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Financing Obstacles of the Taiwan Energy Service Company (ESCO) Industry

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ABSTRACT

Since 2005, the Taiwan government has been promoting the energy service company (ESCO) as an industry to improve energy efficiency and reduce carbon dioxide emissions. The so-called ESCO is an industry that adopts energy-saving performance contract (ESPC) as its business model. Financing means financial circulation. In Taiwan, most of the ESCOs are small and medium-sized enterprises (SMEs), which are unable to obtain sufficient loans due to a lack of collateral. Although Taiwan has the Firefly Project provided by the SME credit guarantee fund (SMECGF) as a financing guarantee mechanism, few ESCOs have used this guarantee mechanism, so there is still a need to strengthen the promotion. Besides, even with the Firefly Project as a financing guarantee mechanism, ESCOs still have difficulty obtaining low-interest loans. Therefore, in addition to the guarantee mechanism, the Taiwan government should provide funds for low-interest loans for ESCOs to support the development of the ESCO industry.

1. INTRODUCTION

1.1 Background

Global warming and climate change have become important issues for countries all over the world. To improve energy efficiency and promote energy saving and emission reduction, the energy service company (ESCO) industry has emerged as the times require. The ESCO industry is an emerging industry, and there are few studies on the financial aspects of the ESCO industry [1]-[3].

1.2 Motivations

Since the Bureau of Energy (BOE, Taiwan) of the Ministry of Economic Affairs (MOEA, Taiwan), introduced the ESCO industry into the Taiwan market in 1998, it hopes to establish energy-saving performance contracts (ESPC) through the subsidies model to promote the development of the ESCO industry. The ESCO industry in Taiwan faces several financing obstacles. However, fewer studies on this topic have been provided in the past. Therefore, this study suggests initial ideas to address the financing obstacles for the ESCO industry in Taiwan.

1.3 Purposes

Most ESCOs in Taiwan are small and medium enterprises (SMEs) with a paid-up capital of less than NT$100 million or less than 200 employees. Due to the long payback period of ESPC projects, it is difficult for an SME to operate multiple ESPCs at the same time. Therefore, this study first describes the financial difficulties (financing obstacles) faced by the ESCO industry in Taiwan and tries to find solutions.

1.4 Importance

Although some scholars have conducted some financial studies on the foreign ESCO industry in terms of loans, grants/subsidies, tax breaks, revolving funds, etc., such studies are rarely seen in Taiwan. This study intends to study the financial obstacles of the Taiwan ESCO industry and promote relevant research on the financial problems of the Taiwan ESCO industry

2. LITERATURE REVIEW

2.1 Financing and Financing Obstacles of the ESCO

2.1.1 The meaning of financing

Financing means financial circulation, that is, combining the lending money (*i.e.* commonly known as lending) and borrowing money (*i.e.* commonly known as borrowing) two relative actions!

2.1.2 Financing obstacles of ESCO

ESCO is an emerging industry with an integrated approach to energy conservation, energy efficiency, and service improvement [4]-[6], and its service fee is amortized based on the energy expenditure that it saves for customers. In Taiwan, at least two-thirds of ESCOs belong to the SMEs defined by the standards for identifying small and medium-sized enterprises [7]. Since most ESCOs in Taiwan are SMEs, the financing

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obstacles faced by SMEs are also obstacles faced by Taiwan ESCOs.

Obtaining financing is crucial for the growth of SMEs [8], [9]. The lack of financing channels is one of the important factors restricting the growth of SMEs [10], [11]. SMEs face many obstacles in obtaining financing [12]-[14], including information asymmetry, high loan costs, and difficulty in controlling credit risks [15]. The financing obstacle of SMEs is an important issue that plagues the country's economic development [16], and its financing obstacle may be affected by bank interest rates, charges, and collateral requirements [17]. The high risk of financing due to inadequate guarantees for SMEs is the main reason for the financing obstacle [18].

Moreover, the source of funding for ESCOs (SMEs) are from initial internal sources, such as funds from ESCO (usually SME) owners [19] to informal external sources, such as financial assistance from family and friends [20], and then formal external sources of financial institutions, such as bank loans [21].

