categorized into transformational and transactional (Deluga and Souza, 1991). We found that sustainability transformational leadership positively influences employees' sustainability behavior and sustainability performance based on the theory of institution.

Second, we demonstrated that employees' sustainability behavior mediates the relationship between sustainability transformational leadership and sustainability performance. Our study contributes to the literature in sustainability and port institution. Prior studies have empirically demonstrated the importance of port institution (Acciaro, 2015; Santos et al., 2016; Vejvar et al., 2018) and sustainability performance (Lu et al., 2016; Oh et al., 2018; Lim et al., 2019). To the best of our knowledge, this study is the first to empirically examine such a relation. Moreover, we drew an attention on the critical role of sustainability transformational leadership and employees' sustainability behavior that port operators should emphasize in the sustainability practices. Indeed, the linkage between sustainability transformational leadership and employees' sustainability behavior is in line with the finding that supports the existence of a sequence of relationships based on a social exchange theory (Blau, 1964). Previous research considered that sustainability transformational leadership predicts a high quality of social exchange relationship with port employees (Chen and Chang, 2013; Singh et al., 2020), which in turn affects the performance of sustainability (Norton et al., 2015; Carmeli et al., 2017). In accordance with our data analysis, the research findings indeed indicated that employees' sustainability behavior can be influenced by sustainability transformational leadership, which in turn can influence the performance of port sustainability. This mediating role of employees' sustainability behavior such as sustainability compliance and participation is particularly important in sustainability practices for which port managers must continuously pay attention to this relationship.

Finally, our examination of the moderated mediation model provides empirical evidence to prove that port institutional response is an important moderating factor in explaining variations of the indirect effect of sustainability transformational leadership on sustainability performance through employees' sustainability behavior. The results of the moderated mediation effects of port institution were positive and significant. Specifically, we found that the indirect effect of sustainability transformational leadership on sustainability performance was stronger among port operators with higher perceptions of port institution responses than those with lower perceptions. These research findings had never been confirmed and examined in previous literature of sustainability practices at ports.

## *5.2 Managerial implications*

Several managerial implications for port operators can be drawn from this study. First, this study explores the effects of crucial strategic responses to institutional pressures in port operations. Our results identified that coercive policy, normative training, communication, and motivation are the crucial constructs in response to institutional pressures in port sustainability practices. We suggest the following responsive actions to port institutions that could be adopted to actively shape or resist institutional pressures: developing sustainability policies and working rules according to ISO 14001; providing sustainability education training programs; communicating sustainability missions and policies with stakeholders; and establishing a motivation mechanism to motivate employees' sustainability behaviors. Our suggestions might generate the effectiveness of current sustainability assessment, help to reinforce sustainability in ports, and present insights on how to respond to governmental regulations and international conventions.

Second, we found that port operators' perceptions on sustainability transformational leadership and port institutional response play strong roles in influencing sustainability performance in the port sector. The results are consistent with previous research propositions (Acciaro, 2015; Santos et al., 2016; Vejvar et al., 2018; Singh et al., 2020). Notably, sustainability transformational leadership was found to be significant impact with direct and moderating effects on sustainability performance. A high level of sustainability transformational leadership will improve employees' attitudes, increase their behavioral intentions toward the company, and lead them to achieve organizational sustainability activities. Good employee sustainability behavior also implies that the port operator can closely meet stakeholders' needs and expectations and consequently cause them to be willing to build a long-term sustainable goal for the organization.

We suggest that port operators should emphasize and reinforce sustainability transformational leadership necessary for implementing sustainability practices. Sustainability practices are essential in developing, acquiring, and sustaining employees who bring to work sustainability values and beliefs that help support a port operator's strategy to achieve organizational goals. Therefore, we suggest that sustainability transformational leadership makes employees with sustainability ability and motivation feel a certain pleasure through supportive leadership and provide them opportunities to understand their potentialities to help port operators exhibit sustainability behaviors to improve the port environment.

