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# Using the Norm Activation Model to Predict the Pro-Environmental Behaviors of Public Servants at the Central and Local Governments in Taiwan

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Received: 2 May 2019; Accepted: 3 July 2019; Published: 6 July 2019



**Abstract:** An understanding of the environmental value-action gap between public servants at the central and local governments is essential for the effective implementation of environmental policies, which is limited in the extant literature. This study has adopted the norm activation model to explore the pro-environmental behaviors of public servants at the central and local governments in Taiwan. A total of 7567 valid questionnaires were collected, and significant differences were evident between public servants at the central ( $n = 3400$ ) and local ( $n = 4167$ ) governments in personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors. Findings revealed that personal norms were the key factors predicting pro-environmental behaviors of public servants at both the central and local governments. Results also indicated that the awareness of consequences by public servants at the central government had a direct effect on their pro-environmental behaviors, which in turn had a significant effect on their ascription of responsibility. In contrast, awareness of consequences by public servants at the local government had no significant direct effect on their pro-environmental behaviors and had only a weak positive effect on their ascription of responsibility.

**Keywords:** awareness of consequence; ascription of responsibility; central and local government; public servants; norm activation model

## 1. Introduction

There have been increasingly significant efforts put into addressing global environmental challenges in the recent years by different stakeholders from varying levels (e.g. individuals, businesses, governments). While the governments are responsible for designing and developing environmental policies (either unilaterally or collectively in the form of international agreements), public servants are often tasked with implementing these policies [1]. The implementation phase is a complex process that requires close cooperation and coordination between various levels of agencies that span from a central government with the highest legislative power in the country to a local government that is at a state-based public management level [2]. Numerous studies [3–6] have discussed the relationship between the decentralization of administrative power and administrative efficiency but have rarely explored the differences in personal (i.e., public servant) cognition and performance between central and local governments, which can have a significant impact on the successful implementation of government policies.

Since 1949, the Taiwanese government has maintained the multi-track operation of a central government, provincial governments, county and city governments [7]. However, since the government structure in Taiwan was streamlined in 1998, there are often gaps in the implementation of policies

between the central and local governments (i.e., county and city governments) due to a lack of consensus among the different administrative levels. Despite the efforts to improve this, in recent years there is an increasingly significant problem relating to the environmental value-action gap between public servants at various administrative levels [8–11]. This can be attributed to the recruitment of public servants being conducted by the central government in the form of a unified examination, where successful personnel are assigned to local administrative agencies based on their examination grades. Public servants are promoted by the central government during their career based on their administrative performance and ratings, with local governments having no or very limited input to this process [12]. The career path of public servants in Taiwan generally requires them to first work in local governments and be promoted through the ranks in the local government setting before being offered opportunities to move up the ladder in central government agencies. Only those who excel at the central government level are then selected and promoted by the elected county and city mayors to their counties and cities as director generals. This systematic career pathway often results in public servants with higher levels of skills, knowledge, education, and experiences serving at the central government agencies. Central government officials develop policies and directives which local governments adhere to for implementation. This system maintains the dignity of permanent officers, strengthens the legitimacy of centralization, and maintains the foundation for the sustainable development of the regime.

Given the gaps in the extant literature about the environmental behaviors of public servants serving at different levels (i.e., central vs. local) of the government, this study seeks to examine specifically the personal environmental cognition and performance of public servants at the central and local governments in Taiwan. In addition, their impact on the implementation of environmental policies will be explored. The findings will contribute to a better understanding of the environmental value-action gap between public servants at the central and local governments and identify key issues in the implementation of environmental policies, which are limited. This study will also contribute towards related environmental behavior theories by extending further theoretical insights, such as the influencing factors of pro-environmental behaviors (PEBs), within the aforementioned context.

### *1.1. Norm Activation Model*

The norm activation model (NAM), which was first proposed by Schwartz in 1977 [13] is considered one of the most commonly used models to predict pro-environmental behaviors. Many previous studies [14–17] have used the NAM as the fundamental theory to investigate pro-environmental behaviors in different contexts, such as public transportation [18], energy use [19], carbon footprint [20], and responsible technology acceptance [21]. The NAM primarily asserts that a person sacrifices their own self-interest for the collective benefits of others, and is rooted in altruistic behaviors [13,14]. There are three key variables in the NAM used to predict pro-environmental behaviors, namely personal norms (PNs), ascription of responsibility (AR), and awareness of consequences (AC). Personal norms refer to a person's self-concept of feeling a moral obligation to perform a specific behavior and can be regarded as a form of self-discipline that is associated with pro-environmental behaviors [22]. Therefore, this moral obligation in one's personal norm can serve as a motivating factor that engages in pro-environmental behaviors. Previous studies have found that personal norms were an important factor influencing various pro-environmental behaviors, such as energy and water saving [16,23], public transportation usage [24], and recycling [25].

Awareness of consequences refers to a person's perception about the severity of his/her own behavior on the welfare of others [26]. People are more likely to engage in environmental issues and display pro-environmental behaviors when they are aware of the adverse consequences of their actions/inactions on others and themselves [27]. Past studies reported the impact of awareness of consequences on pro-environmental behaviors in various settings, including green electricity participation [14], vehicle ownership and usage [28], water recycling [29], and land management [30]. Ascription of responsibility refers to a person's personal feeling about whether he/she is responsible

for the consequences of his/her behavior [26]. People who ascribe responsibility to themselves on environmental-related issues are more likely to support and exhibit pro-environmental behaviors [31]. Prior studies investigated the effects of ascription of responsibility on several topic areas, such as green lodging [32], green electricity usage [14], eco-innovation adoption [33], and waste reduction [34].

Despite many previous studies which investigated the effects of the three key dimensions (personal norms, awareness of consequences, and ascription of responsibility) of the NAM on pro-environmental behaviors, there is still limited research [9,10] conducted to examine specifically the pro-environmental behaviors of public servants serving at different levels (i.e., central vs. local) of the government, which is the key focus of this study.

We posit that using the behavioral model promoted by personal norms in the NAM can help further understand the differences in pro-environmental behaviors between public servants at the central and local governments. In addition, the ascription of responsibility and awareness of consequences enable us to better understand the path structure towards pro-environmental behaviors. Therefore, in this study, we used the NAM theory to deconstruct public servants' pro-environmental behaviors to explain the correlation between public servants' value factors and pro-environmental behaviors.