2.2 Guarantee of ESCO Financing

2.2.1 About guarantee

The debtor provides collateral to the creditor and when the debtor defaults on the debt, the creditor can dispose of the collateral to obtain repayment [22]. Collateral can be divided into entity collateral (tangible assets) and non-entity collateral (intangible assets). [23] There is a positive correlation between the provision of collateral and financing [24]. Empirically, banks require collateral as one of the conditions for financing has always been an obstacle for SMEs to obtain financing [25].

2.2.2 About Guarantee for ESCO Financing

SMEs generally have a capital gap [26]. The purpose of the Small and Medium Enterprise Credit Guarantee Fund (SMECGF) is to provide credit guarantees for SMEs share the risk of financial institutions [27]. The SMECGF can replace the guaranteed effect of entity collateral (tangible assets) by providing a credit guarantee (CG; intangible assets), which can reduce the information asymmetry between ESCO (usually SMEs) and banks [28]. The operation mode of the credit guarantee is shown in Figure 1.

2.3 Funding for Financing

2.3.1 Source of financing

Financing is a general term for the use of a variety of financial instruments to regulate excess capital about the supply and demand for capital. In 2016, 65.28% of ESCOs' funding came from ESCOs' funds and 34.72% came from financing. ESCOs are mainly funded by their funds, with less than half of their funds being obtained through financing [29].

2.3.2 Revolving fund

As the energy efficiency market is unattractive to many financial institutions [30], revolving funds may be able to address the shortage of ESCO capital [31] as an option for ESCO financing [32]. A revolving fund is a pool of capital [30]. In other words, a revolving fund is a reimbursement that can be returned for reuse in a way that maintains the fund principles [33], and uses savings from the initial project to pay for future improvements [34], reducing investment requirements and increasing investment impact through recovery and reinvestment [35], different dictionaries have different definitions of revolving fund, just as shown in Table 1.

In short, the so-called revolving fund is a fund that can be recovered after payment and used for the same purpose after recovery.

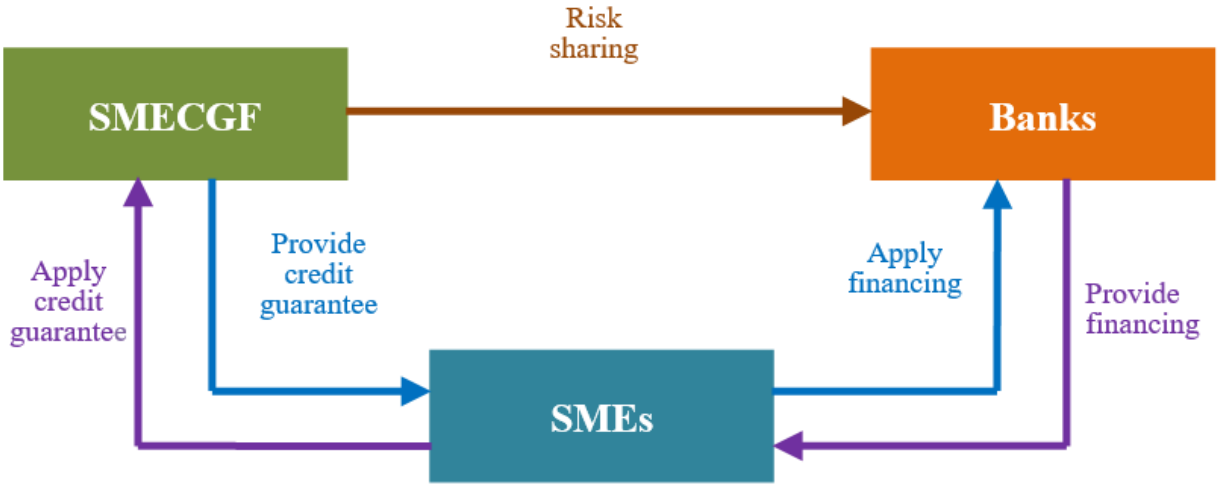

Fig. 1. Operation mode of credit guarantee provided by SMECG (*Source: this research*).