Finally, perhaps the most important managerial implication from this research is related to the impact by PI as a proxy for enhancing the indirect effect of SL on port SP through EB. Although the conditional effects of the moderator (i.e., port institution) were positive and significant, our moderated mediation model analysis established that the mediated effect of sustainability transformational leadership on port sustainability

performance via employees' sustainability behavior is stronger under situations in which PI is perceived to be high than when it is low. This implies that the partial impact of SL and EB could be shaped by PI. Thus, we aim to advise port operators to understand not only the importance of SL and EB, but also the significance of monitoring and controlling a concurrent PI. When PI is favorable, the port operator's efforts to SL and EB have higher congruence with SP. Consistent with prior research, an effective response to PI will help to build employees' satisfaction, trust, and commitment that eventually achieve organizational goals of sustainability.

### *5.3 Limitations and future research*

This research is constrained by numerous limitations for further research. First, the study has brought a comprehensive framework for understanding PI and SL based on the data in Taiwan. This study does not consider corporate governance. Thus, the findings could be biased as a result from the various governance structures of different countries. After all, the role of SL is played by the governance structure in ports. It will be interesting to postulate that more market-oriented port organizations might spur different employees' attitudes toward environmental risks and behaviors. Future studies could address the relationship between corporate governance and sustainability vision in the specific case of Taiwan or other countries. Second, it would be valuable to identify the crucial constructs of PI from the stakeholders' view (e.g., carriers, local community, and shippers) in order to generalize the conceptual model. Third, the analysis conducted in this study was static - i.e., the evaluations of EB and SP were undertaken at one point in time. Longitudinal research would be helpful to indicate how perceptions of PI may change over time. Finally, this research was limited to examining EB and SP based on the perceptions of port operators in Taiwan. Port operations are provided to international shipping lines, and shippers come from different countries around the world. Hence, future research could examine PI and related conditions within ports of different countries.

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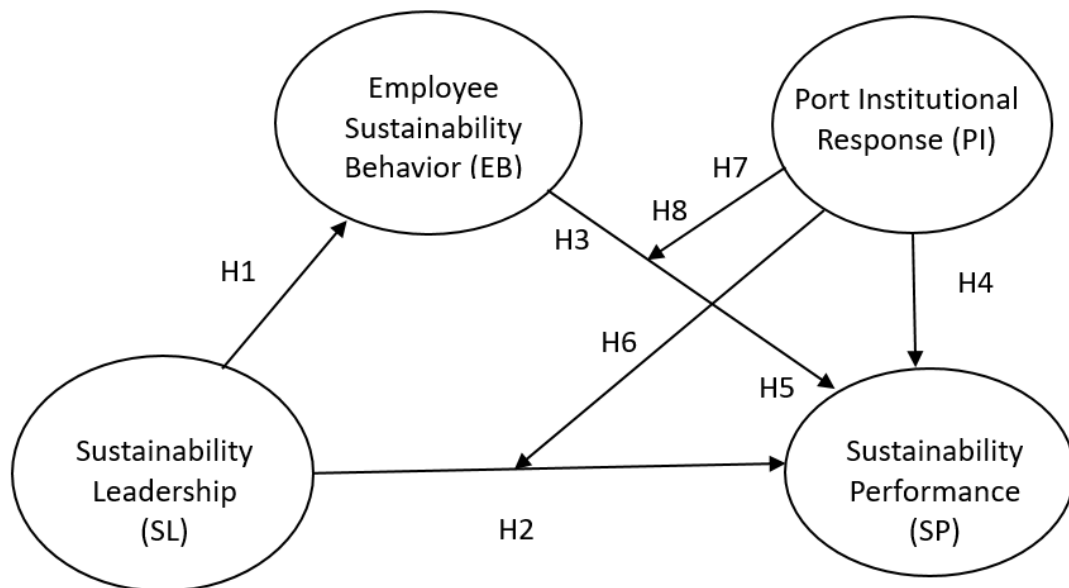
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Notes:

H5 represents the indirect effect of SL on SP; H6 represents the moderating effect of PI on the relationship between SL and SP; H7 represents the moderating effect of PI on the relationship between EB and SP; H8 represents the moderating effect of PI on the indirect of SL on SP via EB.