### *1.2. Hypothesis of the NAM*

We posit that conducting further research on public servants at the central and local governments using three major influence factors of pro-environmental behaviors [35,36], namely personal norms, ascription of responsibility [37], and awareness of consequences can provide further understanding and close the environmental value-action gap between public servants [8]. Therefore, this study specifically seeks to explore the differences in the influence factors of these pro-environmental behaviors between public servants of the central and local governments in Taiwan. In addition, a path structure model will also be used to analyze how these three dimensions regulate and affect responsible environmental behaviors [38] of public servants serving at the central and local governments. Thus, we propose the following hypotheses:

**Hypothesis 1.** *PNs of public servants in the central government affect their PEBs [13,17,26,35,36].*

**Hypothesis 2.** *PNs of public servants in the central government affect their AC [13,17,26].*

**Hypothesis 3.** *PNs of public servants in the central government affect their AR [13,17,26].*

**Hypothesis 4.** *AC of public servants in the central government affects their PEBs [15,39,40].*

**Hypothesis 5.** *AC of public servants in the central government affects their AR [26,36].*

**Hypothesis 6.** *AR of public servants in the central government affects their PEBs [15,36,41].*

**Hypothesis 7.** *PNs of public servants in the local government affect their PEBs [13,17,26,35].*

**Hypothesis 8.** *PNs of public servants in the local government affect their AC [13,17,26].*

**Hypothesis 9.** *PNs of public servants in the local government affect their AR [13,17,26].*

**Hypothesis 10.** *AC of public servants in the local government affects their PEBs [15,39,40].*

**Hypothesis 11.** *AC of public servants in the local government affects their AR [26,36,42].*

**Hypothesis 12.** *AR of public servants in the local government affects their PEBs [15,36,41].*

## 2. Materials and Methods

### 2.1. Participants and Procedure

This was a large-scale nationwide research study conducted in Taiwan during the period between June 2018 to December 2018. The population studied encompassed all public servants (central and local governments) employed in 2017, which accounted for 349,676 people. Of which, 202,643 were men (61%) and 147,213 were women (39%). The number of public servants in the central and local governments was represented by 184,952 (53%) and 164,724 (47%), respectively. This study adopted the systematic sampling method in the first stage by selecting a random number as the first sample before selecting the 35th (sampling interval) as the next sample and so on, after which the number was compiled according to the 2017 public servants' roster ( $n = 349,676$ ). This sample was associated with an equiprobability approach, treated circularly, was considered adequate and representative in a systematic sampling method from an ordered sampling frame. A sample ( $n = 10,000$ ) from a rationale of more than 2% of current government employees was obtained for this research study and the questionnaires were distributed via mail with stamped return envelopes.

The proposed survey method and questionnaire were submitted to the National Taiwan Normal University Research Ethics Committee for review and ethical clearance. The committee confirmed that the research study falls outside the scope of the Human Subject Research Act in Taiwan, and therefore has approved the study protocol (201804HS008).

In the process of the research, a total of 10,000 questionnaires were obtained through systematic sampling in the second stage with proportional allocation between the central and local governments. According to the population proportion (i.e., 53% central government, 47% local government), 5300 questionnaires were mailed to public servants in the central government, whereas public servants in the local government received 4700 questionnaires. A total of 7592 questionnaires were returned, with a response rate of 75.92% (central government, 64.15%; local government, 88.85%). However, 25 questionnaires were deemed to be invalid and eliminated, therefore resulting in a final count of 7567 valid questionnaires to be used for further analysis.

### 2.2. Measures

Based on the NAM theory, this study adopted three main dimensions considered to be influential on pro-environmental behaviors, namely (1) personal norms, (2) awareness of consequences, and (3) ascription of responsibility. We reviewed prior studies of personal norms [43], awareness of consequences [44], ascription of responsibility [45], and pro-environmental behaviors [45] to synthesize the relevant content and establish a questionnaire consisting of 13 statements in total (see Appendix A). Four statements [43] about personal norms were selected to be included in the questionnaire, namely "I have an obligation to cherish the limited resources of the earth"; "I have an obligation to learn the lesson of the natural environment"; "I have an obligation to respect the life-sustaining needs and rights and interests of all living things in the environment"; and "I have an obligation to maintain a good natural environment so that the next generation can have the same life quality". A five-point Likert scale (i.e., 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) was used as a measurement to the respondents' answers to these statements related to personal norms.

Statements on awareness of consequences were adopted from a study by Pepper and Leonard [44]. There were three awareness of consequences statements included in the questionnaire, namely "I know that climate change will have serious consequences for the global environment"; "I know that the ambient air, noise, and sanitation can have an immediate influence on environmental quality"; and "I know that air, noise, and sanitation in the workplace can have an immediate influence on environmental quality". The respondents' awareness of consequences was measured using a five-point Likert scale (i.e., 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree).

Statements about ascription of responsibility were adopted from The Belgrade Charter [45]. There were three statements selected to be included in the questionnaire, namely "I have the responsibility

to take action to improve or solve environmental problems”; “I have the responsibility to work with other people in government agencies to improve or solve the surrounding environmental problems”; and “I have the responsibility to work with environmental groups to improve or solve environmental problems”. The responses to these statements were measured using a five-point Likert scale (i.e., 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree).

Finally, three statements related to pro-environmental behaviors were adopted from The Belgrade Charter [45], which included: “I actively studied the news and information about environmental conservation”; “I paid attention to whether my environment-related behavior is correct”; and “I implemented the concept of environmental friendliness into the work plan for the implementation of official duties”. A five-point Likert scale (i.e., 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) was used to measure the responses to these pro-environmental behavior statements.

The questionnaire was reviewed by five experts in environmental behaviors and environmental education for content validity, and pre-tested by 150 public servants. As a result, some minor changes were made to the questionnaire, which was subsequently used for the actual survey. These subtle changes were made mainly to simplify the wording, by applying, for example, language more similar to spoken language and clear terms in a local context for public servants to understand, but the original meaning of the aforementioned questions was retained.

In this research study, the Statistical Package for the Social Sciences (SPSS v.23) software program was used for analyzing the data collected. Descriptive statistics were used to calculate the total number of occurrences, percentages, means, and standard deviation (SD) scores of demographic statistics and items. A single factor variance analysis and the chi-squared test were used to determine the key dimensions (i.e., personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors). For differences between central and local governments, genders, education levels, and ages, the Pearson correlation coefficient was used to measure the strength and direction of relationships between key dimensions.

