

What is the Impact of Green Strategy on Enterprises? Exploring the Mediating Effect of Green Assets and Green Technology

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ABSTRACT

This study aims to explore the effect of corporate green strategy (CGS) on the corporate green performance (CGP) and green competitive advantage (GCA). Stepwise regression analysis was used in the data analysis and comparison. Three main conclusions are formed in verifying the hypothesis in this study: (1) Corporate green assets (CGA) and corporate green technology (CGT) are the main factors that can be used by firms to obtain the GCA. (2) The direct effect of a CGS on CGA, CGT, CGP, and GCA can be proven. Furthermore, the mediating effect of CGA and CGT in influencing CGS on the CGP and GCA can be defined. (3) Firms should use the corporate environmental responsibility (CER) conceptual framework built by Yu and Chen (2014) to promote GCA, and firms should examine and classify CER performance with partners according to the CER performance measurement indicators built by Chen et al. (2018).

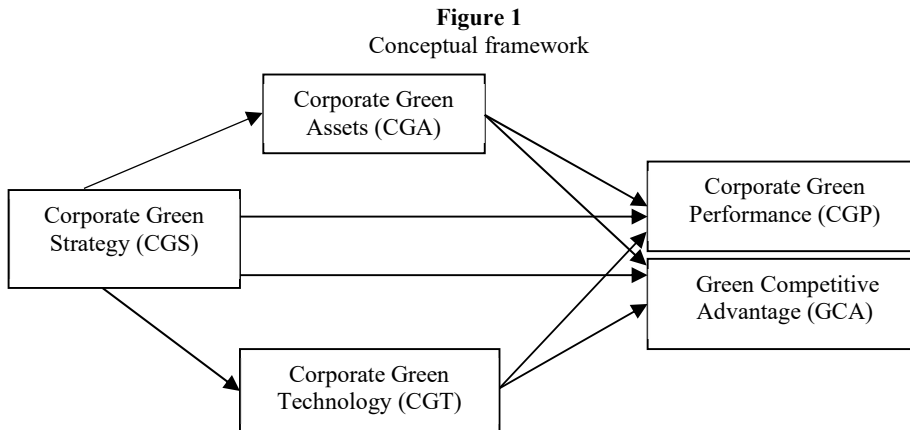
JEL Classifications: M14, M19

Keywords: corporate green strategy, corporate green assets, corporate green technologies, corporate green performance, green competitive advantage

I. INTRODUCTION

Recent years have seen an increasing interest on the separate areas of CER (Stekelorum et al., 2020). The reduction of environmental pollution and the improved efficiency of energy utilization are critical and leading firms who are actively fulfilling their environmental protection activities and corporate social responsibilities (CSR) have become an international trend (Hsu et al., 2011; Wang et al., 2015). Companies should adopt and implement a CSR strategy as early as possible to prevent future negative publicities (Chen et al., 2016). Meanwhile, a firm with a well-directed CSR strategy has a better chance of surviving hard times (Fang et al., 2017), so firms should design a product by choosing the carbon footprint and price in a market with climate concern (Bertini et al., 2020). Notably, although the CER conceptual framework of Yu and Chen (2014) and the CER performance measurement indicators of Chen et al. (2018) successfully revealed the green strategy implemented by the enterprise, achieving the green performance and competitive advantage of the enterprise through the production of CGA and CGT and understanding its main influencing factors have not yet had the opportunity to verify or reinforce the empirical data of quantitative research. Therefore, this study aims to supplement the empirical data and the application of the CER conceptual framework of Yu and Chen (2014) and the CER performance measurement indicators built by Chen et al. (2018) to explore the clear causal relationship between the CGS implemented by the company and its CGP and GCA.

The purpose of this study is to carry out the following: 1. Use construction to measure the actual metrics of the CER conceptual framework of Yu and Chen (2014) and the CER performance measurement indicators of Chen et al. (2018); 2. Use the aforementioned substantive measures in developing effective questionnaire items that can be quantified; 3. Conduct an empirical quantitative study to verify the causal relationship between the conceptual framework and its intrinsic factors; 4. Provide academic research on the relationship between research and the development of CGS and improve CGP and GCA for the first time from conceptual framework to empirical and complete research; and 4. Provide a reference for the business community to effectively develop CGS and enhance CGP and GCA in the future. Figure 1 shows the conceptual framework of this study.