Figure 1. The conceptual model

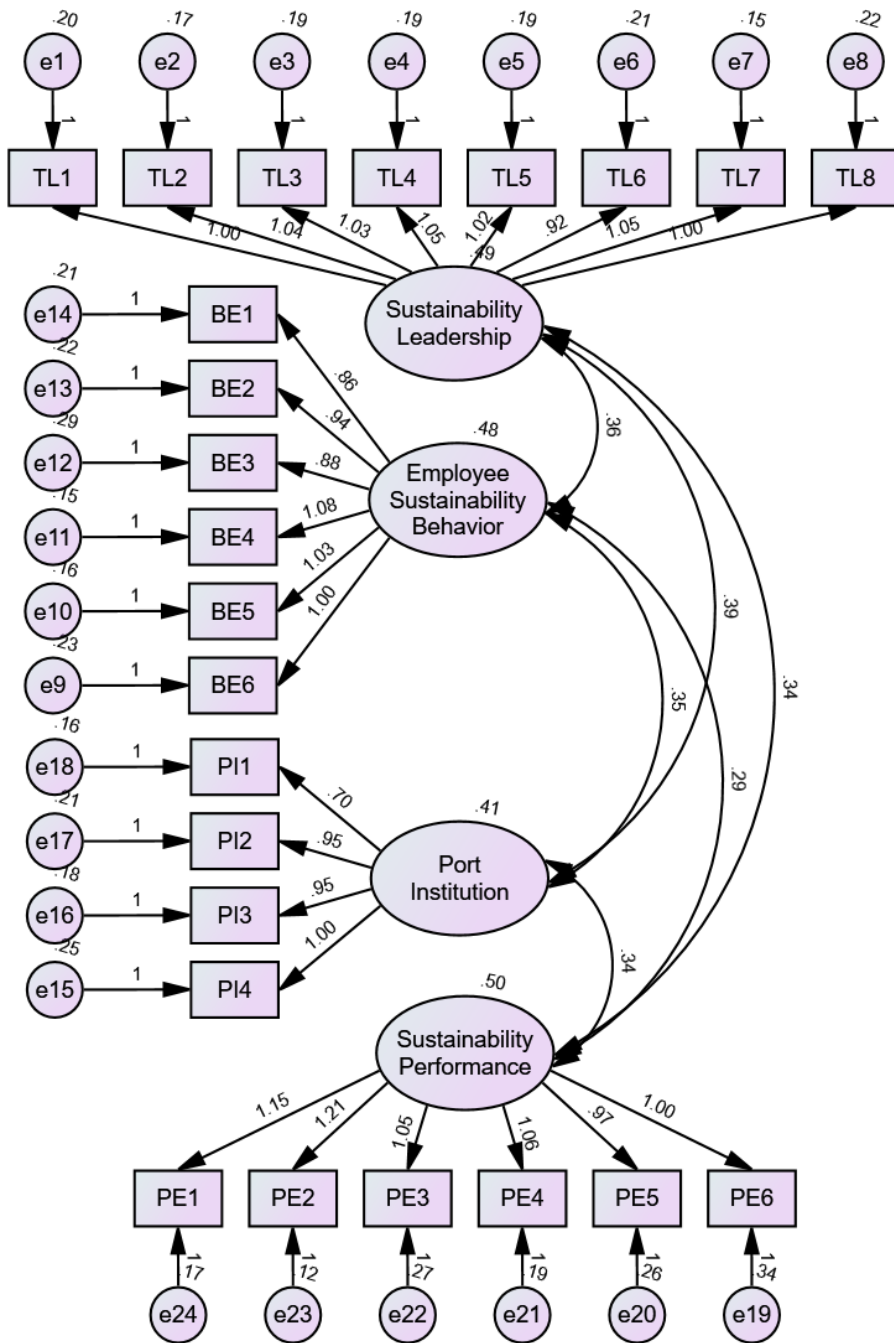


Figure 2. Path diagram for confirmatory factor analysis

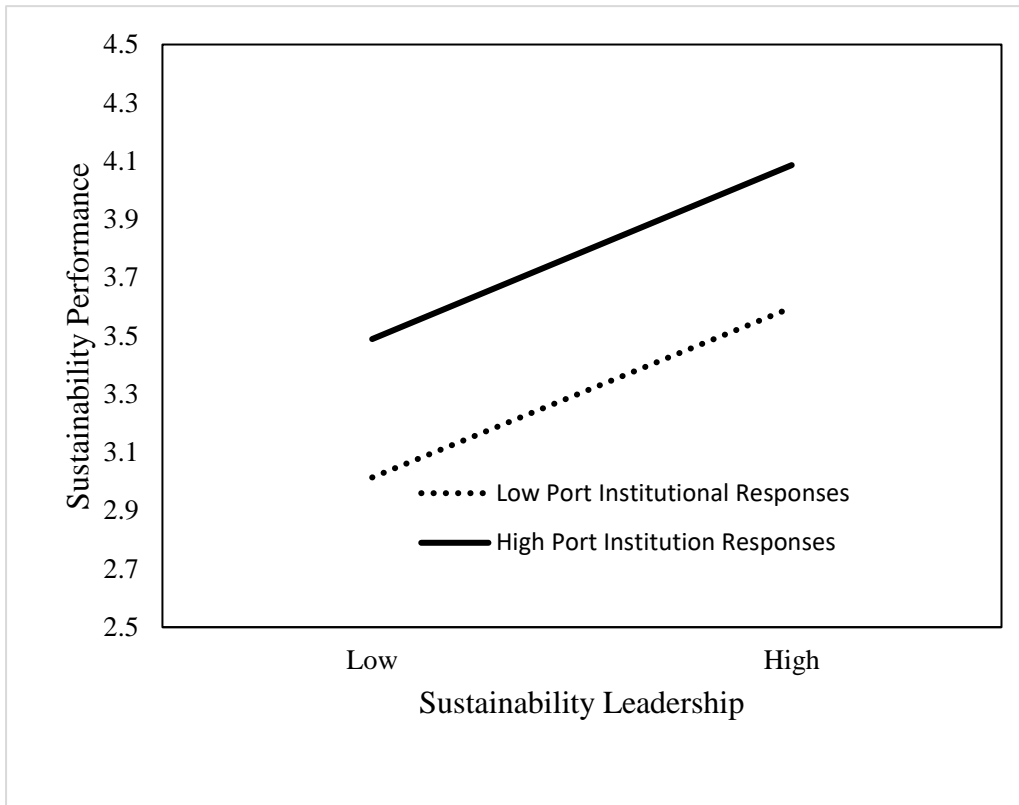


Figure 3. The moderation effects of port institutional responses on the relationship between sustainability leadership and sustainability performance

