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Glass ceiling effects: the case of taiwanese top executives

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Abstract

Gender discrimination in labor markets has been an important issue in labor economics. The main purpose of this paper is to empirically study glass ceiling effects, and investigate whether female workers are indeed being discriminated against, particularly during the promotion process, in top management positions in Taiwan. This paper uses data from 4,485 large firms in Taiwan to study whether there are gender preferences when the chairperson of a company chooses a chief executive officer (CEO). The data show that there are few female top executives (about 6%). In addition, a chairperson tends to team with same sex CEOs. This is especially noticeable among female chairpersons. The empirical results from our random matching model further confirm that gender is neither irrelevant nor neutral when a chairperson names a CEO.

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1. Ⅰ. Introduction

Previous studies about gender discrimination in labor markets have mainly focused on gender wage differentials, occupation segregation, and glass ceiling effects, among others. Glass ceiling effects refer to constraints and limitations that are usually not apparent but keep women from being fairly promoted. The main purpose of this paper is to study glass ceiling effects, and empirically investigate whether female workers are indeed discriminated against during the promotion process, particularly at top management positions, in Taiwan. We want to find out whether female workers have the same opportunities of being promoted to top positions as male workers have. In other words, can gender be an element that affects the probability for women to be promoted as top executives?

Researchers have employed different empirical models and methods to identify and find evidence to support the existence of the so-called glass ceiling in labor markets. Typically, they either compare gender wage gaps at the high-end of the wage distribution, or examine the gaps between prospects or outcomes of promotions for men and women. For example, Albrecht et al. (2003) use Swedish national representative data sets, and employ quantile regression approaches to study glass ceiling effects. They show that glass ceilings do exist at the top end of the wage distribution.

In terms of prospects or outcomes of promotions, Cannings (1988) found that gender does influence the chance of being promoted when career-relevant factors, such as formal education and firm specific productivity, are held constant. The author also found that female workers' promotion rate is only about 80% of that of males in a given year. Besides, Landau (1995) used a sample of 1,268 managerial and professional employees' self-reporting questionnaires, which showed the promotion potential of women was rated lower than of men. Finally, Konrad and Cannings (1997) use two companies to statistically examine the effects of gender discrimination and role congruence in managerial advancement. Their findings support the view that the managerial advancement process is different between women and men.

In this paper, we study whether gender could be an element that affects the possibilities for women to be promoted as top executives in companies. Being promoted as a top executive not only means higher benefits and status but also recognition of past performance. Obviously, competition for promotion is very fierce, and actual promotions do give us the opportunity to study the real gender biases on the part of companies while appointing a chairperson of the board of directors (we call it *chairperson* hereafter) or a chief executive officer (we call it *CEO* hereafter).

This paper uses the concept of Boschini and Sjögren (2007), which models team formation as a random matching process influenced by agents' preferences for team size and gender, to examine the teamship of top executives of companies in Taiwan. Instead of collecting data from a small number of firms and conducting a case study, this paper uses information from thousands of large companies in Taiwan. The large size of the sample makes it possible to compare compositions of teams of top executives in different companies, controlling for industry, firm size, age of company and geographical locations of companies.

The remainder of this paper is organized as follows. In the next section the data is introduced. A random matching model is applied, and empirical results are reported in section 3. Section 4 offers conclusions.

2. The Data

Data used in this paper are from "*Top5000: The Largest Corporations in Taiwan*", which is published by China Credit Information Service, Ltd., in June every year. The 2006 edition is used. China Credit Information Service, Ltd., sent out 16,780 questionnaires to companies which were covered in the 2005 edition and had sales of more than 60 million NT dollars (about 2 million US dollars) in the case of manufacturing companies, or had assets of more than 30 million NT dollars (about 1 million US dollars), in the case of services companies. Of the total, 5,183 questionnaires were returned. Besides the information in returned questionnaires, the

source publication also links companies to their financial data from the Taiwan Stock Exchange Corporation. There are 4,857 companies included in the composite ranking. Several companies were found to have missing values, or had unrecognized information. So the total number of companies we use is 4,485. In the analysis data set, the main variables are the composite rankings of companies, names of chairpersons and CEOs, company age, zip code, and industry code. Gender of chairpersons and CEOs are identified by their Chinese first names.