II. LITERATURE REVIEW AND HYPOTHESES

A. The CER Conceptual Framework and Performance Measurement Indicators

The CER framework developed by Yu and Chen (2014) was constructed based on the strategy that enterprises executed. This conceptual framework has precisely determined the current international advanced CER content that includes three primary dimensions and seven secondary dimensions. Nevertheless, understanding the true intention of businesses practicing environmental protection and management through the CER framework remains difficult (Yu et al., 2016). Therefore, Chen et al. (2018) constructed a set of CER performance measurement indicators based on the CER framework developed by Yu and Chen (2014).

The CER performance measurement indicators include three primary dimensions (Green Social Capital, Green Strategy Transition, and Green Benefit Output), seven secondary dimensions, seven tertiary dimensions, and 56 component factors. Green Social Capital includes Green Certification and Industrial Support; Green Strategy Transition includes green technology and green strategy. Green technology includes component factors like green plant facilities, green production, and green products. Green strategy includes four component factors like objective management, internal audit, external audit, and green benefit. Green Benefit Output includes three component factors: Business Operation Benefit, Environment Benefit, and Community Benefit.

B. The Impact of CGS on CGP and GCA

Lai and Feng (2005) propose that corporate environmental (means green) management activities have a significant positive impact on corporate green performance. Kraus et al. (2020) points out that firm's internal resources like environmental strategy can enhance firm's environmental performance. Chen (2008a) affirms that the green core competence of manufacturers can be positive with the green innovation performance and the green image of the manufacturers themselves. Investing in the development of a green core competence can be beneficial to companies who want to enhance their green innovation and image. Chen et al. (2006) also propose that green product innovation and green process innovation performances have a positive relationship with the company's competitive advantage. Chen (2008b) also emphasizes that three types of green intellectual capital (i.e., green human capital, green structural capital, and green relational capital) have a positive effect on competitive advantages of firms. Also, Yusliza et al. (2020) points out green intellectual capital was found to have positive relationship with sustainable performance and Wang et al. (2020) found the green supply chain management has a positive effect on firm performance. Besides, corporate environmental investment helps improve corporate environmental performance (Tian et al., 2020). In other words, companies investing many resources and efforts in green intellectual capital could not only meet the trends of strict international environmental regulations and popular environmental consciousness of consumers, but also eventually obtain corporate competitive advantages. On the basis of the aforementioned literature, this study infers that Hypotheses 1 and 2 are as follows:

H1: CGS has a significant positive impact on CGP.

H2: CGS has a significant positive impact on GCA.

C. The Impact of CGS on CGA and CGT

Stoneham et al. (2012) points out the importance of physical environmental assets account. Huang and Lei (2021) confirm environmental regulations are positively related to corporate green investment. Berry and Rondinelli (1998) propose that, if companies adopt a proactive environmental management strategy, they should combine environmental protection goals with the functions of the various departments of the enterprise and use innovative environmental protection technologies to solve environmental problems such that they can be exempted from environmental protection. In addition to penalties, these goals can also enhance corporate image and even develop new market opportunities. That is, in the face of external environmental pressures and requirements, companies should take a proactive attitude and combine environmental protection goals with the functions of the various departments of the enterprise using innovative environmental technologies to solve environmental problems and green system factors. The degree of adaptation with the green strategy proposed by the company in response to this green system factor can be increased such that it can also enhance the corporate image and even develop new markets and opportunities to gain a competitive advantage in addition to avoiding environmental protection or punishment. According to the aforementioned literature, this study infers hypothesis 3 as follows:

H3: CGS has a significant positive impact on CGA.

Yan et al. (2020) and Danish and Ulucak (2020) point out the importance of green technology innovation and environmental-related technologies. In recent years, green technology has developed rapidly in advanced countries. Enterprises adopt green technologies, which not only deal with wastes and pollutants but also reduce costs and increase quality and make enterprises competitive in the green consumer market. In addition to the importance of the company's own emphasis on environmental issues, its growth is related to its ability of technology development and innovation (Xiao et al., 2002). If the green technology can be effectively used to reduce production costs and increase product value, then it not only can make up for the investment cost of environmental protection but also can obtain a competitive advantage in the long term (Porter, 1995). In Zhao et al.'s (2020) research, they jointly optimized technical efficiency and environmental sustainability. Also, Forcadell et al. (2021) point out environmental CSR enhances SMEs' innovativeness. According to the aforementioned literature, this study infers hypothesis 4 as follows:

H4: CGS has a significant positive impact on CGT.