### 3. Results

#### 3.1. Descriptive Findings

There was a total of 7567 valid questionnaires returned, with the majority (55%) completed by public servants from the local government, and the remaining (45%) from the central government. Overall, male respondents represented approximately 60.3% (4561 questionnaires), females accounted for about 39.2% (2,966 questionnaires), and 0.5% (40 questionnaires) did not indicate their sex. These 40 questionnaires were included and considered as a valid return according to gender equality in Sustainable Development Goal 5. Among public servants in the central government, 1551 (45.9%) were women, 1828 (54.1%) were men, and 21 people did not respond their sex. As for public servants in the local government, there were 1415 women (34.1%), 2733 (65.9%) men, and 19 who did not indicate their gender.

The results of the differential analysis revealed significant differences in the personal norms ( $df = 7566$ , two-tailed,  $t = 10.340 > 1.96$ ,  $p < 0.001$ ), awareness of consequences ( $df = 7566$ , two-tailed,  $t = 10.502 > 1.96$ ,  $p < 0.001$ ), ascription of responsibility ( $df = 7566$ , two-tailed,  $t = 4.476 > 1.96$ ,  $p < 0.001$ ), and pro-environmental behaviors ( $df = 7,566$ , two-tailed,  $t = 7.169 > 1.96$ ,  $p < 0.001$ ) between public servants in the central and local governments. The personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors were significantly greater for public servants in the central government than their counterparts serving in the local governments.

Furthermore, the findings also indicated that significant differences were evident in personal norms ( $df = 7526$ , two-tailed,  $t = 10.066 > 1.96$ ,  $p < 0.001$ ), awareness of consequences ( $df = 7,526$ , two-tailed,  $t = 8.069 > 1.96$ ,  $p < 0.001$ ), ascription of responsibility ( $df = 7526$ , two-tailed,  $t = 3.638 > 1.96$ ,  $p < 0.001$ ), and pro-environmental behaviors ( $df = 7526$ , two-tailed,  $t = 3.632 > 1.96$ ,  $p < 0.001$ ) between male and female public servants. The values related to personal norms, awareness of

consequences, ascription of responsibility, and pro-environmental behaviors of female public servants were significantly higher than those of male public servants.

When comparing between male and female public servants serving at the central government, findings showed significant differences in their personal norms ( $df = 3378$ , two-tailed,  $t = 4.281 > 1.96$ ,  $p < 0.001$ ), and awareness of consequences ( $df = 3378$ , two-tailed,  $t = 2.493 > 1.96$ ,  $p < 0.05$ ). The personal norms and awareness of consequences of female public servants at the central government were significantly higher than those of male public servants. As for public servants at the local governments, significant differences were noted in the personal norms ( $df = 4147$ , two-tailed,  $t = 8.129 > 1.96$ ,  $p < 0.001$ ), awareness of consequences ( $df = 4147$ , two-tailed,  $t = 6.975 > 1.96$ ,  $p < 0.001$ ), ascription of responsibility ( $df = 4147$ , two-tailed,  $t = 2.739 > 1.96$ ,  $p < 0.01$ ), and pro-environmental behaviors ( $df = 4147$ , two-tailed,  $t = 3.395 > 1.96$ ,  $p < 0.001$ ) between the two genders. The values of personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors were all significantly higher for females than males. Table 1 summarizes the descriptive statistics results for personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors.

The overall results showed that most of the respondents were aged 40–49 years (34.7%), and this was followed by other age groups of 30–39 years (31.6%), younger than 30 years (17%), 50–59 (14.8%), and over 60 years (2%), respectively. For public servants at the central government, respondents aged between 40–49 years (35.0%) constituted the largest group, and this was followed by 30–39 years (29.0%), 50–59 years (19.7%), younger than 30 years (13.0%), and over 60 years (3.2%). As for public servants at the local governments, respondents between 40–49 years (34.4%), and over 60 years (1%) were the largest and smallest group, respectively. Other age groups included: 30–39 years (31.6%), 50–59 years (10.7%), and younger than 30 years (30.0%).

The results of the chi-squared test indicated that a significant difference exists in the age composition between public servants at the central and local governments ( $\chi^2 = 214.998$ ,  $p < 0.001$ ). The proportion of the age groups, 40–49 years, 50–59 years, and over 60 years for public servants serving at the central government was greater than their counterparts at the local governments. In contrast, the local governments had a higher proportion of public servants aged 30–39 years, and younger than 30 years when compared with the central government. Table 2 provides a brief summary of the respondents' age groups.

With regards to academic qualifications (as shown in Table 3), the overall findings revealed that the majority of respondents were university or junior college graduates (70.5%), and this was followed by high school or lower qualifications (15.8%), and a master's degree or higher qualifications (13.7%). Most of the public servants at the central government had university or junior college qualifications (64.1%), and this was followed a master's degree or above (19.4%), and high school or lower (16.6%) qualifications, respectively. On the other hand, public servants at the local governments were predominantly university or junior college graduates (75.8%), with the high school or lower (15.2%), and a master's degree or higher (9%) qualifications representing the remaining.

The results of the chi-squared test revealed a significant difference in academic qualifications between public servants at the central and local governments ( $\chi^2 = 185.134$ ,  $p < 0.001$ ). The proportion of public servants at the central government who obtained a master's degree or above, and high school or lower academic qualifications was higher as compared with their counterparts serving at the local governments. On the other hand, public servants at the local governments had a higher proportion of university or junior college graduates than those at the central government.

**Table 1.** Descriptive statistics and variance analysis related to personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors.

Variables	Frequency	Percent	Personal Norms				Awareness of Consequences				Ascription of Responsibility				Pro-Environmental Behaviors			
			Mean	SD	<i>t</i>	<i>p</i>	Mean	SD	<i>t</i>	<i>p</i>	Mean	SD	<i>t</i>	<i>p</i>	Mean	SD	<i>t</i>	<i>p</i>
<b>Government Type</b>																		
Central	3400	45.0	4.43	0.67	10.340	0.000	4.42	0.70	10.502	0.000	3.98	0.76	4.376	0.000	3.95	0.68	7.169	0.000
Local	4167	55.0	4.26	0.78			4.24	0.82			3.90	0.80			3.83	0.75		
<b>Overall Gender</b>																		
Female	2966	39.4	4.45	0.67	10.066	0.000	4.41	0.70	8.069	0.000	3.97	0.75	3.638	0.000	3.92	0.67	3.632	0.000
Male	4561	60.6	4.27	0.77			4.27	0.81			3.91	0.80			3.86	0.75		
<b>Central Government Gender</b>																		
Female	1551	45.9	4.49	0.64	4.281	0.000	4.46	0.67	2.493	0.013	4.00	0.74	1.670	0.095	3.96	0.66	0.389	0.697
Male	1828	54.1	4.39	0.71			4.40	0.72			3.96	0.77			3.95	0.70		
<b>Local Government Gender</b>																		
Female	1415	34.1	4.39	0.69	8.129	0.000	4.36	0.73	6.975	0.000	3.94	0.77	2.739	0.006	3.89	0.18	3.395	0.001
Male	2733	65.9	4.20	0.81			4.18	0.85			3.87	0.82			3.81	0.15		

**Table 2.** Results of the cross-analysis and chi-squared test in relation to the age groups of public servants at the central and local governments. ( $n = 7550$ , 17 people did not answer).

