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The Role of the Manager's Education in Firm Growth: An Empirical Analysis in the Taiwanese Manufacturing Sector

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Abstract

This paper investigated manner in which the manager's education affects the management of the firm. The manager's education functions as a necessary background when he/she is required to understand high technologies and international business information. We adopt variables that are representative of the constituents of education such as the fields of specialization, overseas education, and the choice of overseas destination for education in order to determine the specific role of education. Moreover, we analyzed the effect of education within high-tech and export-oriented industries. An analysis of firms in the start-up period and a comparison in terms of firm size were also conducted. In addition, we analyzed whether managers' human network contributes to firm growth. We found that education serves to provide the necessary background and that scientific knowledge and foreign languages play substantial roles. It was also found that human network contributes to management.

I. Introduction

When considering the modern competitions between firms, one can observe that while some managers successfully lead the operations of firms, others do not. In general, the

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abilities of a manager are crucial to a firm's performance. A capable manager raises the firm's performance, thereby leading to economic development through innovation. Therefore, their abilities should be analyzed within the scope of economics, although scant attention has been paid to this issue.

The abilities of a manager comprise innate and acquired characteristics. The latter could mainly be defined as human capital. Among the studies on the human capital of managers, some researchers had found positive impacts of manager's education on firm's performance (Bates, 1990; Scherer and Huh, 1992; Bertrand and Schoar, 2003; Honjo, 2004). In these studies, however, the reason for these positive impacts is less evident. In other words, these studies could not successfully unveil the mechanism through which education contributes to a firm's performance.

Several studies in developmental economics on the Asian industrial districts had revealed that the education of managers does not exert an influence until the entire developmental level of the industrial districts exceeds a certain threshold (Sonobe et al., 2003; Yamamura et al., 2003; Sonobe et al., 2004). These studies suggested that education serves management through the comprehension of high technologies and international business information. Their results, however, were limited to partial geographical areas abundant with tiny firms. Therefore, these findings should be cross examined using data with a wider scope.

Educating managers might provide basic scientific principles and theories on which high technologies are based. Modern technologies are constructed on the vast layers of past findings in the field's history. Similarly, in order to comprehend international business information, the manager might be required to possess the ability to understand foreign languages and knowledge on the international business environment.

In order to unveil this mechanism, we adopted two methods. First, we introduced

variables representing the constituents of education, such as the fields of specialization, experiences while studying abroad, and overseas destinations for education. For example, it would be expected that the managers with science degrees have a larger impact than managers with degrees in liberal arts, in terms of the comprehension of technologies. Overseas education might be advantageous in grasping international business information. Therefore, we expect to shed light on the role of education in the provision of a necessary background, through detailing the constituent-specific effect of education.

Second, we investigated the industry-specific effect of education. The necessity of education in the provision of the necessary background might vary across industries. In high-tech industries, production technologies tend to be complex. Hence, it would be appropriate to investigate the role of education in these industries where the importance of technologies is relatively high. Similarly, the impact of education would also be more substantial in export-oriented industries due to the requirement of an understanding of international business information.

In order to implement the above two methods, the data set should contain detailed information on the constituents of education received by managers. The availability of such a data set appears to be rather limited. However, a manager's directory published in Taiwan contains detailed information on the constituents of education. An analysis of Taiwanese managers enables us to take a full advantage of this data set.

Taiwan is one of the most successful economies to achieve rapid economic growth during the post-World War II period. The factors contributing to its rapid growth have attracted the interests of many researchers. These researchers found that the export-oriented economic structure, free-market policies of the government, and active entrepreneurship were the main sources of Taiwan's success. The economy's take-off—primarily led by the export-oriented textile and apparel industries—began in the

1960s.

Since the 1980s, the electronics industry has emerged as a new leading front. During the rise of electronics, many Taiwanese employees of the computer manufacturers in the United States returned to Taiwan with the aim of establishing their own businesses in the emerging industry. Originally, a majority of the returnees had entered the United States as international students. Their newly launched businesses have been regarded as one of the main driving forces behind the development of the Taiwanese electronics industry (Saxenian and Hsu, 2001). Currently, this is the most prosperous industry in Taiwan. However, the role of the returnees in the development of high-tech industries has rarely been analyzed using econometric methods.