D. Mediating Effect of CGA

Grant (1991) emphasizes the strategy analysis of resource-based theory. A framework is implemented after the strategy is selected. The enterprise defines the resource gaps that must be filled and forms its ability through the resources it owned. Subsequently, this ability evolves into competitive advantage and finally influences the formation of corporate strategy. In the impact of strategy on competitive advantage, the resource and capacity of the enterprise are intermediating effects. Tian et al. (2020) points the

corporate environmental investment helps improve corporate environmental performance. Chen et al. (2005) confirm that green innovation performance is internal and external environmental protection. The role of pressure on the competitive advantage of enterprises is full intermediary. Chen et al. (2006) propose that green product and process innovation performance have a positive relationship with the company's competitive advantage. Shen (2010) also contends that green smart capital has a partial intermediary effect on corporate environmental management and performance. Huang and Chen (2012) deduce that the green resources of enterprises have a remarkable positive impact on the exploration and application of green product innovation. In addition, the green resources of enterprises have a remarkable positive impact on the success of green product innovation. On the basis of the aforementioned literature, this study infers Hypotheses 5 and 6 as follows:

H5: CGA has a mediating effect on the relation between CGS and CGP.

H6: CGA has a mediating effect on the relation between CGS and GCA.

E. Mediating Effect of CGT

Danish and Ulucak (2020) points out the importance of environmental-related technologies and finds environmental-related technologies positively contribute to green growth. Huang and Kao (2003) emphasize that the organizational structure of each sub-facial aspect is significantly positively correlated with the adoption of green technology innovation. Furthermore, Huang and Kao (2003) also confirm that the adoption of green technology innovation greatly affects the environmental management of enterprises. Chen et al. (2005) verify that green innovation performance plays a full mediating role in the impact of internal and external environmental pressures on corporate competitive advantage. Lin et al. (2006) affirm that innovation in environmental technology can improve company competitiveness. Meanwhile, Yang et al. (2020) proves that green technology is an important mediating variable on the relationship between environmental regulation and carbon intensity and Sartal et al. (2017) also confirm the total mediation by environmental technology between Lean Manufacturing and performance. According to the aforementioned literature, this study infers Hypotheses 7 and 8 as follows:

H7: CGT has a mediating effect on the relation between CGS and CGP.

H8: CGT has a mediating effect on the relation between CGS and GCA.

III. METHODOLOGY

A. Case Selection

Data from the Department of Investment Services of the Ministry of Economic Affairs in Taiwan reveal that Taiwan became the second largest manufacturer of information hardware worldwide in 2005. With 70% of the market share, Taiwan is likewise the largest supplier of semiconductors, optoelectronics, information, and communications worldwide (Wang et al., 2015). Meanwhile, many related studies of CSR, CER, green or sustainability performance will focus on Taiwanese firms (Chiou and Shu, 2019; Deng

et al., 2018), therefore, the present study selected leading Taiwanese high-technology electronic firms with international levels of technology as research participants.

Answering the questionnaire used in this study through a single department of a company is difficult. Multiple departments should be assisted to obtain a good response. Therefore, this study is assisted by the researchers themselves and senior managers. The research questionnaires can be distributed in two ways. (1) The questionnaires were randomly distributed to other high-tech manufacturing companies through job and business contacts with the help of senior managers of two high-tech companies. (2) According to the website of the Business Council for Sustainable Development of Taiwan (BCSD-Taiwan) (<https://www.wbcd.org/Overview/Global-Network/Regions/Asia/Taiwan/BCSD-Taiwan>), this study will contact the relevant high-tech industry companies to inquire and request high-tech industries. The company is assisted in the questionnaire survey. At the end of the study, 32 samples of effective high-tech industry companies were collected whose technologies belong to the international level.

B. The Operational Definition and Measures

Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (Amos) were used in data analysis and comparison. The Cronbach's α value was used in examining whether the measurement of variables in this study satisfied the consistency requirements. Composite reliabilities (CR) and average variances extracted (AVE) were used in examining the convergent validity and the discriminant validity. Stepwise regression analysis was employed in testing the hypotheses.

Olson (2008) points out a green strategy fundamentally helps an enterprise make decisions that have a positive impact on the environment. Adopt the reference from Olson (2008) for their definition about CGS. This study defines CGS as the firm's basic environmental strategy, including green actions and decisions that have a positive effect on the environment. In addition, referring to the research of Olson (2008), Yu and Chen (2014), and Chen et al. (2018), the CGS of this research includes four secondary dimensions.

Meanwhile, Hall (1992) and Collis and Montgomery (1995) divide resources into two types of assets and capabilities to discuss. Assets refer to the stock of elements owned or controlled by an organization, including patents, trademarks, contracts, goodwill, etc. Capability refers to the organization's ability to allocate resources. It is an intangible asset, including organizational culture, etc. Intentionally, this study adopts the reference from Hall (1992) and Collis and Montgomery (1995) to define CGA as the related environmental protection elements owned by the company. In addition, referring to Hall (1992), Collis and Montgomery (1995), Yu and Chen (2014), and Chen et al. (2018), the CGA of this research include two secondary dimensions.