Attributes	Age Groups					Total	$\chi^2$	$p$
	Less than 30	30–39	40–49	50–59	60 and over			
Central Government	433 (13.0%)	986 (29.0%)	1188 (35.0%)	669 (19.7%)	109 (3.2%)	3395	214.998	<0.000
Local Government	837 (20.1%)	1401 (33.7%)	1429 (34.4%)	445 (10.7%)	43 (1.0%)	4155		
Total	1280 (17.0%)	2387 (31.6%)	2617 (34.7%)	1114 (14.8%)	152 (2.0%)	7550		

**Table 3.** Results of the cross-analysis and chi-square test related to the academic qualifications of public servants at the central and local governments. ( $n = 7510$ , 57 people did not answer).

Attributes	Academic Qualifications			Total	$\chi^2$	$p$
	High School or Lower	University or Junior College	Master's Degree or Higher			
Central Government	560 (16.6%)	2165 (64.1%)	655 (19.4%)	3380	185.134	<0.000
Local Governments	626 (15.2%)	3132 (75.8%)	372 (9.0%)	4130		
Total	1186 (15.8%)	5297 (70.5%)	1027 (13.7%)	7510		

According to Table 4, public servants who had 11–20 years of work experience accounted for 26.1%, and this was followed by 21–30 years (25.9%), less than 3 years (16.1%), 3–5 years (15.3%), 6–10 years (12.5%), and more than 31 years (4%), respectively. For public servants at the central government, most of them had 11–20 years (28.3%) of working experience, and this was followed by 21–30 years (26.4%), less than 3 years (15.1%), 6–10 years (13%), 3–5 years (11.7%), and more than 31 years (5.5%), respectively. As for public servants at the local governments, the 21–30 years (25.6%) of work experience category had the highest representation, with other categories as follows: 11–20 years (24.4%), 3–5 years (18.2%), less than 3 years (16.9%), 6–10 years (12.2%), more than 31 years (2.8%).

**Table 4.** Results of the cross-analysis and chi-squared test related to the work experience of public servants at the central and local governments. ( $n = 7224$ , 343 people did not answer).

Attributes	Years of Work Experience						Total	$\chi^2$	$p$
	Less than 3 years	3–5 years	6–10 years	11–20 years	21–30 years	Over 31 years			
Central Government	486 (15.1%)	375 (11.7%)	417 (13.0%)	908 (28.3%)	846 (26.4%)	176 (5.5%)	3208	98.183	<0.000
Local Governments	678 (16.9%)	732 (18.2%)	488 (12.2%)	980 (24.4%)	1027 (25.6%)	111 (2.8%)	4016		
Total	1164 (16.1%)	1107 (15.3%)	905 (12.5%)	1888 (26.1%)	1873 (25.9%)	287 (4.0%)	7224		

When comparing public servants between the central and local governments, a significant difference was found in their years of work experience ( $\chi^2 = 185.134$ ,  $p < 0.001$ ). The findings indicated a higher proportion of public servants at the central government with the following work experience categories: 6–10 years, 11–20 years, 21–30 years, and more than 31 years. Conversely, public servants at the local governments were better represented in the less than 3 years, and 3–5 years of work experience categories.

There were four personal norms items investigated in this study, among them “I have an obligation to cherish the limited resources of the earth” and “I have an obligation to maintain a good natural

environment so that the next generation can have the same life quality” had the highest mean score, and this was followed by “I have an obligation to learn more about the natural environment” and “I have an obligation to respect the life-sustaining needs and rights and interests of all living things in the environment”. The reliability analysis results showed an internal consistency reliability measurement with a Cronbach’s  $\alpha$  value of 0.900 for the personal norms items. Table 5 presents a brief summary of the results of the personal norms items.

**Table 5.** Results of personal norms items.

Personal Norms	Mean	SD
PN1. I have an obligation to cherish the limited resources of the earth.	4.38	0.814
PN2. I have an obligation to learn more about the natural environment.	4.33	0.832
PN3. I have an obligation to respect the life-sustaining needs and rights and interests of all living things in the environment.	4.26	0.868
PN4. I have an obligation to maintain a good natural environment so that the next generation can have the same life quality.	4.38	0.859
Overall personal norms	4.34	0.740

Three items related to awareness of consequences were examined, with “I know that the ambient air, noise, and sanitation can have an immediate influence on environmental quality” achieving the highest mean score. This was followed by “I know that the air, noise, and sanitation in the workplace can have an immediate influence on environmental quality” and “I know that climate change will have serious consequences to global environment.” The reliability analysis results revealed an internal consistency reliability measurement with a Cronbach’s  $\alpha$  value of 0.922 for the awareness of consequences items. Results of the awareness of consequences items are presented in Table 6.

**Table 6.** Results of awareness of consequences items.

Awareness of Consequences	Mean	SD
AC1. I know that climate change will have serious consequences for the global environment.	4.27	0.837
AC2. I know that the ambient air, noise, and sanitation can have an immediate influence on environmental quality.	4.36	0.829
AC3. I know that air, noise, and sanitation in the workplace can have an immediate influence on environmental quality.	4.33	0.821
Overall awareness of consequences	4.32	0.770

Findings for the ascription of responsibility items are displayed in Table 7. Among the three ascription of responsibility items, “I have a responsibility to work with other people in government agencies to improve or solve the surrounding environmental problems” had the highest mean score, and this was followed by “I have a responsibility to work with environmental groups to improve or solve environmental problems” and “I have a responsibility to take action to improve or solve environmental problems”. The reliability analysis results indicated an internal consistency reliability measurement with a Cronbach’s  $\alpha$  value of 0.754 for the ascription of responsibility items.