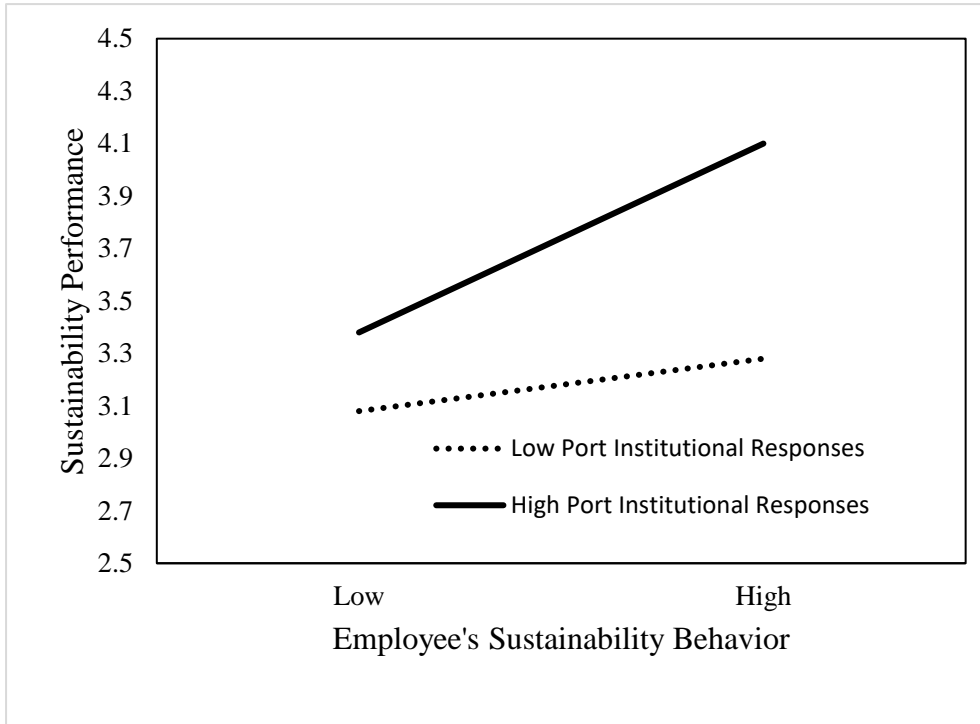
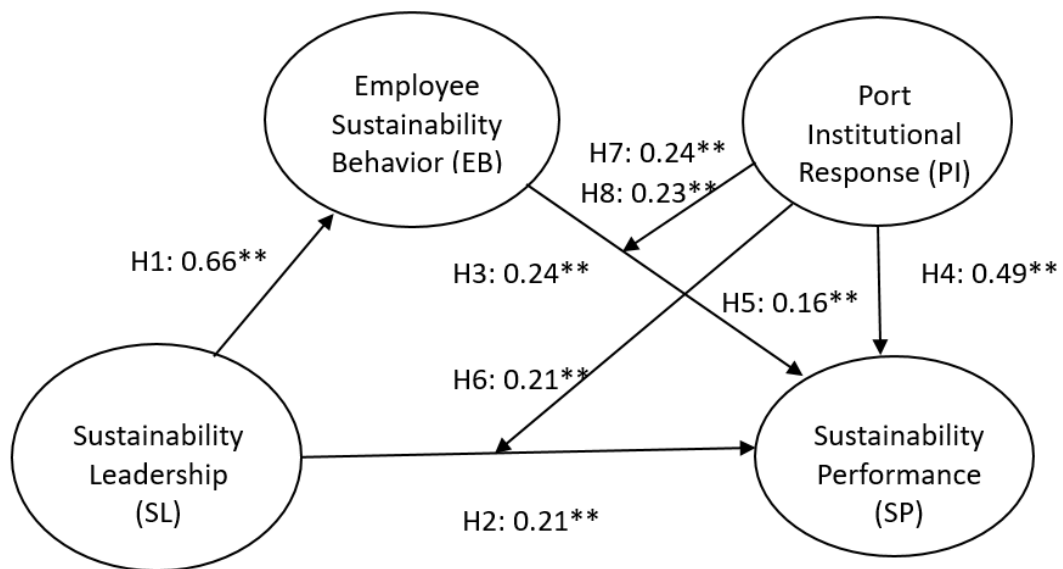


Figure 4. The moderation effects of port institutional responses on the relationship between employees' sustainability behavior and sustainability performance



Notes:

H5 represents the indirect effect of SL on SP; H6 represents the moderating effect of PI on the relationship between SL and SP; H7 represents the moderating effect of PI on the relationship between EB and SP; H8 represents the moderating effect of PI on the indirect of SL on SP via EB.

Figure 5. Moderated mediation model results

Table 1. Profile of Respondents

Item		Number	Percentage
Organization	Headquarters Office - Taipei	65	22.0
	Keelung Port Corporation	59	19.9
	Taichung Port Corporation	40	13.5
	Kaohsiung Port Corporation	104	35.1
	Hualien Port Corporation	28	9.5
Length of work experience	5 years or less	132	44.6
	6 to 10 years	19	6.4
	11~20 years	24	8.1
	21~30 years	84	28.4
	31 years or more	37	12.5
Job	General employee	106	35.8
	Administrative assistant	130	43.9
	Manager	37	12.5
	Senior manager or above	23	7.8
Department	Administration	72	24.3
	Operations	84	28.4
	Human resources	46	15.5
	Business	67	22.6
	Harbor	19	6.4
	Warehousing	8	2.7

Table 2. Exploratory factor analysis for sustainability transformational leadership, employees' sustainability behavior, and sustainability performance (within-block loadings)

Sustainability transformational leadership (SL)		Employees' behavior (EB)		Sustainability performance (SP)	
Item	Factor	Item	Factor	Item	Factor
TL1	0.858	BE1	0.850	PE1	0.898
TL2	0.884	BE2	0.858	PE2	0.922
TL3	0.877	BE3	0.809	PE3	0.856
TL4	0.878	BE4	0.895	PE4	0.885
TL5	0.873	BE5	0.881	PE5	0.853
TL6	0.847	BE6	0.835	PE6	0.829
TL7	0.902				
TL8	0.854				
Percentage of variance					
	75.974	73.102		76.452	
Cronbach's $\alpha$					
	0.955	0.926		0.938	

Notes:

*Sustainability transformational leadership measures:*

TL1: My supervisor provides employees with sustainability information.