Taiwanese industries primarily comprised two defining aspects. One is the higher technological standard, and the other, the export-oriented structure. Therefore, when investigating the effect of education that is specific to high-tech and export-oriented industries, it could also be appropriate to select this economy as the subject of our investigation.

Research on managers has only focused on the managers of either large firms or SMEs (Small and Medium Enterprises). A comparison between these two types of firms has been conducted rarely, possibly due to the constraint of data. However, the investigation of the difference across these two sectors appears to be important. In Taiwan, the SME sector had a comparably large presence, sustained by active entrepreneurship. However, since the 1990s, the large firm sector has continued to expand[1]. This expansion is attributed mainly to the concentration of foreign orders on large firms (Kawakami, 2003). The large firms are capable of responding to sizable orders from overseas immediately, whereas SMEs face difficulties in this regard. In

[1] The share of the firms with 500 or more employees in the total production was 26.77% in 1991. However, it increased to 31.03% in 1996 and reached 36.45% in 2001 (Industry, Commerce, and Service Census).

terms of foreign orders, the manager's abilities to engage in international business appear important. Moreover, the importance of such abilities in large firms might differ from that in the SMEs, which are declining due to the burgeoning international business environment. Thus, we separately analyze the impact of overseas education in each sector.

Another important point pertains to whether or not the managers of a business concern are the founding managers. The required abilities of founding managers are distinctively different from those of the already established and esteemed firms. Hence, we extracted the firms that are still in the start-up period and conducted a separate analysis. Bates (1990) and Honjo (2004) found positive impacts of education on the firm's performance among entrepreneurs. However, their results are still less evident with regard to how education contributes to management.

Besides human capital, social capital appears to be important in most of the economic activities. Human networks also appear to be important to managers. In addition to education, human networks were analyzed. While the manager's human network has been considered important, few researches have been conducted on this, partly because of the difficulties faced during data collection.

There are diverse forms of human networks. In the traditional Taiwanese society, human networks are of great importance. Social groups connected to kinship, alumni, or identical birthplace provide individuals with various forms of informal assistance. The networks constructed in workshops or military services also play an important role.

Besides, interpersonal relationships might also be established through avocation. Golfing is one of the most popular activities in the communication among Taiwanese businessmen[2]. Thus, human networks based on golfing would be expected in business

[2] An acquaintance made through golfing activities among managers is called a "Ball Friend (Qiu-You)."

communities. We examine whether such human networks influences management.

The rest of this paper is organized as follows. Section II provides the discussion of the hypotheses. The data sources and definitions of variables are presented in Section III. Section IV discusses the econometric method. Section VI presents the estimation result. Some implications and conclusions are presented in Section VII.

II. Hypothesis Setting

University Education

In high-tech industries, education might provide the necessary background to enable the comprehension of advanced technologies. Thus, the importance of university education for managers in these industries appears to be greater than that in the other industries. It would also be expected that within these industries, education in terms of a science degree has a comparably large effect on management than that with a liberal arts degree.

University education also appears to have a positive impact with regard to processing international business information. Thus, the effect of university education would be observed in the case of the export-oriented as well that of high-tech industries.

In start-up businesses, the required abilities of founding managers are different from those of managers in already established and esteemed firms. Thus, it should be examined whether the effect of university education is still robust even in the case of the sample of firms in the start-up period.

Founders in the high-tech industries should set up brand-new production facilities. Thus, they should be capable of comprehending technologies. On the other hand, financial and legal knowledge is important, particularly in the start-up period.

Therefore, effect of a manager with a liberal arts degree is also expected to be found.

Overseas Education

Overseas education provides foreign language abilities, detailed knowledge regarding overseas destination for education, and human networks. Thus, overseas education appears to play an important role under the export-oriented structure of Taiwanese industries.

Moreover, when considering the positive association of the returnees with the emergence of electronics industries, managers educated in the United States might be crucial in high-tech firms that are highly dependent on the OEM/ODM (Original Equipment Manufacturing/Original Design Manufacturing) contracts with manufacturers in the United States [3]. Moreover, among these returnees, those majoring in natural science could achieve higher growth than those majoring in liberal arts.

However, it remains unclear whether the returnees contributed to firm growth by establishing new firms. Therefore, we also attempted the same specification by using the sample in the start-up period.