Table 1. Definition of revolving fund in dictionaries.

● A fund whose income or repayment amount can be used to fund its continuing business activities every year, usually set up by the government or non-profit organization to provide discount loans. (*American Heritage Dictionary of the English Language, 2016*)
● A fund set up for a specific purpose and constantly added to by income from its investments. (*Collins English Dictionary, 2014*)
● A fund established to finance a cycle of operations to which reimbursements and collections are returned for reuse in a manner such as will maintain the principal of the fund, e.g., working capital funds, industrial funds, and loan funds. (*Dictionary of Military and Associated Terms. 2005*)
● A fund set up for specified purposes with the proviso that repayments to the fund may be used again for these purposes. (*Merriam-Webster's Dictionary, 2016*)
● An amount of money that exists in order to finance something, but from which any loans must be replaced in order that the full amount is available again. (*Cambridge Dictionary, 2019*)

Source: organized by this research.

3. RESEARCH DESIGN

This research adopts the literature analysis method, the secondary data research method, and the questionnaire survey method.

3.1 Research Methods

The literature analysis method adopted in this research is qualitative research, while the secondary data research method and questionnaire survey method are quantitative research [36].

3.1.1 Literature analysis method

This study reviews the domestic and foreign literature on the development of the ESCO industry, financial guarantees, and revolving funds (including books, journals, master and doctoral theses, research reports, conference materials, and websites) as reference data for the research. For details, see the previous section of this research.

3.1.2 Secondary data research method

This study not only collects public information and reports about the ESCO industry from Taiwan government agencies but also refers to the existing data of non-governmental organizations, such as the Taiwan Green Productivity Foundation (TGPF), Taiwan Energy Service Association (TESA) and Taiwan Association of Energy Service Companies (TAESCO), as the reference data for this research.

3.1.3 Questionnaire survey method

According to the principle of business must go back to the guild, all ESCOs must be forced to join the TESA [37]. Therefore, this study is based on a questionnaire survey of ordinary members of TESA who have paid their membership fees.

a: Research variables and their operational definitions

The following variables are included in this study and the operational definitions of each variable are as follows:

- Independent variable (IV)
  This research takes bank financing as the IV.
- Dependent variable (DV)
  This research takes ESCO borrowing as the DV.
- Moderating variable (MoV)
  In this research, financing guarantees and revolving funds are used as MoVs.

b: Research framework and research hypothesis

Based on the foregoing description, this research proposes a propositional hypothesis framework diagram, such as Figure 2 on the relationship between various variables, and proposes the hypothesis as follows:

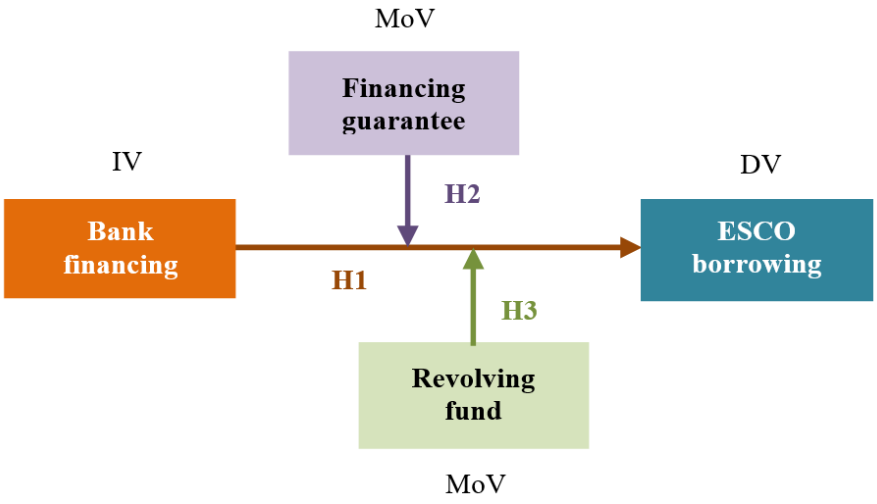

Fig. 2. The framework of the research proposition hypothesis *(Source: this research)*.