TL2: My supervisor cares about employees' sustainability behaviors.

TL3: My supervisor encourages employees' sustainability behaviors.

TL4: My supervisor praises employees' sustainability behaviors.

TL5: My supervisor often states that sustainability issues should be considered at work.

TL6: My supervisor discusses sustainability issues with employees.

TL7: My supervisor respects employees' sustainability suggestions.

TL8: My supervisor participates in setting employees' sustainability goal.

*Employees' sustainability behavior measures:*

BE1: I care about sustainability at work.

BE2: I obey my company's sustainability rules and standard operation procedure.

BE3: I will not neglect sustainability even if I am busy.

BE4: I actively participate in the set of sustainability goal.

BE5: I actively provide suggestions for improving sustainability.

BE6: I actively join sustainability meetings.

*Sustainability performance measures:*

PE1: I feel that the water quality in the port area is better than before.

PE2: I feel that the air quality in the port area is much cleaner than before.

PE3: I feel that the landscape in the port area is better than before.

PE4: I feel that the noises in the port area have significantly been reduced.

PE5: I feel that the hazardous cargo operations in the port area are safer than before.

PE6: I feel that the port monitoring program effectively reduces air and water pollution and vessel exhaust emissions.



Table 3. Factor analysis for port institutional responses

Item		Coercive policy	Normative training	Communication	Motivation
Aa1	My company has announced sustainability policies.	<b>0.745</b>	0.198	0.235	0.162
Aa2	My company has set up sustainability goal(s).	<b>0.796</b>	0.145	0.224	0.080
Aa3	My company has established a responsibility system of sustainability.	<b>0.678</b>	0.301	0.120	0.293
Aa4	My company has set up working guidelines for sustainability.	<b>0.664</b>	0.356	0.178	0.269
Aa5	My company has included environment and corporate social responsibility in the policy.	<b>0.785</b>	0.183	0.273	0.108
Aa6	My company assesses sustainability according to ISO 14001.	<b>0.651</b>	0.300	0.143	0.232
Aa7	My company operates based on the requirement of EcoPort certification.	<b>0.775</b>	0.166	0.287	0.103
Ab1	My company provides sustainability education training according to the rules.	0.378	<b>0.760</b>	0.182	0.167
Ab2	My company's education program includes sustainability.	0.312	<b>0.784</b>	0.251	0.113
Ab3	My company's sustainability training is applicable to my job.	0.300	<b>0.754</b>	0.244	0.229
Ab4	My company's sustainability training is understandable.	0.265	<b>0.776</b>	0.302	0.237
Ab5	The design of sustainability training programs is good.	0.171	<b>0.802</b>	0.302	0.293
Ab6	My company provides sufficient sustainability training for employees.	0.171	<b>0.798</b>	0.290	0.285
Ad1	My company has delivered sustainability policies to relevant stakeholders.	0.229	0.219	<b>0.754</b>	0.265
Ad2	My company's website includes information that introduces sustainability policies.	0.361	0.208	<b>0.749</b>	0.238
Ad3	My company organizes sustainability conferences or forums.	0.335	0.246	<b>0.762</b>	0.099
Ad4	My company issues sustainability brochures.	0.198	0.283	<b>0.760</b>	0.242
Ad5	My company communicates sustainability with local groups.	0.184	0.301	<b>0.718</b>	0.305
Ad6	My company has good communication with government departments on sustainability.	0.232	0.288	<b>0.704</b>	0.296
Af1	My company motivates employees' sustainability behaviors.	0.192	0.240	0.247	<b>0.844</b>
Af2	My company encourages employee participation in sustainability decision-making.	0.212	0.277	0.254	<b>0.822</b>