Moreover, according to Shrivastava (1995), environmental technologies as a competitive force and a tool for competitive advantage. Environmental technologies offer a new substantive orientation and a management process for minimizing ecological impacts of economic production while enhancing competitiveness of firms. Klassen and Whybark (1999) refers to the green technology as the technology that can change the factors which will affect the natural environment in the production process. Therefore, this study adopts the reference from Shrivastava (1995) and Klassen and Whybark (1999)

to define CGT as the related software and hardware environmental protection technologies that can reduce the negative impact on the environment during the production process. In addition, with reference to the research of Shrivastava (1995), Klassen and Whybark (1999), Yu and Chen (2014), and Chen et al. (2018), the CGT of this research includes three major dimensions.

Sharma (2000) defines organizational environmental performance as the impact on the natural environment when a company engages in business and management activities. The ISO 14001 environmental management system specification of ISO (2002) defines environmental performance as the measurable results of an environmental management system that is based on an organization's environmental policies, goals, and controls the elements of environmental impact. Hence, this study adopts the reference from Sharma (2000) and ISO (2002) to define CGP as the company is engaged in business and management activities, the measurable results of related environmental protection activities that are based on environmental policies and the purpose and objectives of reducing the impact on the natural environment, and the environmental impact elements are controlled. In addition, with reference to the studies of Sharma (2000), ISO (2002), Yu and Chen (2014), and Chen et al. (2018), the CGP of this study includes the two secondary dimensions.

The definition of GCA was adopted as reference from Porter (1985), Barney (1991), Chen et al. (2006), and Chen et al. (2009). This study defines GCA as the company's competitors cannot simultaneously implement the company's current green value creation strategies, and cannot replicate and reap the benefits of the company's green strategies. In addition, this study refers to the research of Porter (1985), Hart (1995), Porter and van der Linde (1995), Chen et al. (2006), and Chen et al. (2009) to measure GCA.

The possibility of alternative explanations was reduced through the inclusion of four important controls. We controlled for number of employees, capital, revenue and establishment time, as they are viewed as important variables affecting corporate green strategy. The number of employees includes all employees of local and foreign nationalities. Employees may provide services in a full-time, part-time, permanent, irregular or temporary manner, including managers, general employees and contracted employees, etc. In addition, capital is the initial working capital registered by the company. It also represents the mix of assets or resources a company can draw on in financing its business. Moreover, revenue is the income from sales of products or services provided by the company's operations throughout the year. Furthermore, the establishment time is the time when the company was first established.

IV. DATA ANALYSIS

A. Basic Information of Samples

The company with the largest and lowest number of employees has more than 501 and less than 200 employees, respectively. In the sample, the company's highest capital is more than USD 10 million, followed by USD 2.67–3.33 million. The company's annual revenue is USD 13 million or more, followed by USD 6.7–10 million. The sample company has 20 establishments for this year. The company with the largest number of establishments for this year has 29 and 10 to 19. In the industry part of the sample

company, the company with the largest number of companies is part of the computer, electronic products, and optical product manufacturing industry, followed by electronic component manufacturing company.

B. Reliability, Validity, and Descriptive Statistics

This study will conduct a pre-test before the formal questionnaire is issued to check if the reliability of the questionnaire can meet the requirements of the research design. Guilford (1965) suggests that α value higher than 0.7 indicates a fairly high reliability of measurement. A total of 10 questionnaires were distributed in the pre-test of the study, and 10 valid questionnaires were collected. According to the test results, Cronbach's α values of the variables in the pretest and formal questionnaire were greater than 0.8, which were all high-confidence, indicating that the internal consistency of the variables in this study was good.

Convergence validity refers to the degree of the consistency of the same variable under different measurement methods. The criteria for assessing the validity of convergence include the following: The factor loading for each variable measurement item should be greater than 0.5 (Bagozzi and Yi, 1988; Hair et al., 1998) and the composite reliabilities (CR) of the variables should be greater than 0.6 (Bagozzi and Yi, 1988; Fornell and Larcker, 1981). According to the test results, the factor loading of each variable in the study is greater than 0.6. In addition, the CR values of each variable in the study are also greater than 0.97. The variables in this study present convergence validity. In addition, discriminant validity refers to the degree to which different variables can be distinguished. Fornell and Larcker (1981) emphasize that, if discriminant validity is observed between variables, the average variance extracted (AVE) of each variable is greater than 0.5, that is, the interpretable variation of the variable is greater than the measurement error. The AVE values of the variables in the study were all greater than 0.62, indicating that the variables have discriminant validity. Thus, the scale of this study is suitable for measurement.