Hypothesis：

H1: Bank financing (loan) and ESCO borrowing (borrowing) are positively correlated.
H2: Financing guarantees will positively moderate the debtor-creditor relationship.
H3: Revolving funds will positively moderate the debtor-creditor relationship.

c: Measurement instrument and scale structure

■ Measurement instrument

The Likert 5-point scale was used to measure from 1. Very disagree, 2. Disagree, 3. Common, 4. Agree and 5. Very agree.

■ Scale structure

The questionnaire used in this research was designed by the authors, and after a pre-test by 10 members of TESA, and revision by consulting the opinions of 2 ESCO experts. The structure of the questions in the questionnaire is shown in Table 2.

Table 2. The structure of the questions in the questionnaire.

I. Basic information of the interviewee
II. Bank financing (Q1-Q5) (Q5 is reversed item)
III. ESCO borrowing (Q6-Q10)
IV. Financing guarantee (Q11-Q15)
V. Revolving fund (Q16-Q20)

Source: this research.

3.2 Data Collection and Analytical Method

In this study, the literature analysis method and secondary data research method were used first, followed by the questionnaire survey method. in terms of analytical methods, the data analyzing methods adopted in this research are summarized as follows:

3.2.1 Descriptive statistical analysis

In this study, the mean and standard deviation (σ) of the samples were used to understand the concentration and dispersion trends of the samples.

3.2.2 Validity analysis

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are the two most widely used analysis methods [38]. Construct validity refers to the degree to which operational definitions of variables are properly assigned [39], [40]. This research adopts the factor analysis to analyze construct validity analysis.

3.2.3 Reliability analysis

This study conducted an internal consistency analysis of Cronbach's alpha coefficient values. If the Cronbach's alpha coefficient is greater than 0.7, the reliability is higher; if it is between 0.5 and 0.7, it is acceptable; if it is less than 0.35, the reliability is low and should be rejected [41], [42].

3.2.4 Correlation coefficients analysis

Pearson's correlation coefficients range from -1 to +1, with 0 representing no correlation, negative values being negative correlation, and positive values being positive correlation.

3.2.5 Regression analysis

Regression analysis is a general term for a statistical technique. Essentially, it is the use of regression equations to understand the effect of the independent variable (IV) on the dependent variable (DV).

3.3 Common Method Variance (CMV)

In addition, common method variance (CMV) is one of the sources of error that may affect the results of the research. To avoid the problem of common method variance, in addition to the positive item listed in the questionnaire, the reversed item (*i.e.*, the 5th question of the questionnaire) was listed to reduce the consistent answers of the test takers [43].

4. ANALYSIS AND DISCUSSION

4.1 Sample Analysis

Based on interviews with TESA staff, 115 of the 299 existing general members had paid their dues (*i.e.* rights and obligations in full) by the end of December 2022. A questionnaire survey was conducted with the 115 paid-up TESA general members, 10 predicted and 115 tested. A total of 115 questionnaires were sent out. 66 questionnaires were returned, of which 3 were invalid (incomplete) and 63 were valid, representing a return rate of 57.39% and 95.45% valid questionnaires. The details of the questionnaire return are shown in Table 3.

Table 3. Questionnaire recovery status.

Item	Value	Description
Questionnaire issued	115	ESCO members who have paid their dues
Questionnaire recycling	66	
Percentage of questionnaire recycling	57.39%	Questionnaires collected / Questionnaires distributed
Invalid questionnaire	3	Not fully completed
Valid questionnaire	63	
Percentage of valid questionnaires	95.45%	Valid questionnaires / Questionnaires collected

Source: this research.

After collating 63 valid questionnaires, the sample of this research was analyzed as follows.