Results (see Table 8) indicate that there were three pro-environmental behaviors items; “I paid attention to whether my environment-related behavior is correct” and “I actively studied the news and information about environmental conservation” received the highest and lowest mean scores, respectively. Another item also included: “I implemented the concept of environmental friendliness into the work plan for the implementation of official duties”. The reliability analysis results showed an internal consistency reliability measurement with a Cronbach’s  $\alpha$  value of 0.829 for the pro-environmental behaviors items.

**Table 7.** Results of ascription of responsibility items.

Ascription of Responsibility	Mean	SD
AR1. I have a responsibility to take action to improve or solve environmental problems.	3.82	0.927
AR2. I have the responsibility to work with other people in government agencies to improve or solve the surrounding environmental problems.	4.01	0.848
AR3. I have the responsibility to work with environmental groups to improve or solve environmental problems.	3.97	0.883
Overall ascription of responsibility	3.93	0.784

**Table 8.** Results of pro-environmental behaviors items.

Pro-Environmental Behaviors	Mean	SD
PEB1. I actively studied the news and information about environmental conservation.	3.83	0.883
PEB2. I paid attention to whether my environment-related behavior is correct.	4.10	0.830
PEB3. I implemented the concept of environmental friendliness into the work plan for the implementation of official duties	4.08	0.826
Overall pro-environmental behaviors	3.89	0.719

### 3.2. Correlation Analysis

This study used the Pearson correlation mathematical equation as shown below to analyze the relationships between age, education level, and work experience of the respondents with personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} \quad (1)$$

According to the correlation analysis as shown in Table 9, the findings revealed that age and work experience of public servants were significantly correlated with personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors ( $p < 0.001$ ). While the education level of public servants was also significantly correlated with personal norms, no relationship was found with awareness of consequences, ascription of responsibility, and pro-environmental behaviors.

**Table 9.** Pearson correlation matrix for age, education level, and work experience.

Variables	PN	AC	AR	PEBs
Age	0.190 ***	0.201 ***	0.110 ***	0.165 ***
Education Level	0.044 ***	0.021	−0.007	−0.008
Work Experience	0.165 ***	0.185 ***	0.096 ***	1.151 ***

Note: \*\*\*  $p < 0.001$ , two-tailed. Abbreviations: PN, personal norm; AC, awareness of consequences; AR, ascription of responsibility; PEBs, pro-environmental behaviors.

As presented in Table 10, the results of the correlation analysis for public servants at both the central and local governments revealed that the correlation between awareness of consequences and personal norms ( $r = 0.823$ ) was the strongest, and they were highly correlated. Findings also showed moderate correlations between personal norms and ascription of responsibility ( $r = 0.585$ ), personal norms and pro-environmental behaviors ( $r = 0.638$ ), awareness of consequences and ascription of responsibility ( $r = 0.560$ ), awareness of consequences and pro-environmental behaviors ( $r = 0.605$ ), and ascription of responsibility and pro-environmental behaviors ( $r = 0.661$ ). Therefore, all four dimensions in this study were interrelated.

**Table 10.** Pearson correlation matrix for personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors for public servants at both the central and local governments.

Variables	PN	AC	AR	PEBs
PN	1.000			
AC	0.823	1.000		
AR	0.585	0.560	1.000	
PEBs	0.638	0.605	0.661	1.000

Note: All  $p < 0.001$  are two-tailed.

For public servants at the central government, the results of the correlation analysis (as shown in Table 11) suggest that the strongest relationship was between personal norms and ascription of responsibility (H2,  $r = 0.788$ ). Findings also indicate that moderate correlations between awareness of consequences and pro-environmental behaviors (H4,  $r = 0.639$ ), personal norms and pro-environmental behaviors (H1,  $r = 0.618$ ), ascription of responsibility and pro-environmental behaviors (H6,  $r = 0.613$ ), awareness of consequences and ascription of responsibility (H5,  $r = 0.533$ ), and personal norms and ascription of responsibility (H3,  $r = 0.511$ ) exist.

**Table 11.** Pearson correlation matrix for personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors for public servants at the central government.

Variables	PN	AC	AR	PEBs
PN	1.000			
AC	0.788 (H2)	1.000		
AR	0.511 (H3)	0.533 (H5)	1.000	
PEBs	0.618 (H1)	0.639 (H4)	0.613 (H6)	1.000

Note: All  $p < 0.001$  are two-tailed.

On the other hand, findings of the correlation analysis (as shown in Table 12) for public servants at the local governments indicate that personal norms and awareness of consequences (H8,  $r = 0.846$ ) have the strongest correlation. Results also reveal moderate correlations between ascription of responsibility and pro-environmental behaviors (H12,  $r = 0.714$ ), awareness of consequences and pro-environmental behaviors (H10,  $r = 0.705$ ), personal norms and pro-environmental behaviors (H7,  $r = 0.658$ ), awareness of consequences and ascription of responsibility (H11,  $r = 0.632$ ), and personal norms and ascription of responsibility (H9,  $r = 0.592$ ).

**Table 12.** Pearson correlation matrix for personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors for public servants at the local governments.

Variables	PN	AC	AR	PEBs
PN	1.000			
AC	0.846 (H8)	1.000		
AR	0.592 (H9)	0.632 (H11)	1.000	
PEBs	0.658 (H7)	0.705 (H10)	0.714 (H12)	1.000

Note: All  $p < 0.001$  are two-tailed.

### 3.3. Path Analysis and Structural Equation Model

LISREL (linear structural relations) 9.2 [46] was used to analyze the research hypotheses and measurement dimensions to determine the overall and internal fit of the hypothetical model. Maximum likelihood estimation was applied to estimate the model parameters. Various fit indices were used as determination bases to test the overall model fit and are briefly explained as follows. A goodness of fit index (GFI) is a measure of fit between the hypothesized model and the observed covariance

matrix, in which an index of >0.90 indicates acceptable goodness of fit. In Equation (2),  $F$  is the maximum likelihood discrepancy function;  $S$  is the sample variance/covariance matrix;  $\Sigma(\theta)$  represents the variance/covariance matrix implied by the population parameters; and  $\Sigma(\theta)_i$  denotes the variance/covariance matrix implied by the sample-estimate parameters.

$$GFI = 1 - \frac{F[S, \Sigma(\theta)]}{F[S, \Sigma(\theta)_i]} \quad (2)$$

A comparative fit index (CFI) analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size inherent in the chi-squared test of model fit, where an index of >0.90 indicates acceptable comparative fit [47]. In Equation (3),  $\lambda_i$  is the non-centrality of the independence model; and  $\lambda_k$  represents the centrality parameter estimates of the estimated model.