Af3	My company encourages employees to provide suggestions for sustainability.	0.211	0.246	0.272	<b>0.818</b>
Af4	My company rewards employees with high sustainability performance.	0.220	0.201	0.298	<b>0.792</b>
Percentage of variance			20.800	20.492	15.835
Cronbach's $\alpha$			0.915	0.949	0.930

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Table 4. Convergent validity

Factors and scale items	UFL <sup>a</sup>	CSFL <sup>b</sup>	S.E. <sup>c</sup>	C.R. <sup>d</sup>	R <sup>2</sup>
<u>Sustainability transformational leadership</u>					
TL1	1.000	0.843	-	-	0.710
TL2	1.043	0.868	0.054	19.301**	0.754
TL3	1.031	0.857	0.055	18.777**	0.735
TL4	1.045	0.860	0.055	18.839**	0.740
TL5	1.020	0.852	0.055	18.594**	0.725
TL6	0.924	0.819	0.053	17.345**	0.670
TL7	1.051	0.882	0.053	19.686**	0.778
TL8	1.003	0.833	0.056	17.876**	0.694
					1
<u>Port Institutional Response</u>					
PI1	0.700	0.790	0.052	13.390**	0.564
PI2	0.946	0.821	0.065	14.470**	0.636
PI3	0.950	0.797	0.063	15.092**	0.674
PI4	1.000	0.751	-	-	0.623
<u>Employee's sustainability behavior</u>					
BE1	0.858	0.790	0.056	15.282**	0.625
BE2	0.937	0.811	0.059	15.881**	0.658
BE3	0.883	0.752	0.062	14.335**	0.566
BE4	1.075	0.886	0.058	18.615**	0.785
BE5	1.031	0.871	0.057	18.140**	0.758
BE6	1.00	0.821	-	-	0.674
<u>Sustainability performance</u>					
PE1	1.145	0.894	0.068	16.797**	0.798
PE2	1.214	0.926	0.069	17.509**	0.858
PE3	1.048	0.816	0.069	15.110**	0.666
PE4	1.064	0.863	0.066	16.143**	0.744
PE5	0.970	0.804	0.065	16.797**	0.646
PE6	1.000	0.772	-	-	0.595

Notes: UFL: Unstandardized factor loading, which indicates a parameter fixed at 1.0 in the original solution; CSFL: Completely standardized factor loading; PI1: Coercive policy; PI2: Normative training; PI3: Communication; PI4: Motivation; S.E. is an estimation of the standard error of the covariance; C.R. is the critical ratio obtained by dividing the estimate of the covariance by its standard error. \*\* represents a level of significance of 0.05.



Table 5. Correlations and squared correlation between sustainability transformational leadership, employees' sustainability behavior, port institutional response, and sustainability performance

Constructs	Mean	S.D.	Composite reliability	AVE <sup>a</sup>	SL	PI	EB	SP
SL	3.474	0.728	0.955	0.726	1			
PI	3.616	0.620	0.787	0.649	0.803*** <sup>b</sup> (0.644) <sup>c</sup>	1		
EB	3.790	0.694	0.828	0.616	0.701** (0.491)	0.704** (0.491)	1	
SP	3.586	0.785	0.911	0.774	0.663* (0.439)	0.693** (0.480)	0.578** (0.334)	1

Notes:

a. Average variance extracted (AVE) = (sum of squared standardized loadings)/[(sum of squared standardized loadings)+(sum of indicator measurement error)];

Indicator measurement error can be calculated as  $1 - (\text{standardized loading})^2$ ; Composite reliability = (sum of standardized loadings)<sup>2</sup>/[(sum of standardized loadings)<sup>2</sup>+(sum of indicator measurement error)]. Indicator measurement error can be calculated as  $1 - (\text{standardized loading})^2$ .

b. \* Correlation is significant at the 0.05 level; \*\*Correlation is significant at the 0.01 level.

c. Squared correlation.

d. SL: Sustainability transformational leadership; PI: Port institution; EB: Employees' sustainability behavior; SP: Sustainability performance; SD: Standard deviation.

Table 6. Heterotrait-monotrait (HTMT) results

Constructs	SL <sup>a</sup>	PI	EB	SP
SL	-			
PI	0.869 <sup>b</sup>	-		
EB	0.731	0.766	-	
SP	0.687	0.766	0.601	-

Notes:

- a. SL: Sustainability transformational leadership; PI: Port institution; EB: Employees' sustainability behavior; SP: Sustainability performance; SD: Standard deviation.
- b. The calculation of HTMT was based on the Henseler et al. (2015) formula.