Within the export-oriented industries, we focused on the foreign language abilities acquired through overseas education. We compared two groups: managers educated in the United States and managers educated in Japan. By comparing these two groups, we can expect to find the difference in the returns from language abilities acquired through overseas education. However, overseas education also provides managers with extensive human networks and information on the countries that they received education from, thereby creating market opportunities. Thus, the comparison is problematic if the market size between the United States and Japan is extremely

[3] With regard to the lap-top computer—one of the key exports, over 90% were produced based on OEM/ODM contracts in 2002. (Information Industry Yearbook, 2003)

different. However, when taking into account the fact that both counties are substantially important export markets for Taiwanese firms[4], the difference in terms of potential market opportunities might be negligible[5].

According to the previous literature, Taiwanese SMEs had oriented themselves to the foreign market, since the domestic market had already been dominated by larger and state-owned firms. Thus, the Taiwanese SMEs had played an important role in the export-oriented economic development by finding a solution in the form of the export market. Many of the managers of such SMEs were low-educated, low-funded, and self-made individuals. However, such traditional characteristics might be undergoing a change in the face of the recent expansion of the large firm sector.

There could be two opposing hypotheses with regard to the comparison of the effect of overseas education between large firms and SMEs. In large firms, where the business relationships with foreign customers are becoming increasingly important, it is necessary for managers to understand international business information. Further, the managers in large firms are confronted with more tasks that are related to international business than those in SMEs. Thus, the necessity of overseas education appears to be high in large firms.

On the other hand, in SMEs, the influence of the individual manager is substantial as compared to that in large firms. Small businesses are highly dependent on a single manager. Therefore, it appears that the education received by the managers penetrates considerably into small businesses. If overseas education has a positive impact, this will be revealed more directly in the smaller organization. It is probable that SME managers educated overseas successfully grow small businesses primarily

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[4] In 2002, the export to the United States accounted for 20.5% (the second largest) of the total value of export, and that to Japan accounted for 9.2% (the third largest).

[5] If the orders from the United States were increasing and those from Japan were decreasing in the respective period, managers educated in the United States were advantageous in terms of potential market opportunities. However, during this period, orders from Japan as well as those from the United States were increasing (*Commercial Times*, October 28, 1998).

by finding niches in the export market, despite the declining trend of SMEs there.

Human Networks

Golfing communities provide managers with extensive human networks. By using golfing as a proxy for human networks, we analyzed whether the human networks contribute to management.

Moreover, business networks are particularly important in the start-up period, helping managers to identify markets. Therefore, the effect of human networks should be separately examined using the sample of firms in the start-up period.

III. Sample Construction

The data used in this study was drawn from the 1993 and 2002 editions of "The Manager's Directory in Taiwan" published by the China Credit Information Service, LTD (CCIS). This databank company had collected information on the individual attributes of managers and basic firm characteristics through mailing questionnaires. This data source used several criteria to select the firms to be listed; they are as follows:

At least one of the following conditions should be satisfied.

i. Sales reach of NT$ 100 millions (approximately US$ 3 millions)

ii. Featured on the previous version of "Manager's Directory"

iii. Acknowledged as "Excellent Exporters and Importers" by the Taiwanese Government.

iv. Capital reach of NT$ 10 million (approximately US$ 0.3 million)

v. Having 100 or more employees

vi. Listed on the Taiwan Stock Exchange or traded on over-the-counter transactions.

vii. Featured on "The Firm Directory of Users of Formal Character Product Name"

viii. Featured on "The Business Groups in Taiwan" published by the CCIS

As mentioned earlier, the advantage of this data set is that it could provide information on the constituents of education, such as the field of specialization, experiences while studying abroad, and the names of countries. It is also noteworthy that the data set contained a considerable number of SMEs. Moreover, it could provide information on the leisure activities of the managers, inclusive of golfing.

Despite these advantages, this data set has a weakness to which some attention should be paid. The positions that the respondents filling out the questionnaires hold in the companies had not been specified. The extent to which the respondents had been informed of accurate figures is unclear; this might cause measurement errors. This problem should be considered carefully; however, the advantages of this data set appear to compensate for this weakness.

The 1993 directory provides information on 1,944 managers and their firms in the manufacturing sector. A total of 851 samples had survived to the 2002 edition. However, some firms which are not featured on that edition had virtually satisfied the listing criteria of the edition. This implies that some respondents might refuse to fill out the questionnaires. In order to compensate for these omissions, we used another data source, "The Largest Companies in Taiwan Top 5000 2002," which was also published by the CCIS in 2002. This data set had ranked among the top 5000 firms in Taiwan based on an original performance index. With this supplementary data set, the sample size increased by 213.