4.1.1 Sample variable structure

The mean and standard deviation of the 63 valid samples were obtained through descriptive statistical analysis. The mean of the four directions in this study ranged from 3.463 to 4.937, with the highest score for financing guarantee and the lowest score for revolving fund, which are listed in Table 4.

4.1.2 Validity Analysis

This research uses a factor analysis approach to analyze construct validity, which is detailed as follows:

a: Construct validity of bank financing (IV) and ESCO borrowing (DV)

This research uses a factor analysis approach to analyze construct validity. From Table 5, the factor loading of bank financing (IV) and ESCO borrowing (DV) is between -0.139~0.868, the unrotated eigenvalue of the first factor is 5.733, and the cumulative variance is 63.696% (greater than 50%), which can be considered as an ideal situation. For details, the analysis of the factors of bank financing (IV) and ESCO borrowing (DV) is shown in Table 5.

Table 4. Basic analysis table of each aspect.

Facet and Question	Mean	Standard Deviation
bank financing (IV) —total 4 questions	4.937	0.237
bank financing (IV) —total 5 questions	4.737	0.340
financing guarantee (MoV) —total 5 questions	4.737	0.340
revolving fund (MoV) —total 5 questions	3.463	0.882

Source: this research.

Table 5. Bank financing (IV) and ESCO borrowing (DV) factor load scale.

question	factor		unrotated eigenvalue	cumulative variance (%)
	1	2		
[Table 2] Q1	0.747	0.553		
[Table 2] Q2	0.369	0.593		
[Table 2] Q3	0.487	0.774		
[Table 2] Q4	-0.139	0.868		
[Table 2] Q6	0.686	0.629	5.733	63.70%
[Table 2] Q7	0.540	0.659		
[Table 2] Q8	0.686	0.629		
[Table 2] Q9	0.807	0.259		
[Table 2] Q10	0.861	-0.032		

Source: this research.

Table 6. Financing guarantee (MoV) factor load scale

question	factor	unrotated eigenvalue	cumulative variance (%)
[Table 2] Q11	0.921		
[Table 2] Q12	0.984		
[Table 2] Q13	0.984	4.681	0.936%
[Table 2] Q14	0.974		
[Table 2] Q15	0.974		

Source: this research

The reasons why this research does not follow the recommendations of the factor analysis results for classification are as follows:

- Question 1 is "Do you agree the financier is the fund provider for the debtor-creditor relationship?" Since the financier is the creditor in the debtor-creditor relationship, and the financier is the subject of Question 1, so Question 1 is classified as Factor 2.

- Question 7 is "Do you agree that the ESCO borrowing mainly comes from bank financing?" The borrower is the debtor in the debtor-creditor relationship, and the borrower is the subject of Question 7, so Question 7 is classified as Factor 1.

b: Construct validity of financing guarantee

The financing guarantee in this research is one of the interference variables (MoV) of the overall structure. From Table 6, the factor loading is between 0.921 and 0.984, the unrotated eigenvalue of the first factor is 4.681, and the cumulative variance is 93.6% (greater than 50%), which can be regarded as an ideal situation. The test results are detailed in financing guarantee factors. The analysis table is shown in Table 6.

c: Construct validity of revolving fund

The revolving fund in this research is one of the interference variables (MoV) of the overall structure. From Table 7, the factor loading is between 0.703 and 0.962, the unrotated eigenvalue of the first factor is 4.098, and the cumulative variance is 81.969% (greater than 50%), which can be regarded as an ideal situation. The detection results are detailed in the analysis table of financing guarantee factors as shown in Table 7.

4.1.3 Reliability analysis

The Cronbach's α value of each facet of the questionnaire in this research ranged from 0.793 to 0.982, all of them were above 0.7, which fully met the standard threshold value (that is, the α value greater than 0.7) proposed by Nunnally [41], which indicates that the questionnaire in this research has a certain degree of reliability, as shown in the reliability analysis table for each facet Table 8.