This study adopts Pearson's correlation coefficient analysis and descriptive statistics shown in Table 1. According to the figures shown in Table 1, we find clearly the relationship between variables in this study shows a highly positive correlation and the mean value of each variable are greater than median value. In addition, the standard deviation (S.D.) of each variable is around 1, which shows that no significant deviation occurred.

Table 1
Correlation coefficients and descriptive statistic

	1.	2.	3.	4.	5.
1. CGS	1.00				
2. CGA	0.837**	1.00			
3. CGT	0.839**	0.905**	1.00		
4. CGP	0.863**	0.918**	0.860**	1.00	
5. GCA	0.731**	0.816**	0.816**	0.767**	1.00
Mean	3.86	3.05	3.48	3.10	3.29
S.D.	0.938	1.334	1.237	1.296	1.387
Min	1	1	1	1	1
Max	5	5	5	5	5

Note:**means $p \leq 0.01$; *means $p \leq 0.05$

C. Results

The data collected in this study was subjected to stepwise regression and multi-regression analysis to verify the hypotheses. Eight stepwise regression models from model 1 to 8 were developed for hypotheses testing of direct effect, and the results of testing are shown in Table 2.

Table 2
Stepwise regression analyses of direct effect (independent variable: CGS)

Variables	M1	M2 (CGP)	M3	M4 (GCA)	M5	M6 (CGA)	M7	M8 (CGT)
N.O.E.	0.296 (1.345)	0.254 (1.829)	0.48 (2.091*)	0.3 (1.528)	0.523 (2.591*)	0.318 (2.286*)	0.376 (1.78)	0.172 (1.112)
Capital	0.561 (2.803**)	-0.312 (-2.241*)	0.164 (0.783)	-0.178 (-0.906)	0.17 (0.925)	-0.219 (-1.578)	0.304 (1.584)	-0.082 (-0.531)
Revenue	-0.129 (-0.548)	0.127 (0.873)	0.106 (0.43)	0.185 (0.9)	0.107 (0.493)	0.197 (1.354)	0.036 (0.158)	0.125 (0.773)
E.T.	0.056 (0.387)	0.067 (0.765)	-0.05 (-0.335)	-0.084 (-0.676)	0.076 (0.578)	0.038 (0.427)	0.202 (1.467)	0.164 (1.671)
CGS		0.845 (7.181****)		0.609 (3.663****)		0.693 (5.896****)		0.688 (5.258****)
F	6.723***	23.605***	5.631**	9.261***	9.278***	23.656***	7.914***	18.109***
R ²	0.499	0.819	0.455	0.64	0.579	0.820	0.54	0.777
Adj-R ²	0.425	0.785	0.374	0.571	0.516	0.785	0.471	0.734
ΔR ²		0.32		0.185		0.241		0.237

Note: N.O.E. means Number of Employees; E.T. means Establishment Time; D.W. means D-W value;****means $p \leq 0.001$; **means $p \leq 0.01$; *means $p \leq 0.05$; The value in brackets represents the t value

Base on the testing result from model 2 in Table 2, the D-W value is 1.672, which is close to 2, indicating that the residuals are independent of each other and have no autocorrelation (Durbin and Watson, 1950), and the regression coefficient (β) is 0.845 ($t=7.181$, $p=0.000$) affirms that CGS will have a significant positive impact on CGP. In addition, the adjusted R^2 is 0.785, indicating that Number of Employees (N.O.E.), Capital, Revenue, Establishment Time (E.T.) and CGS can explain the 78.5% variation in CGP. The hypothesis 1 of this study is supported on the basis of the observations.

The test results from model 4 confirm that the D-W value is 2.163 and is close to 2, indicating that the residuals are independent of each other and have no autocorrelation. The β coefficient is 0.609 ($t=3.663$, $p=0.001$), indicating that CGS will have a significant positive impact on the green CA. In addition, the adjusted R^2 is 0.571, indicating that N.O.E., Capital, Revenue, E.T. and CGS can explain the 57.1% variation in the GCA. This observation infers that Hypothesis 2 of this study is supported.

According to the testing result from model 6 prove that the D-W value is 1.554 and is close to 2, indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.693 ($t=5.896$, $p=0.000$), indicating that CGS will have a significant positive impact on CGA. In addition, the adjusted R^2 is 0.785, indicating that N.O.E., Capital, Revenue, E.T. and CGS can explain the 78.5% variation of CGA. This observation infers that Hypothesis 3 of this study is supported.