Table 7. Moderated mediation analysis results

Predictor	Coefficient	SE	t value	LLCI	ULCI
Dependent Variable: EB					
SL	0.66	0.04	16.61**	0.58	0.74
Dependent Variable: SP					
SL	0.21	0.07	2.708**	0.05	0.37
EB	0.24	0.07	3.26**	0.44	0.67
PI	0.49	0.09	5.38**	0.31	0.67
SL*PI	-0.30	0.10	-3.08**	-0.50	-0.11
EB*PI	0.35	0.09	3.61**	0.16	0.54
Conditional indirect effect of SL on SP via EB					
<u>Level</u>	Effect	Boot SE	Boot LLCI	Boot ULCI	
Low (-1 SD)	0.01	0.08	-0.14	0.18	
Mean	0.16**	0.06	0.05	0.29	
High (+1 SD)	0.31**	0.11	0.10	0.56	
Conditional effects of the moderator (PI) on the relationship between SL and SP					
<u>Level</u>	Effect	SE	t value	LLCI	ULCI
Low (-1 SD)	0.40	0.09	4.49**	0.22	0.58
Mean	0.21	0.07	2.70**	0.05	0.37
High (+1 SD)	0.02	0.11	0.20	-0.19	0.23
Conditional effects of the moderator (PI) on the relationship between EB and SP					
<u>Level</u>	Effect	SE	t value	LLCI	ULCI
Low (-1 SD)	0.02	0.07	0.39	-0.11	0.17
Mean	0.24	0.07	3.26**	0.09	0.39
High (+1 SD)	0.46	0.11	4.00**	0.23	0.70
Index of moderated mediation:					
		Index	BootSE	LLCI	ULCI
Port institution		0.23**	0.13	0.01	0.51

Notes: Bootstrap sample size = 5000; Level of confidence for all confidence intervals is 95%; SL: Sustainability transformational leadership; PI: Port institution response; EB: Employees' sustainability behavior; SP: Sustainability performance; Boot SE: Bootstrap estimate; LL = Lower Limit; CI = Confidence Interval; UL = Upper Limit; N = 287; \*\* $p < 0.01$ .

Appendix A. Common method bias analysis

Construct	Indicator	Substantive Factor Loading (R1)	R1 <sup>2</sup>	Method Factor Loading (R2)	R2 <sup>2</sup>
Employees' Sustainability Behavior	BE1	0.720**	0.518	0.318**	0.101
	BE2	0.745**	0.555	0.299**	0.089
	BE3	0.694**	0.482	0.291**	0.085
	BE4	0.848**	0.719	0.280**	0.078
	BE5	0.824**	0.679	0.290**	0.084
	BE6	0.773**	0.598	0.281**	0.079
Sustainability Performance	PE1	0.859**	0.738	0.261**	0.068
	PE2	0.896**	0.803	0.255**	0.065
	PE3	0.770**	0.593	0.263**	0.069
	PE4	0.819**	0.671	0.271**	0.073
	PE5	0.750**	0.563	0.279**	0.078
	PE6	0.718**	0.516	0.261**	0.068
Port Institution	PI1	0.624**	0.389	0.364**	0.132
	PI2	0.698**	0.487	0.288**	0.083
	PI3	0.750**	0.563	0.298**	0.089
	PI4	0.655**	0.429	0.279**	0.078
Transformational Leadership	TL1	0.791**	0.626	0.284**	0.081
	TL2	0.822**	0.676	0.280**	0.078
	TL3	0.814**	0.663	0.281**	0.079
	TL4	0.815**	0.664	0.278**	0.077
	TL5	0.803**	0.645	0.284**	0.081
	TL6	0.767**	0.588	0.297**	0.088
	TL7	0.839**	0.704	0.283**	0.080
	TL8	0.780**	0.608	0.282**	0.080
Average		<b>0.774</b>	<b>0.603</b>	<b>0.285</b>	<b>0.082</b>

\*\* p < 0.01