$$CFI = 1 - \frac{\lambda_k}{\lambda_i} \quad (3)$$

The root mean square error of approximation (RMSEA) index of <0.080 indicates acceptable goodness of fit [48] that seeks to avoid issues of sample size by analyzing the discrepancy between the hypothesized model, with optimally chosen parameter estimates, and the population covariance matrix [49]. In Equation (4),  $\chi_h^2$  is the chi-squared value of the estimated model, while  $df_h$  is the estimated model degrees of freedom.

$$RMSEA = \sqrt{\frac{\left(\frac{\chi_h^2}{df_h}\right) - 1}{n}} \quad (4)$$

A non-normed fit index (NNFI) is similar to the normed fit index (NFI) but adjusts for model complexity, in which an index of >0.90 is considered satisfactory [50]. In Equation (5),  $\chi_i^2$  is the chi-squared value of the baseline model;  $df_i$  denotes the baseline model degrees of freedom;  $\chi_h^2$  is the chi-squared value of the estimated model; and  $df_h$  represents the estimated model degrees of freedom.

$$NNFI = \frac{\frac{\chi_i^2}{df_i} - \frac{\chi_h^2}{df_h}}{\frac{\chi_i^2}{df_i}} \quad (5)$$

The structural equation model (SEM) results revealed that public servants at the central and local governments had various behavioral paths. The various dimensions of public servants at the central government were analyzed using LISREL 9.2. The results indicated that the value of the GFI model reached 0.973, the value of CFI reached 0.982, and the value of NNFI reached 0.976. Since all these values were greater than 0.9, a satisfactory fit was attained. The RMSEA was 0.052, which is an acceptable fit (less than 0.06), and the normed chi-squared was 595.04, far greater than 3. The factor loading of each item also reached an acceptable standard of 0.5 or higher [51].

The model structure of pro-environmental behavior for public servants at the central government is illustrated in Figure 1, with the summary results of the hypothesis testing presented in Table 13. The results of the path analysis indicated that personal norms of public servants at the central government had a direct influence on pro-environmental behaviors ( $\gamma = 0.41$ ,  $t = 10.747$ ,  $p < 0.001$ , standard error (SE) = 0.038), awareness of consequences ( $\gamma = 0.87$ ,  $t = 49.587$ ,  $p < 0.001$ , SE = 0.018), and ascription of responsibility ( $\gamma = 0.42$ ,  $t = 9.932$ ,  $p < 0.001$ , SE = 0.042), respectively. Therefore, the following three hypotheses were supported by the findings.

**Hypothesis 1.** *PNs of public servants in the central government affect their PEBs.*

**Hypothesis 2.** *PNs of public servants in the central government affect their AC.*

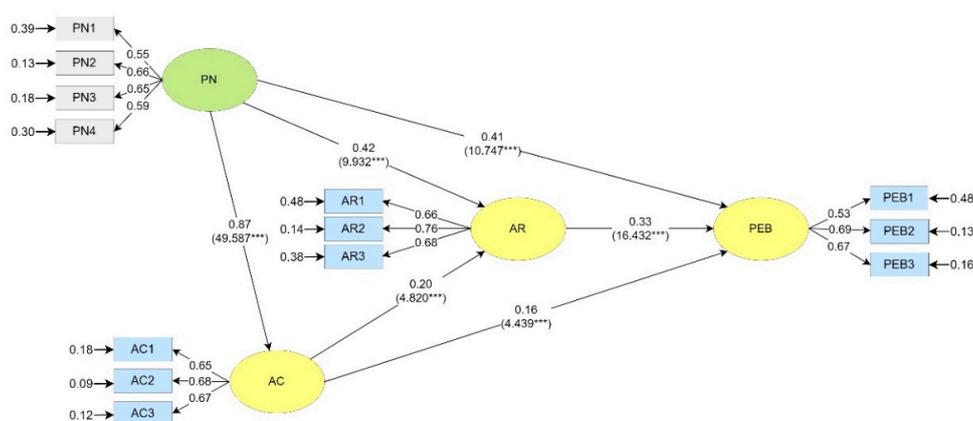
**Hypothesis 3.** PNs of public servants in the central government affect their AR.

Furthermore, the results showed that the pro-environmental behaviors of public servants at the central government were directly affected by awareness of consequences ( $\beta = 0.16, t = 4.439, p < 0.001, SE = 0.035$ ) and ascription of responsibility ( $\beta = 0.33, t = 16.432, p < 0.001, SE = 0.020$ ). Whereas ascription of responsibility was also affected by awareness of consequences ( $\beta = 0.20, t = 4.820, p < 0.001, SE = 0.041$ ). Hence, the results supported the three hypotheses below.

**Hypothesis 4.** AC of public servants in the central government affects their PEBs.

**Hypothesis 5.** AC of public servants in the central government affects their AR.

**Hypothesis 6.** AR of public servants in the central government affects their PEBs.



Chi-Square = 595.04, df = 59, p-value = 0.00000, RMSEA = 0.052

**Figure 1.** Path diagram of public servants at the central government in PNs, AC, AR and PEBs. The root mean square error of approximation (RMSEA) represented as a statistic to determine fit with large sample sizes. Note: \*\*\*  $p < 0.001$ .

**Table 13.** Results of the hypothesis testing for public servants at the central government.

Hypothesis	Path	$\gamma$	$\beta$	$t$	Outcome
H1	PNs → PEBs	0.41	-	10.747 ***	Accepted
H2	PNs → AC	0.87	-	49.587 ***	Accepted
H3	PNs → AR	0.42	-	9.932 ***	Accepted
H4	AC → PEBs	-	0.33	16.432 ***	Accepted
H5	AC → AR	-	0.20	4.820 ***	Accepted
H6	AR → PEBs	-	0.16	4.439 ***	Accepted

Note: \*\*\*  $p < 0.001$ .

Similarly, the various dimensions of public servants at the local governments were analyzed using LISREL 9.2. The results revealed that the GFI (0.971), CFI (0.984), and NNFI (0.979) values were greater than 0.9, which represents a satisfactory fit. The RMSEA was 0.055, which is an acceptable fit (less than 0.060), and the normed chi-squared was 792.12, far greater than 3. The factor loading of each item also reached an acceptable standard of 0.5 or higher.