Base on the testing result from model 8 corroborate that the D-W value is 1.769,

which is close to 2, indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.688 ($t=5.258$, $p=0.000$) shows that CGS will have a significant positive impact on the CGT. In addition, the adjusted R^2 is 0.734, indicating that N.O.E., Capital, Revenue, E.T. and CGS can explain the 73.4% variation of the CGT. This observation infers that Hypothesis 4 of this study is supported.

This study is based on the method of verifying the mediating effect mentioned by Baron and Kenny (1986). Eight regression models from model 9 to 16 were developed for hypotheses testing of CGA mediating effect, and the results of testing are shown in Tables 3 and 4.

Table 3
Results for mediated regression analyses (mediator: CGA; reactive variable: CGP)

Variables	M9(Same M1) (CGP)	M10(Same M6) (CGA)	M11(Same M2) (CGP)	M12 (CGP)
N.O.E.	0.296 (1.345)	0.318 (2.286*)	0.254 (1.829)	0.06 (0.489)
Capital	0.561 (2.803**)	-0.219 (-1.578)	-0.312 (-2.241*)	-0.178 (-1.511)
Revenue	-0.129 (-0.548)	0.197 (1.354)	0.127 (0.873)	0.007 (0.055)
E.T.	0.056 (0.387)	0.038 (0.427)	0.067 (0.765)	0.044 (0.623)
CGS		0.693 (5.896***)	0.845 (7.181***)	0.422 (2.901**)
CGA				0.611 (3.854***)
F	6.723***	23.656***	23.605***	32.627***
R ²	0.499	0.820	0.819	0.887
Adj-R ²	0.425	0.785	0.785	0.860
ΔR^2			0.32	0.068
D.W.		1.553	1.672	1.895

Note: N.O.E. means Number of Employees; E.T. means Establishment Time; D.W. means D-W value;***means $p \leq 0.001$; **means $p \leq 0.01$; *means $p \leq 0.05$; The value in brackets represents the t value

Table 4
Results for mediated regression analyses (mediator: CGA; reactive variable: GCA)

Variables	M13(Same M3) (GCA)	M14(Same M6) (CGA)	M15(Same M4) (GCA)	M16 (GCA)
N.O.E.	0.48 (2.091*)	0.318 (2.286*)	0.3 (1.528)	0.126 (0.621)
Capital	0.164 (0.783)	-0.219 (-1.578)	-0.178 (-0.906)	-0.057 (-0.297)
Revenue	0.106 (0.430)	0.197 (1.354)	0.185 (0.9)	0.077 (0.384)
E.T.	-0.05 (-0.335)	0.038 (0.427)	-0.084 (-0.676)	-0.105 (-0.893)
CGS		0.693 (5.896***)	0.609 (3.663***)	0.228 (0.954)
CGA				0.549 (2.111*)
F	5.631	23.656***	9.261***	9.487***
R ²	0.455	0.820	0.640	0.695
Adj-R ²	0.374	0.785	0.571	0.622
ΔR^2			0.185	0.055
D.W.		1.553	2.163	2.311

Note: N.O.E. means Number of Employees; E.T. means Establishment Time; D.W. means D-W value;***means $p \leq 0.001$; **means $p \leq 0.01$; *means $p \leq 0.05$; The value in brackets represents the t value

The test results in Table 3 infer that, in model 10, the D-W value is 1.553 and is close to 2, indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.693 ($t=5.896$, $p=0.000$), indicating that the relationship path A exists. In model 11, the D-W value is 1.672, which is close to 2,

indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.845 ($t=7.181$, $p=0.000$), indicating that the relationship path C exists. Finally, for Model 12, the β coefficient of CGA on the CGP of the enterprise is 0.611 ($t=3.854$, $p=0.001$). This result validates that the relationship path B exists, and in the impact of CGS on the CGP, the β coefficient is 0.422 ($t=2.901$, $p=0.008$), which is smaller than the β coefficient of model 11 (0.845). The CGA have significant and positive partial mediating effect at this time, whereas the overall mode D-W value is 1.895 and approaches 2, indicating that the residuals are independent of each other and have no self-correlation. In addition, the adjusted R^2 is 0.86, which shows that N.O.E., Capital, Revenue, E.T., CGS and CGA can explain the 86% variation of CGP. This observation infers that Hypothesis 5 of this study is supported, and, at this time, the CGA has a significant and positive partial mediating effect.