Chairpersons and CEOs of companies in the data are sorted by gender as shown in Table 1. Column 1 shows companies are sorted into even and single teams. A company with an even team is one which has different persons functioning as chairperson and CEO, while a company with a single team is one which has the same person holding both posts. Column 2 shows the number of female top executives corresponding to the team type, and Column 3 is the number of male top executives. Column (4) is the number of companies corresponding to the team types.

Row (A) presents the gender composition of chairpersons and CEOs in even teams. There are 3,142 companies that have different persons as chairperson and CEO. Row (B) presents the gender composition of single teams in 1,343 companies covered in this data set. The sum of each column is shown in Row (C). It is found the total number of females observed is 460, and the total number of males is 7,167, in 4,485 companies covered by the data used for this paper.

We find that female top executives are relatively scarce in Taiwan. In Table 1, the percentage in the parenthesis is the share calculated by rows: females' share in chairpersons in even teams is 7.45%, while the share of females in single teams is only 3.43%. It is found that in both even and single teams, males dominate. The proportion of female and male workers is perhaps fairly equal at the entry level of labor markets. Then why at the top end does the ratio of females and males plunge to 1:16? Besides, there are fewer female CEOs than chairpersons. This makes one wonder whether there might be a gender preference among female chairpersons while hiring a CEO.

3. Empirical Models and Results

The model used in this paper is based on that of Boschini and Sjögren (2007). We consider that every chairperson is randomly matched to a potential CEO. Based on the chairperson's team preferences, he/she decides whether or not to hire a CEO for the company. We also assume that a fraction of the chairpersons might have gender preferences over the CEO's.

Since the random matching model is similar to the one in Boschini and Sjögren (2007), two similar propositions can be obtained. First, if team preferences of both sexes are the same and gender preferences are also the same, gender would not be considered as an important element here. It means gender is irrelevant for term formation. Second, if gender neutrality and different preferences of team formation of the two sexes are assumed, it allows gender neutrality to be sustained even when team preferences of the two genders are different. For example, we might observe that female chairpersons have a higher propensity to cooperate with female CEOs than males. And, the gender neutrality hypothesis can still hold if men are more likely to work alone than women.

Based on these two propositions, we will first test whether there is difference of the partnership between chairman and chairwoman. And, if there is a difference, the single team type can then be tested in order to find support for the gender neutral hypothesis.

The structure of the empirical model is also based on that of Boschini and Sjögren (2007). The probit model is applied.

$$Y_{ij}^{FC}* = X'^{FC}_{ij}\,\beta + \varepsilon_{ij}^{FC}$$
$$Y_{ij}^{FC} = \begin{cases} 1, \text{if } Y_{ij}^{FC*} > 0 \\ 0, \text{if } Y_{ij}^{FC*} \le 0 \end{cases} \qquad (1)$$

$$Y_{ij}^{S}* = X'^{S}_{ij}\,\beta + \varepsilon_{ij}^{S}$$
$$Y_{ij}^{S} = \begin{cases} 1, \text{if } Y_{ij}^{S*} > 0 \\ 0, \text{if } Y_{ij}^{S*} \le 0 \end{cases} \qquad (2)$$

Where $Y_{ij}^{FC}*$ and $Y_{ij}^{S}*$ are unobserved variables. Equation (1) denotes a chairperson's tendency to cooperate with a female CEO while Equation (2) denotes a chairperson's tendency to form a single team (to be the CEO as well). The observed outcome in Equation (1) is a binary variable: if $Y_{ij}^{FC}* > 0$ (i.e. the chairperson of *i* company in *j* industry cooperates with a female CEO), then Y_{ij}^{FC}=1, otherwise Y_{ij}^{FC}=0. The observed outcome variable in Equation (2) is also a binary variable: if $Y_{ij}^{S}* > 0$ (i.e. the chairperson and the CEO of *i* company in *j* industry is the same person), then Y_{ij}^{S}=1, otherwise Y_{ij}^{S}=0.

Both equations share the same explanatory variables. The 1st explanatory variable is the sex of the chairperson, f_i. If the chairperson of company *i* is female, then f_i=1, otherwise f_i=0. The 2nd explanatory variable is the share of female CEOs in *j* industry, ϕ_{ij}. There are three different industry classifications used in this paper: SCP, MCP and ACP. The first industry classification is SCP (Simple index of female CEO proportion). All companies are divided into 5 different industries, which are manufacturing, service, banking and finance, public enterprise and private universities. We then compute the female CEO proportion in each of the five industries.