The model structure of pro-environmental behaviors for public servants at the local governments is illustrated in Figure 2, with the summary results of the hypothesis testing presented in Table 14. According to the analysis, personal norms of public servants at the local governments were directly affecting their pro-environmental behaviors ( $\gamma = 0.48, t = 12.344, p < 0.001, SE = 0.038$ ), awareness of

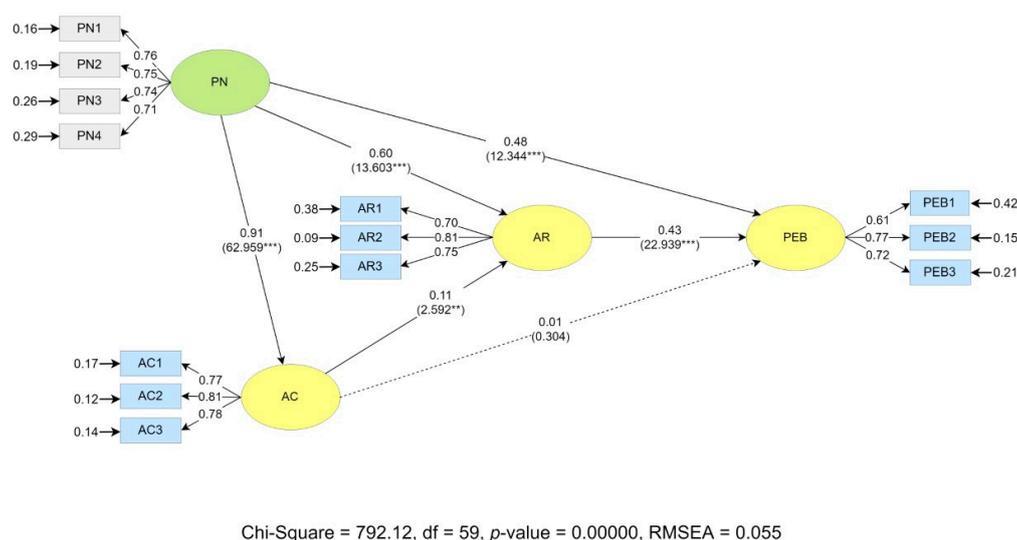
consequences ( $\gamma = 0.91, t = 62.959, p < 0.001, SE = 0.014$ ), and ascription of responsibility ( $\gamma = 0.60, t = 13.603, p < 0.001, SE = 0.044$ ). Thus, the findings supported the three hypotheses below.

**Hypothesis 7.** PNs of public servants in the local government affect their PEBs.

**Hypothesis 8.** PNs of public servants in the local government affect their AC.

**Hypothesis 9.** PNs of public servants in the local government affect their AR.

Although results indicated that ascription of responsibility ( $\beta = 0.43, t = 22.939, p < 0.001, SE = 0.019$ ) had a direct impact on the pro-environmental behaviors of public servants at the local governments, there was no evidence that awareness of consequences ( $\beta = 0.01, t = 0.304, p > 0.05, SE = 0.036$ ) had a similar effect. Hence, H10: AC of public servants in the local government affects their PEBs was rejected, whereas H12: AR of public servants in the local government affects their PEBs was accepted. The findings also suggested that ascription of responsibility was directly influenced by awareness of consequences ( $\beta = 0.11, t = 2.592, p < 0.01, SE = 0.043$ ), which represented the support of H11: AC of public servants in the local government affects their AR.



**Figure 2.** Path diagram of public servants at the local governments in PNs, AC, AR, and PEBs. The root mean square error of approximation (RMSEA) represented as a statistic to determine fit with large sample sizes. Note: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ .

**Table 14.** Results of the hypothesis testing for public servants at the local governments.

Hypothesis	Path	$\gamma$	$\beta$	$t$	Outcome
H7	PNs → PEBs	0.48	-	12.344***	Accepted
H8	PNs → AC	0.91	-	62.959***	Accepted
H9	PNs → AR	0.60	-	13.603***	Accepted
H10	AC → PEBs	-	0.01	0.304	Rejected
H11	AC → AR	-	0.11	2.592**	Accepted
H12	AR → PEBs	-	0.43	22.939***	Accepted

Note: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ .

#### 4. Discussion

This study adopted the aforementioned NAM theoretical framework to investigate how personal norms, awareness of consequences, and ascription of responsibility of public servants at the central and local governments in Taiwan could affect their pro-environmental behaviors. The extant literature

suggested that there was a need to gain further understanding of the environmental value-action gap between public servants at different levels (i.e., central vs. local) of the government, and gain insights into the key issues in the implementation of environmental policies. This study has attempted to address this gap by testing personal norms, awareness of consequences, and ascription of responsibility to determine their specific path and level of influence on pro-environmental behaviors. Results showed support and accepted 11 (i.e., H1, H2, H3, H4, H5, H6, H7, H8, H9, H11, and H12) of the 12 hypotheses, indicating a positive direct relationship.

Findings of the differential analysis revealed that public servants at the central government achieved significantly higher scores than their counterparts serving at local governments in the following four dimensions: personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors. In addition, the results of the chi-squared test showed that there were greater proportions of public servants at the central government with higher educational levels, seniority, and more work experience than those public servants at the local governments. The correlation analysis also suggested that the four factors: personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors were significantly correlated with age and seniority of public servants. Therefore, any differences in terms of influencing factors and path models between public servants at the central and local governments could be attributed to their age and seniority.

#### *4.1. Influence of Personal Norms*

A core component of the NAM is personal norms, which were often considered as a self-concept or cognition of obligations that were closely related to environmental behavior and ethics [26,35]. For public servants at the central government, the findings indicated that their personal norms not only had a significant positive direct effect on their pro-environmental behaviors, but also played an indirect role in influencing pro-environmental behaviors through awareness of consequences and ascription of responsibility. Similarly, personal norms of public servants at the local governments had a positive direct impact on their pro-environmental behaviors as well as an indirect effect on pro-environmental behaviors via ascription of responsibility. However, an indirect relationship with their pro-environmental behaviors was not established through awareness of consequences.

This study revealed that personal norms had a direct influence on pro-environmental behaviors, which was consistent with the findings of previous studies [13,17,26,35]. The personal norms of public servants at both the central and local governments were identified as a key factor influencing their pro-environmental behaviors. An explanation to this could be a strong sense of personal obligations towards pro-environmental behaviors, which in turn generates a higher level of awareness and attitude that subsequently encourages pro-environmental behaviors [13,17,26,35]. However, a lack of awareness about the consequences of environmental issues by public servants at the local governments has raised an important concern to be addressed as a priority in order to enhance their pro-environmental behaviors.