The verification results in Table 4 deduce that the D-W value in Model 14 is 1.553 and is close to 2, indicating that the residuals are independent of each other and self-correlation. The β coefficient is 0.693 ($t=5.896$, $p=0.000$), indicating that the relationship path A is present. In model 15, the D-W value is 2.163, indicating that the residuals are independent of each other and have no self-correlation. The β coefficient is 0.609 ($t=3.663$, $p=0.001$), indicating that the relationship path C exists. Finally, for model 16, the influence of CGA on the GCA of model 3 resulted in the β coefficient 0.549 ($t=2.111$, $p=0.045$), showing that relationship path B exists, and in the impact of CGS on the GCA, has β coefficient of 0.228 ($t=0.954$, $p=0.349$), indicating that relationship path C is nonexistent. Therefore, the CGA have significant and positive full mediating effect at this time, whereas the overall mode D-W value is 2.311 and approaches 2, indicating that the residuals are independent of each other and have no self-correlation. In addition, the adjusted R^2 is 0.622. This result affirms that N.O.E., Capital, Revenue, E.T., CGS and CGA can explain the 62.2% variation of the GCA. This observation infers that Hypothesis 6 of this study is supported, and, at this time, CGA has a significant and positive full mediating effect.

Eight regression models from model 17 to 24 were developed for hypotheses testing of CGT mediating effect, and the results of testing are shown in Tables 5 and 6.

Table 5
Results for mediated regression analyses (mediator: CGT; reactive variable: CGP)

Variables	M17(Same M1) (CGP)	M18(Same M8) (CGT)	M19(Same M2) (CGP)	M20 (CGP)
N.O.E.	0.296 (1.345)	0.172 (1.112)	0.254 (1.829)	0.193 (1.448)
Capital	0.561 (2.803**)	-0.082 (-0.531)	-0.312 (-2.241*)	-0.282 (-2.157*)
Revenue	-0.129 (-0.548)	0.125 (0.773)	0.127 (0.873)	0.082 (0.598)
E.T.	0.056 (0.387)	0.164 (1.671)	0.067 (0.765)	0.009 (0.104)
CGS		0.688 (5.258***)	0.845 (7.181***)	0.6 (3.79***)
CGT				0.357 (2.16*)
F	6.723***	18.109***	23.605***	23.221***
R^2	0.499	0.777	0.819	0.848
Adj- R^2	0.425	0.734	0.785	0.811
ΔR^2		0.237	0.32	0.029
D.W.		1.769	1.672	2.129

Note: N.O.E. means Number of Employees; E.T. means Establishment Time; D.W. means D-W value;***means $p \leq 0.001$; **means $p \leq 0.01$; *means $p \leq 0.05$; The value in brackets represents the t value

Table 6
Results for mediated regression analyses (mediator: CGT; reactive variable: GCA)

Variables	M21(Same M5) (CGA)	M22(Same M8) (CGT)	M23(Same M4) (GCA)	M24 (GCA)
N.O.E.	0.523 (2.591*)	0.172 (1.112)	0.3 (1.528)	0.187 (1.066)
Capital	0.17 (0.925)	-0.082 (-0.531)	-0.178 (-0.906)	-0.124 (-0.719)
Revenue	0.107 (0.493)	0.125 (0.773)	0.185 (0.9)	0.102 (0.566)
E.T.	0.076 (0.578)	0.164 (1.671)	-0.084 (-0.676)	-0.192 (-1.681)
CGS		0.688 (5.258***)	0.609 (3.663***)	0.156 (0.748)
CGT				0.658 (3.032**)
F	9.278***	18.109***	9.261***	11.683***
R ²	0.579	0.777	0.640	0.737
Adj-R ²	0.516	0.734	0.571	0.674
ΔR ²		0.237	0.185	0.097
D.W.		1.769	2.163	1.816

Note: N.O.E. means Number of Employees; E.T. means Establishment Time; D.W. means D-W value;***means $p \leq 0.001$; **means $p \leq 0.01$; *means $p \leq 0.05$; The value in brackets represents the t value

The results of the verification in Table 5 affirm that the D-W value in Model 18 is 1.769 and approaches 2, indicating that the residuals are independent of each other without self-correlation; The β coefficient is 0.688 ($t=5.258$, $p=0.000$), indicating that relationship path A exists. In model 19, the D-W value is 1.672 and is close to 2, indicating that the residuals are independent of each other and have no self-correlation. The β coefficient is 0.845 ($t=7.181$, $p=0.000$), indicating that the relationship path C exists. Finally, for the model 20, in the impact of the CGT on the CGP of the enterprise, β coefficient is 0.357 ($t=2.16$, $p=0.041$), indicating that relationship path B exists, and in the impact of CGS on CGP, its β coefficient is 0.6 ($t=3.79$, $p=0.001$), which is smaller than β coefficient of model 19 (0.845), CGT has significant and positive partial mediating effect at this time. In addition, the adjusted R^2 is 0.811, which shows that N.O.E., Capital, Revenue, E.T., CGS and CGT can explain the 81.1% variation of CGP. Looking at the above, we can infer that the hypothesis 7 of this study is supported, and, at this time, CGT has a significant and positive partial mediating effect mode. D-W value is 2.129 and approaches 2, indicating that the residuals are independent of each other and have no self-correlation.