The second industry classification is MCP (Main index of CEO proportion). The main difference between MCP and SCP is that the industries are divided into 41 sub groups, and the representative industry code is chosen by the main product of a company. Representative industry codes are used to calculate the proportion of female CEOs.

The third industry classification is ACP (Average index of CEO proportion), and it also uses the same 41 industry codes as MCP. But, since each company may not be listed for only one industry code, the number of corresponding female CEOs is calculated on a weighted basis. For example, if a company reports 3 different industry codes, it will be counted in all the three industries.

The 3rd explanatory variable is the interaction term of the sex of the chairperson and the share of female CEOs in the company's industry, $f_i\phi_{ij}$. The 4th explanatory variable is a dummy variable of regions, i.e. the location of a company, $POST_i$. If *i* company is located in north Taiwan, then $POST_i$=1, if a company is located in non-north Taiwan, then $POST_i$=0. The 5th explanatory variable is a dummy variable of established years of a company, EST_i. They are divided by intervals of 10 years into four groups. The benchmark of the established years is a company which was established less than 10 years ago. The 6th explanatory variable is the size of a company, $SIZE_i$. The firm size is based on the net sales of the company, which means the higher is a company's sales revenue, the bigger the company is. Firm sizes are divided into five levels.

Based on the predictions the random matching model, we first want to test the gender neutrality, i.e. to check whether female and male chairpersons have different attitudes towards teaming up with female CEOs. The key coefficient in this step is β_3^{FC} of Equation (1). Second, the single team tendency is examined, which can provide further support for the gender neutrality hypothesis. β_1^{S} and β_3^{S} of Equation (2) are two key coefficients that need to be estimated.

β_3^{FC} is the coefficient of the interaction term of the chairperson's sex (f_i) and the share of

female CEOs (ϕ_{ij}). If β_3^{FC} is statistically significantly different from zero, then it can be inferred that female and male chairpersons do have different attitudes towards the gender of CEOs, when forming a team. In other words, if the coefficient is insignificant, then it suggests that gender irrelevance might be true.

β_1^S is the coefficient of the chairperson's sex (f_i) in Equation (2). If it is statistically significantly different from zero, then it can be concluded that the gender of chairpersons does influence the decision to have a single team. β_3^S is the coefficient of interaction term of chairperson's sex and the proportion of female CEOs in Equation (2), which is used to test whether there is a difference between genders in deciding to form a single team, when the share of female CEOs is taken into account. If these two coefficients are not consistent to the previous model's expectations, then the gender neutral hypothesis will not be sustained.

Estimation results of equations (1) and (2) are in tables 2 and 3. Three sets of independent variables are used:

(i) Chairperson's sex (f_i) for firm *i* and share of female CEOs (ϕ_{ij}) in industry *j* are included as explanatory variables.

(ii) In addition to the variables in (1), an interaction term of chairperson's sex and share of female CEOs ($f_i\phi_{ij}$) is added.

(iii) In addition to (1) and (2), region ($POST_i$), established years (EST_i) and firm size ($SIZE_i$) are included.

Table 2 shows the estimates of Equation (1), which are used to test the tendency of chairpersons of different sexes to opt for a female CEO. The total number of companies used in the estimation is 3,142, since single team companies are excluded. The table has three parts: columns (1), (2) and (3) use the same index of *female CEO share*, which is SCP, and columns (4), (5) and (6) are estimations using the MCP index as the share of female CEOs, while columns (7), (8) and (9) use the ACP index instead.

Coefficients of the first explanatory variable, *female chairperson* (PSEX), is positive and statistically significantly different from zero at the 90% level in columns (5), (6), (8) and (9), which means female chairpersons tend to work with female CEOs under classifications of both MCP and ACP. The second explanatory variable, the *female CEO share*, is positive and statistically significantly different from zero in all estimations. It can be inferred that as the *female CEO share* increases, the number of chairpersons willing to team with female CEOs also increases.

The third explanatory variable is the interaction term of *female chairperson* and the *female CEO share*. Coefficients under the indices of MCP and ACP are negative and statistically significantly different from zero at 90% and 95% levels, respectively. This implies that when the *female CEO share* increases, a female chairperson has a lower tendency to cooperate with female CEOs, than male chairpersons.

Next, the results of estimations of Equation (2) are shown in Table 3. The layout of Table 3 is the same as that of Table 2, since explanatory variables of single team estimations are the same as those of female teams estimations. All observed companies are used for single team estimation in Table 3; there are 4,485 companies.