4.1.4 Correlation coefficient analysis

This research uses Pearson's Correlation Coefficients to explore the correlation between variables. When the correlation coefficient is 1, it is a complete correlation; when the correlation coefficient is between 0.7 and 0.99, it is a high degree of correlation; when the correlation coefficient is between 0.4 and 0.69, it is a moderate correlation; and when the correlation coefficient is less than 0.39, it is a low degree Related. The correlation coefficient analysis table of this research is shown in Table 9.

Table 7. Revolving fund (MoV) factor analysis table.

question	factor	unrotated eigenvalue	cumulative variance (%)
[Table 2] Q16	0.703		
[Table 2] Q17	0.932		
[Table 2] Q18	0.962	4.098	81.969%
[Table 2] Q19	0.961		
[Table 2] Q20	0.941		

Source: this research

Table 8. Reliability analysis table for each facet.

Facet	Measure item	Cronbach's α value
Bank financing (IV)	4 [Table 2] Q1~Q4	0.793
ESCO borrowing (DV)	5 [Table 2] Q6~Q10	0.811
Financing guarantee (MoV)	5 [Table 2] Q11~Q15	0.982
Revolving fund (MoV)	5 [Table 2] Q16~Q20	0.941

Source: this research

Table 9. Correlation coefficient analysis.

	Bank financing (IV)	ESCO borrowing (DV)	Financing guarantee (MoV)	Revolving fund (MoV)
Bank financing (IV)	1			
ESCO borrowing (DV)	0.737**	1		
Financing guarantee (MoV)	0.737**	1.000**	1	
Revolving fund (MoV)	0.174	0.095	0.095	1

*Note: ** The correlation is significant at the 0.01 level (two-tailed).*
Source: this research.

According to the analysis of correlation coefficients in Table 9, in terms of bank financing (IV) and ESCO borrowing (DV) and bank financing (IV) and financing guarantee (MoV), the correlation coefficients are both 0.737 (both above 0.7), indicating a significant positive correlation between the two. In terms of ESCO loans (DV) and guarantees (MoV), the correlation coefficient is 1.000, indicating a completely positive

correlation between the two. Regarding the bank financing and revolving funds, which serve as IV and MoV, respectively, the correlation coefficient is 0.174 (between 0.1 and 0.39), indicating a low positive correlation between the two. The correlation coefficients for ESCO loans (DV) and revolving funds (MoV) and financing guarantees (MoV) and revolving funds (MoV) are both 0.095 (both below 0.1), indicating a weak positive correlation between the two.

4.1.5 Regression analysis and hypothesis verification

The results of the regression analysis for this study are as follows:

a: The impact of bank financing (loan) on ESCO borrowing (borrow)

The results of the regression analysis on the effect of bank financing (loan) on ESCO borrowing are shown in Table 10. The standardized coefficient of β is 0.737 and the t-value is 8.527 with p=0.000<0.001, indicating significance. The R-squared value of 0.536 indicates that the explanatory variables of this study are 53.6% and the F-test is F=72.701, indicating that the regression model is significant and has predictive power. In addition, to check for co-linearity, the variance inflation factor (VIF) can be determined by whether the VIF is less than 10. The VIF in this study is equal to 1.000 (less than 10), thus showing that there is no co-linearity problem.

Table 10. Regression analysis of bank financing on ESCO borrowings.

IV	β value	t-value	p-value	VIF
ESCO borrowing	0.737***	8.527	0.000	1.000
R square: 0.536		F-test: 72.701***		

*Note: * significant, ** very significant, *** extremely significant*
Source: this research.

The effect of bank financing (loan) on ESCO borrowing (borrow) shows a positive and significant effect (β value is positive and p-value<0.001), so hypothesis 1 (H1) of this research is valid.

H1:	Bank financing (loan) and ESCO borrowing (borrowing) are positively correlated.	**Valid**

b: Interference effect of financing guarantees on the loan (bank financing) - borrowing (ESCO borrowing) relationship

The regression analysis was used to analyze the impact of the guarantee on bank financing and ESCO borrowing and the results are shown in Table 11. The β value is 0.969, the t-value is 30.714, p=0.000<0.001, which means significant, and the R square value=0.938 means that the explanatory variables of this research are 93.8%, and the F-test is F=943.342, indicates that this regression model is significant and has a predictive ability. The VIF in this research is equal to 1.000 (less than 10) and no co-linearity problem arises.