The verification results in Table 6 affirm that the suitable D-W value in Model 22 is 1.769, which is close to 2, indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.688 ($t=5.258$, $p=0.000$), indicating that relationship path A is present. In model 23, the suitable D-W value is 2.163 and is close to 2, indicating that the residuals are independent of each other without self-correlation. The β coefficient is 0.609 ($t=3.663$, $p=0.001$), showing that relationship path C is present. Finally, for model 24, which show the impact of CGT on GCA. Its β coefficient is 0.658 ($t=3.032$, $p=0.006$), indicating that the relationship path B exists. Among the

influences of CGS on GCA, the β coefficient is 0.156 ($t=0.748$, $p=0.462$), and relationship path C does not exist at this time. Therefore, the CGT has a significant and positive full mediating effect at this time, and the D-W value of the overall model is 1.816, which is close to 2, indicating that the residuals are independent of each other and have no self-correlation. In addition, the adjusted R^2 is 0.674, showing that N.O.E., Capital, Revenue, E.T., CGS and CGT can explain the 67.4% variation in GCA. This observation infers that the hypothesis 8 of this study is supported, and at this time, CGT has a significant and positive full mediating effect.

V. CONCLUSION AND IMPLICATION

A. Research Results

On the basis of the empirical analysis results of this study and the basic assumptions of resource-based theory, the effect of CGA and CGT mediates on CGP can be considered the presentation of enterprise resource use results. Thus, the CGS, under the influence of CGP, CGA, and CGT, plays a part in the mediating effect. Therefore, to achieve CGP, CGA and CGT are important factors but are not indispensable. The empirical results of this study are consistent with the basic assumptions of resource-based theory that firms have different tangible and intangible resources that can be transformed into unique capabilities that are the source of a firm's CA. In the discussion of the effect of CGA and CGT mediates, CGP can be regarded as the presentation of enterprise resource use results. Therefore, under the influence of CGS on CGP, CGA and CGT are part of the mediating effect. In the same way, according to the hypothesis of resource-based theory, competitive advantage is the ultimate result, and the unique resources and capabilities of enterprises are the source of sustainable competitive advantage. Therefore, under the influence of CGS on GCA, CGA and CGT play a full mediating effect.

B. Theoretical Application

This study makes a positive contribution to theories. First of all, this study in addition to exploring the direct impact of CGS on CGP and GCA, this study also explores whether CGA and CGT have mediating effects in the impact of CGS on CGP and GCA. The empirical analysis results in this study confirm that, in the impact of CGS on CGP and GCA, the CGA and CGT will indeed have a significant mediating effect, thereby clarifying the uncertainty in subsequent relevant research.

Second, this study confirm the firms can use the CER conceptual framework built by Yu and Chen (2014) to promote GCA, and firms should examine and classify CER performance with partners according to the CER performance measurement indicators built by Chen et al. (2018).

C. Management Practice

Resources are the basic elements of an organization and a source of organizational growth and competitive advantage. Nowadays, for the reduction of environmental pollution, related concepts of environmental management, such as green management, marketing, production, and innovation, are beginning to be pursued by enterprises. If the company

is determined to invest in environmental management activities, then the company will begin to develop relevant green strategies. At this time, enterprises must consider how much green assets they own, and, in the face of the requirements of green system factors, enterprises should increase which relevant green assets can meet the requirements of the green corporate strategy and green system.

In terms of the impact of corporate green strategies on green competitive advantages, corporate green assets and corporate green technologies both play a full mediating effect. It can be seen that companies want to gain green competitive advantages in this "green trend". Corporate green assets and corporate green technologies are an indispensable factor. The establishment of corporate green assets and green technologies requires a large amount of capital in the initial stage, but companies in the middle and late stages usually cannot afford this expenditure. Therefore, relevant government agencies should provide resources and channels to assist companies with less capital to obtain green assets and green technology.

D. Limitation and Future Development Direction

The limitation of this study is listed as follows: This study concludes to investigate the high-tech industry in Taiwan. Although the conclusions are clear, their applicability to other industry categories is unknown. Future studies could conduct longitudinal data and investigate other industry to verify this aspect.

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