453 surviving firms in which the initial managers had been replaced during the

analytical period were excluded since we had no information on the date of replacement[6]. A total of 101 samples having missing values on the variables used for the analysis were excluded. Managers who were born outside Taiwan were also excluded for the purpose of conducting an improved comparison of managers educated under the same educational system. After excluding 40 managers, the overall sample used for this study amounted to 674.

Table I shows the definition of variables and their descriptive statistics[7]. The variable *BUSIG* was defined according to the definition of "The Business Groups in Taiwan 1994/1995" published by the CCIS in 1993. (The listing criteria of this data source are shown in the Appendix A.)

With regard to educational variables, university graduates account for approximately 40 percent, which is higher than the share among all the Taiwanese managers in 2004 (32.08 percent) (Manpower Utilization Survey). [8]

[Insert Table I about here]

With regard to overseas education, one fourth of the university graduates were educated at universities or graduate schools overseas. The United States and Japan are the most frequent destinations for overseas education. The fact that over half of the managers take up golf indicates the widespread nature of this leisure activity.

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[6] With regard to the firms that had not survived to 2002, we have no information as to whether the replacement (or retirement) of managers had occurred. As a result, from these non-surviving samples, we could not remove the replaced managers. In the subsequent analysis, we used the Heckman's sample selection model. In its reduced form selection equation, the dependent variable is the probability of survival. Since we could not remove the replaced managers from the non-surviving firms, but only from the surviving firms, there remains a possibility that our selection model is not appropriately specified. However, it is noteworthy that the estimation result of the selection equation was not seriously changed by that removal. The removal of the replaced managers appears to have no deleterious effect to the validity of the model.

[7] Although the entire sample size is 1,064, part of the educational variables and *GOLF* have missing values. For example, the number of observations for *UNIVSC* is 967 because part of the respondents had not mentioned their majors. Likewise, some respondents had not referred to their leisure activities. We used as many samples as we could obtain regarding each of the educational variables and *GOLF*.

[8] This figure includes legislators and government administrators. The share of university graduates in the entire working population is 14.53%.

IV. Empirical Methodology

In this study, the effect of manager's education on firm growth was examined. Chairperson (Dong-Shi-Zhang) was chosen as the subject for empirical reasons. In the case of part of the SMEs in our data set, managerial positions other than that of chairperson were not assigned.

In Taiwan, the position that is roughly equivalent to the CEO is that of president (Zong-Jing-li). In many countries, the chairperson is a non-executive representing the majority equity owner. Thus, he/she does not belong to the management team. However, in Taiwanese firms, the chairperson is part of the management team, and in most cases, the most influential entity. Many presidents merely follow the chairperson's instructions. In addition, in accordance with Taiwanese laws, the chairperson holds the right of representation. Thus, presidents in Taiwanese firms tend not to be the leaders who make strategic decisions; rather, most of them are the secretaries engaged in practical management based on the decisions made by the chairperson.

Since we focused on chairpersons, the effect of education should be analyzed in terms of strategic decision-making rather than practical administration. Hence, our main issue is whether education assists managers' strategic decision-making by way of the comprehension of technologies and international business information.

Firm growth might be the indirect indicator of firm performance because it could not completely capture the efficiency within the firm. For example, a return on equity (ROE) could provide a more direct picture of firm efficiency. However, our sample contains a considerable number of SMEs. This sample characteristic causes difficulties in obtaining direct indicators.

With regard to the measure of growth, employment growth was adopted as the measure of growth. Sales growth is also frequently used in the analysis of firm growth. However, sales growth might not be a suitable measure for the part of our sample that includes firms in the start-up period when it is difficult to generate sales.

As shown earlier, only part of the firms in the 1993 edition of the directory survived to the 2002 edition, causing a potential selection bias problem. In order to reduce this bias, Heckman's two-step estimation (Heckman, 1979) was used.

Further, with regard to educational variables, there appears to be another problem. Educational variables depend on the sample managers' past decision-making, since educational attainments are the consequences of human capital investments. For example, when a manager was at the age of entering university, his/her decision to proceed to the university depended on the expected return from university education, conditional on the financial constraints and the developmental level of the national educational system.