Table 11. Regression analysis of financial guarantee to ESCO borrowings.

IV	β value	t-value	p-value	VIF
bank financing × financing guarantees borrowing	0.969***	30.714	0.000	1.000
R square: 0.938		F-test: 943.342***		

*Note: * significant, ** very significant, *** extremely significant*
Source: this research

The financing guarantee has a positive and significant impact on the interference effect of the debtor-creditor relationship (β value is positive and p-value<0.001), so hypothesis 2 (H2) of this research is valid.

H2:	Financing guarantees will positively moderate the debtor-creditor relationship.	**Valid**

c: Interference effect of revolving funds on the loan (bank financing) - borrowing (ESCO borrowing) relationship

The regression analysis was used to analyze the effect of revolving funds on the disruption of the Loan-Borrowing Relationship and the results are shown in Table 12. The β value is 0.200, the t-value is 30.714, p=0.115>0.05, which means insignificant, and the R square value=0.024 means that the explanatory variables of this research are 2.4%, and the F-test is F=2.552. The VIF in this research is equal to 1.000 (less than 10) and no co-linearity problem arises.

Table 12. Regression analysis of revolving funds to ESCO borrowings.

IV	β value	t-value	p-value	VIF
Bank financing x revolving funds	0.200***	26.965	0.115	1.000
R square: 0.024		F-test: 2.552***		

*Note: * significant, ** very significant, *** extremely significant*
Source: this research

The revolving funds have an insignificant impact on the interference effect of the debtor-creditor relationship (p-value>0.05), so hypothesis 3 (H3) of this research is invalid.

H3:	Revolving funds will positively moderate the debtor-creditor relationship.	**Invalid**

The reason why hypothesis 3 (H3) is invalid is that bank financing is not the only channel for ESCO borrowing. In other words, ESCO borrowing may come from other channels than bank financing, which is why the effect of bank financing on ESCO borrowing is insignificant.

4.1.6 Path analysis

Emory and Cooper (1991) used an example with 3 variables to show that researchers can determine the relative importance of the independent variables by the magnitude of the regression coefficient, meaning that the magnitude of the β value and the positive and negative numbers can be used to determine the magnitude of the effect between variables and the directionality of the correlation [44]. The path analysis diagram of the model in this research is shown in Figure. 3.

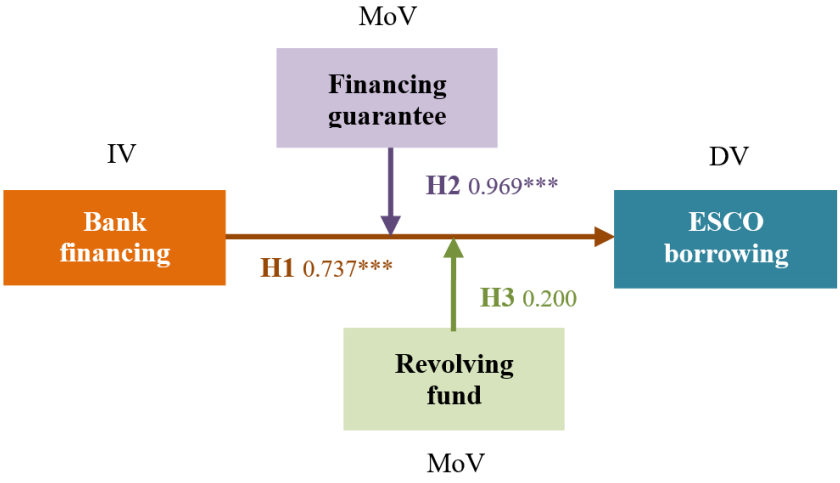

Fig. 3. Causal path diagram.
Note: 1. The number represents the β value.
2. The solid line means the hypothesis is valid, and the dashed line means the hypothesis is invalid.
3.* p<0.05; ** p<0.01; *** p<0.001

4.2 Results

After verification by regression analysis, the following results were obtained:

H1: Bank financing (loan) and ESCO borrowing (borrow) are positively correlated →Valid

H2: Financing guarantees will positively moderate the debtor-creditor relationship →Valid

H3: Revolving funds will positively moderate the debtor-creditor relationship →Invalid

It can be seen that bank financing (loan) will positively affect ESCO borrowing (borrow). The financing guarantee is a moderate variable of the debtor-creditor relationship. And the revolving fund is not a moderate variable of the debtor-creditor relationship.

5. CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Conclusions

The management revelations from this study are as follows:

5.1.1 Taiwan ESCO borrowings are mainly from bank financing

There are not many sources of financing in Taiwan. Since most ESCOs in Taiwan are SMEs [7], in addition to their own funds, most ESCOs (usually SMEs) obtain funds from banks through financing [21], [29].

5.1.2 The level of guarantee affects the ease of borrowing for ESCOs

As verified by this study, a positive correlation exists between the provision of collateral and financing [24]. In other words, the level of financing guarantee will affect the difficulty of borrowing for ESCOs [18].

5.1.3 The revolving funds do not affect the ESCO borrowing

Since H3 of this study is invalid (see 4.2 of this study), the revolving fund does not have a positive impact on the debtor-creditor relationship, and the Taiwan government has not established a revolving fund for ESCO [52].

5.2 Policy Implications

Based on the above conclusions, the following policy insights are drawn:

5.2.1 Reduce information asymmetries

Information asymmetry is a situation where one party to an economic activity has better information than the other [45]. Information asymmetry between the supply of funds (loans) and the demand for funds (borrowing) can significantly affect financing decisions and is a major problem in financing relationships [46]-[49]. Financing risks are often due to information asymmetries in ex-post reports rather than ex-ante information asymmetries [50]. Therefore, reducing information asymmetry between banks and ESCOs is the only way to increase 'mutual trust' between banks and ESCOs.

5.2.2 Enhanced Promotion of the Firefly Project

The Firefly Project, funded by SMECGF, is a fund set up by an enterprise and SMECGF with equal amounts of capital to provide credit guarantees for the enterprise's supply chain [51]. For example, the Chunghwa Telecom Firefly Project Credit Guarantee is a loan guarantee of

20 times the amount of the loan (*i.e.* NT$2 billion) provided by Chunghwa Telecom and SMECGF, each contributing NT$50 million. Although the Firefly Project is the best financing guarantee mechanism available, it has been over 15 years since the establishment of the Firefly Project in June 2006 and most ESCOs are unaware of its existence.

5.2.3 Seeking a stable source of financing

The presence or absence of revolving funds does not have a positive impact on the debt-liability relationship, which means that the absence of revolving funds would not affect the ESCOs' borrowing sources. Therefore, the Taiwanese government has not established a revolving fund as a source of borrowing funds for ESCOs but has assisted ESCOs in obtaining funds through various incentives or subsidies. Perhaps in the future, revolving funds may still be a source of borrowing capital for ESCOs.

5.3 Research Limitations

This study is subject to subjective and objective factors and still has certain limitations, which are briefly described as follows:

- The questionnaire survey is only for the general members of the TESA who have paid their dues, it is still a bit biased.
- In the questionnaire, the response may be affected by factors such as the attitude or experience of the interviewee, which may result in distortion of the research results.

NOMENCLATURE

BOE	Bureau of Energy
CFA	confirmatory factor analysis
CG	credit guarantee
CMV	common method variance
DV	dependent variable
EFA	exploratory factor analysis
ESCO	energy service company
ESPC	energy-saving performance contract
IV	independent variable
MOEA	Ministry of Economic Affairs
MoV	moderating variable
SMECGF	SME credit guarantee fund
SMEs	small and medium-sized enterprises
TAESCO	Taiwan Association of Energy Service Companies
TESA	Taiwan Energy Service Association
TGPF	Taiwan Green Productivity Foundation
VIF	variance inflation factor

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