From the first row of Table 3, coefficients of *female chairpersons* are negative and statistically significantly different from zero at 95% level in seven out of nine columns, which means female chairpersons have lower possibilities of working alone than male chairpersons. Coefficients of the explanatory variable, *female CEO share*, are negative and statistically significant in columns (3), (6) and (9), which means that as the share of female CEOs increases, the number of companies that opt for a single team decreases. However, the interaction term of the *female chairperson* and the *female CEO share* is insignificant in all estimations. Thus, there

is no conclusive information about how the female CEOs share can influence the different genders of chairpersons who opt for a single team.

Combining the estimation results and the two propositions derived in the model section, the gender irrelevant hypothesis is first examined. It is found that coefficients of the interaction term β_3^{FC} <0, which implies $\beta_f^{FC} < \beta_m^{FC}$. Thus, the gender irrelevant hypothesis is failed. Second, coefficients of single team are examined with coefficients of *female chairpersons* $\beta_1^S < 0$, which shows that female chairpersons have a lower tendency to form a single team than male chairpersons. However, coefficient of the interaction term of *female chairpersons* and *female CEOs share*, β_3^S, is insignificant. Since the gender neutral hypothesis is sustained only when β_1^S >0 and β_3^S <0 are satisfied, the gender neutral hypothesis is also failed.

4. Conclusions

Wage differentials and occupational segregation are often considered as the main issues of gender discrimination in labor markets. Since women now receive higher education and have more labor market choices. The seriousness of the wage gap and occupation segregation is decreasing. However, the promotion process and standards are still not the same and fair for female and male workers.

In this paper, data from the 2006 edition of "Top5000: The Largest Corporations in Taiwan", published by China Credit Information Service, Ltd. is used to investigate whether there are gender preferences when a chairperson names a CEO. The total number of companies is 4,485. The team formation process is assumed as random matching, which is similar to Boschini and Sjögren (2007).

First, based on the descriptive statistics in the data section, there are only a few female chairpersons and CEOs in these top companies, i.e. about 6%. We also found that chairpersons have a higher tendency to work with same sex CEOs. This means there is gender gap in teamship choices between male and female chairpersons. Second, based on the results of the estimations, both the gender irrelevant hypothesis and gender neutral hypothesis in the random matching model are not sustained by the estimated coefficients of equations (1) and (2).

Notice that the empirical test suggests that a female chairperson has a lower tendency to cooperate with a female CEO than a male chairperson, when the *female CEO share* increases in some industry segments. Promoting a candidate as CEO may be a complex decision, especially in a big company. A chairperson needs to consider many aspects, such as opinions of company's senior managers and the relationship between the competitors and future CEOs. Therefore, female chairpersons may face more pressure to name a same sex CEO in male dominated working environments. On the other hand, male chairpersons may team with a female CEO in order to bring in different perspectives, especially in female dominated industries.

References

1. Albrecht, James. Björklund, Anders. and Vroman, Susan. (2003) Is There a Glass Ceiling in Sweden? *Journal of Labor Economics*, 21, 145-177.
2. Boschini , Anne. and Sjögren Anna. (2007) Is Team Formation Gender Neutral? Evidence from Coauthorship Patterns. *Journal of Labor Economics*, 25, 325-365.
3. Cannings, Kathy. (1988) Managerial Promotion: the effects of socialization, specialization, and gender. *Industrial and Labor Relation Review*, 42, 77-88.
4. Konrad, Alison M. and Cannings, Kathy. (1997) The Effects of Gender Role Congruence and Statistical Discrimination on Managerial Advancement. *Human Relations*, 50, 1305-1328.
5. Landau, Jacqueline. (1995) The relationship of Race and Gender to Manager's Ratings of Promotion Potential. *Journal of Organizational Behavior*, 16, 391-400.