#### *4.2. Influence of Awareness of Consequences*

Awareness of consequences relate to being aware of the impact of environmental problems, which is associated with environmental behaviors. For public servants at the central government, findings showed that their awareness of consequences had a direct effect on their ascription of responsibility and pro-environmental behaviors. Although the relationship was not significant, it indicated that public servants at the central government were more conscious about environmental issues and their consequences. This might be explained by the fact that public servants at the central government have extensive experience and more opportunities in handling public-related affairs and policies that affect the nation than their counterparts at the local governments. These public servants at the central government were responsible for implementing higher level strategic policies at a national level. Thus, they were more aware of the effect of environmental problems (both local and global contexts), which directly affected their ascription of responsibility and pro-environmental behaviors. The findings

aligned with previous studies that suggested awareness of consequences could have a positive effect on pro-environmental behaviors [15,36,41].

In contrast, results indicated that the awareness of consequences of public servants at the local governments had no direct influence on their pro-environmental behaviors, and its effect on the ascription of responsibility was relatively weak as well. Furthermore, findings also revealed that the awareness of consequences of public servants at the local governments was significantly lower than those of their counterparts serving at the central government. An explanation to this could be because public servants at the local governments mainly deal with operational and administrative tasks to implement the policies assigned by higher level agencies from the central government. As a result, they lack consideration for a wider range of environmental issues (e.g., global climate change) and are less concerned about the surrounding environmental problems.

#### *4.3. Influence of Ascription of Responsibility*

Ascription of responsibility relates to a person's attitude toward environmental behaviors [52] and is a major factor influencing environmental behaviors [37] and responsible environmental behaviors (REBs) [38]. The results of this study revealed that the personal norms of public servants at the central and local governments had a positive effect on their ascription of responsibility, which is a crucial intervening variable in the model. In addition, a direct path was also evident between their ascription of responsibility and pro-environmental behaviors. Several studies also supported a positive direct effect of ascription of responsibility on pro-environmental behaviors [15,36,41].

Although personal norms and awareness of consequences could lead to pro-environmental behaviors through the mediation of ascription of responsibility for public servants at the central and local governments, findings suggest that personal norms had a greater effect on the ascription of responsibility than awareness of consequences. This indicates that personal norms are more influential towards pro-environmental behaviors.

### **5. Implications, Limitations, and Future Research**

This study examined the determinants that influence the pro-environmental behaviors of public servants at the central and local governments in Taiwan. The findings of this study have provided further insights to the literature on pro-environmental behaviors, specifically in the under researched context of public servants at different levels (i.e., central vs. local) of the government.

The results revealed that personal norms were the main factors predicting the pro-environmental behaviors for public servants at both central and local governments. The findings also indicated that for public servants at the central government, their awareness of consequences had a direct effect on their pro-environmental behaviors as well as a significant effect on their ascription of responsibility. On the contrary, awareness of consequences of public servants at the local governments had no significant direct effect on pro-environmental behaviors and had only a relatively weak positive influence on the ascription of responsibility. Therefore, the conduct of regular seminars, workshops, and "roadshows" for public servants at local governments could help create and improve their awareness of consequences of various environmental issues [35,53,54], which they lack due to the daily focus on operational and administrative tasks of implementing environmental policies. In addition, the implementation of a mandatory basic environmental education training program through legislation (such as the Environmental Education Act) [55,56] could address the lack of ascription of responsibility where pro-environmental behaviors might be established through awareness of consequences.

The scores on personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors were significantly higher for public servants at the central government than those serving at the local governments. The proportions of public servants at the central government with higher educational levels, seniority, and more work experience were greater than their counterparts in the local governments. Personal norms, awareness of consequences, ascription of responsibility, and pro-environmental behaviors were significantly correlated to age and seniority of

public servants. Thus, any variations in terms of the influencing factors and path models between public servants at the central and local governments could be a result of age and seniority differences. This is a result of the systematic career path structure in which public servants in Taiwan have to first work at local governments, and only after they have acquired a higher level of skills, knowledge, education, and experiences can they be expected to serve at central government agencies.

This was an empirical study conducted in Taiwan, and therefore the findings are not applicable to other countries or political systems. Further research is required to provide comparisons between Taiwan and other countries and to determine related similarities or differences. In addition, future research can also be conducted to investigate other factors that influence pro-environmental behaviors [56,57], the related issues in the implementation of policies by public servants, and other possible effects on behavioral paths.

**Author Contributions:** W.-T.F., J.-C.L. and Y.-T.C. conceived and designed the experiments; Y.-T.C. and J.-C.L. performed the experiments; Y.-T.C. and W.-T.F. analyzed the data; W.-T.F., E.N., and Y.-T.C. contributed analysis tools; W.-T.F., Y.-T.C., J.-C.L., and E.N. wrote the paper.

**Funding:** The authors disclosed receipt of the following financial support for the research, authorship, and publication of this article. The grants that we received in support of our research work. We received funds for covering the costs to publish in open access. Preparation of this manuscript was supported by Grant MOST 105-2511-S-003-021-MY3 to W.-T. Fang from the Ministry of Science and Technology, Taiwan, ROC. This article was also subsidized by the National Taiwan Normal University (NTNU), Taiwan, ROC.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A Questionnaire

Gender: Male; Female.

Age: Less than 30; 30–39; 40–49; 50–59; 60 and over.

Academic Qualifications: High-School or Lower; University or Junior College; Master’s Degree or Higher.

Working agencies: Central Government; Local Government:

Years of Work Experience: Less than 3 years; 3–5 years; 6–10 years; 11–20 years; 21–30 years; Over 31 years.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have an obligation to cherish the limited resources of the earth.					
I have an obligation to learn more about the natural environment.					
I have an obligation to respect the life-sustaining needs and rights and interests of all living things in the environment.					
I have an obligation to maintain a good natural environment so that the next generation can have the same life quality.					
I know that climate change will have serious consequences for the global environment.					
I know that the ambient air, noise, and sanitation can have an immediate influence on environmental quality.					
I know that air, noise, and sanitation in the workplace can have an immediate influence on environmental quality.					
I have a responsibility to take action to improve or solve environmental problems.					
I have the responsibility to work with other people in government agencies to improve or solve the surrounding environmental problems.					
I have the responsibility to work with environmental groups to improve or solve environmental problems.					
I actively studied the news and information about environmental conservation.					
I paid attention to whether my environment-related behavior is correct.					
I implemented the concept of environmental friendliness into the work plan for the implementation of official duties.					

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