Table 1: Gender of Chairperson and CEO

	(1)		(2)	(3)	(4)
			Female	Male	Companies
(A)	Even Team	Chairperson	234 (7.45%)	2,908 (92.55%)	3,142 (100%)
		CEO	180 (5.73%)	2,962 (94.27%)	
(B)	Single Team		46 (3.43%)	1,297 (96.57%)	1,343 (100%)
(C)	Total Observations		460	7,167	4,485

Table 2: Probit Estimation of Team Composition with Female CEOs (Marginal Effects)

	SCP				MCP				ACP		
	(1)	(2)	(3)		(4)	(5)	(6)		(7)	(8)	(9)
Female Chairman (PSEX)	0.0214	-0.00797	-0.00486		0.0161	0.0852*	0.0836*		0.0167	0.100*	0.0991*
	(0.0175)	(0.0617)	(0.0637)		(0.0166)	(0.0493)	(0.0497)		(0.0167)	(0.0541)	(0.0548)
Female CEO Share (FCS)	1.108**	1.065**	0.972**	(MCP)	0.891**	0.954**	0.932**	(ACP)	0.919**	0.991**	0.970**
	(0.325)	(0.340)	(0.346)		(0.111)	(0.116)	(0.115)		(0.118)	(0.123)	(0.122)
PSEX*FCS		0.496	0.394	PSEX*MCP		-0.682*	-0.695**	PSEX*ACP		-0.807**	-0.825**
		(1.204)	(1.190)			(0.351)	(0.349)			(0.371)	(0.370)
North Taiwan			0.00136				0.00693				0.00758
			(0.00926)				(0.00841)				(0.00840)
Established Years 11~20			0.00881				0.00388				0.00388
			(0.0113)				(0.0105)				(0.0105)
Established Years 21~30			0.00617				0.00131				0.00171
			(0.0128)				(0.0116)				(0.0117)
Established Years >30			-0.00849				-0.0154				-0.0155
			(0.0113)				(0.0101)				(0.0101)
Firm Size Level (2^{nd} highest level)			0.0247*				0.0202				0.0203
			(0.0145)				(0.0135)				(0.0136)
Firm Size Level (3^{rd} highest level)			0.0167				0.0108				0.0109
			(0.0143)				(0.0131)				(0.0131)
Firm Size Level (4^{th} highest level)			0.0139				0.00911				0.00932
			(0.0142)				(0.0130)				(0.0131)
Firm Size Level (5^{th} highest level)			0.0329*				0.0273				0.0278
			(0.0191)				(0.0178)				(0.0179)

N=3,142. The robust standard errors are listed in the parentheses, and constant is not reported. *significant at the 90% level; **significant at the 95% level. SCP: 5 industry classifications. MCP: 41 industry classifications. ACP: 41 industry classifications and each company may have more than one industry code.

Table 3: Probit Estimation of Single Team Composition (Marginal Effects)

	SCP			MCP			ACP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female Chairman (PSEX)	-0.143**	-0.0869	-0.100	-0.142**	-0.161**	-0.170**	-0.142**	-0.154**	-0.163**
	(0.0234)	(0.122)	(0.118)	(0.0235)	(0.0438)	(0.0432)	(0.0235)	(0.0464)	(0.0459)
Female CEO Share (FCS)	-0.557	-0.494	-1.244**	-0.320	-0.347	-0.486**	-0.361	-0.378	-0.497*
	(0.554)	(0.567)	(0.590)	(0.236)	(0.245)	(0.247)	(0.249)	(0.257)	(0.260)
PSEX*FCS		-1.335	-1.337		0.462	0.433		0.296	0.239
		(2.628)	(2.633)		(0.934)	(0.963)		(0.983)	(1.013)
North Taiwan			0.0424**			0.0356**			0.0354**
			(0.0154)			(0.0153)			(0.0153)
Established Years 11~20			0.0643**			0.0679**			0.0679**
			(0.0194)			(0.0194)			(0.0194)
Established Years 21~30			0.0726**			0.0786**			0.0786**
			(0.0218)			(0.0218)			(0.0218)
Established Years >30			-0.00449			0.00442			0.00467
			(0.0206)			(0.0206)			(0.0206)
Firm Size Level (2^{nd} highest level)			0.0686**			0.0703**			0.0703**
			(0.0225)			(0.0225)			(0.0225)
Firm Size Level (3^{rd} highest level)			0.124**			0.125**			0.125**
			(0.0228)			(0.0229)			(0.0229)
Firm Size Level (4^{th} highest level)			0.161**			0.160**			0.160**
			(0.0230)			(0.0230)			(0.0230)
Firm Size Level (5^{th} highest level)			0.138**			0.136**			0.136**
			(0.0278)			(0.0277)			(0.0277)

N=4,485. The robust standard errors are listed in the parentheses, and constant is not reported. *significant at the 90% level; **significant at the 95% level. SCP: 5 industry classifications. MCP: 41 industry classifications. ACP: 41 industry classifications and each company may have more than one industry code.