In developing countries such as Taiwan during the developing period in the past, human capital investments had been conditional on family incomes, the gender of children, and the entire developmental level of the educational system. In Taiwan, the families of the Mainlanders (Wai-Sheng-Ren), who had immigrated from Mainland China together with the Nationalist Party (Kuomintang, KMT) after World War II, have had comparably high advantages with regard to children's education. This was due to their larger family incomes (Luoh, 2001)[9]. Moreover, along with the rapid economic development after World War II, the educational system had expanded substantially, providing more educational opportunities to younger generations[10].

Therefore, university graduates tend to be part of the younger generations and

[9] Luoh (2001) had shown the difference in educational attainments among ethnic groups and across genders in terms of an econometric analysis. He had also found that the gap across ethnic groups and genders had shrunk as the educational system developed.

[10] In 1950, there were only 4 public universities in Taiwan. In 2003, the number of universities had reached 142.

male members of Mainlanders' families. In this case, a simple comparison between graduates and non-graduates by means of a standard dummy variable regression might be biased over the sample in which managers from Mainlanders' families, males, and the younger generations concentrate excessively on the graduate group.

Therefore, a self-selection bias (Maddala, 1985) should be corrected. In order to reduce this bias, we adopted the endogenous dummy model (Heckman, 1978), thus treating each educational variable as an endogenous dummy variable[11].

The econometric model is described below.

$$GROW_i = \mathbf{x}_i'\boldsymbol{\beta} + \alpha\, EDUC_i + u_{1i}, \qquad u_{1i} \sim WN\left(0, \sigma_1\right) \tag{1}$$

$\mathbf{x}_i$: independent variables vector,

$EDUC_i$: educational variable (endogenous dummy variable),

$$GROW_i \text{ is observed if } GROW_i^* \geq 0, \qquad GROW_i^* : \text{latent variable of } GROW_i$$

$$GROW_i^* = \mathbf{x}_i'\boldsymbol{\gamma_1} + \beta_1\, MAINL + u_{2i}, \quad u_{2i} \sim WN\left(0, \sigma_2\right), \tag{2}$$

$$\begin{cases} EDUC_i = 1, & \text{if } EDUC_i^* \geq 0, \\ EDUC_i = 0, & \text{if } EDUC_i^* < 0, \end{cases} \qquad EDUC_i^* : \text{latent variable of } EDUC_i$$

$$EDUC_i^* = \gamma_1 + \gamma_2 MAINL + \gamma_3 GEND + \gamma_4 AGE + u_{3i}, \quad u_{3i} \sim WN\left(0, \sigma_3\right). \tag{3}$$

As can be observed, our econometric model consists of three equations. Equation (1) is the main regression of interest. The sample selection model was estimated by probit regression in Equation (2)[12]. In Equation (3), the dummy variable that is treated as an

[11] The endogenous dummy model has been used in many fields, for example, medical experiments, labor economics, developmental economics, evaluation of macro policy, analysis regarding the demand of electricity, etc.

[12] *MAINL* enables the identification of estimators in Equations (2) and (3).

endogenous variable is regressed on *MAINL*, *GEND*, and *AGE*. In practical terms, this model was estimated by the following two-step procedure.

1. Estimate Equation (2) by probit estimation and then predict the first inverse mills ratio, $\hat{\lambda}_{1i}$ (*LAMDA1*). Estimate Equation (3) by probit estimation and then obtain the second inverse mills ratio, $\hat{\lambda}_{2i}$ (*LAMDA2*).
2. Regress $GROW_i$ on $\mathbf{x}_i$ and $EDUC_i$ together with $\hat{\lambda}_{1i}$ and $\hat{\lambda}_{2i}$ by OLS.

In the following econometric analysis, two reduced forms in the first step are formulated each time the regression was run according to the composition of the variables.

In the comparison between the SMEs and large firms, a sub-sample analysis was conducted. We followed a standard definition of the SME as a firm with less than 200 employees, which is used by many of the studies on Taiwanese SMEs.

In addition, another sub-sample analysis was conducted for the firms that were still in the start-up period. We divided the entire sample according to firm age. In other words, the sample with the youngest firms was defined as the sample of firms in the start-up period. We extracted the youngest 25th percentile[13]. The age of firms within this extracted sample ranged from 1 to 13 years. The F-test for structural change suggested that the null hypothesis was rejected at the 1% significance level, suggesting a statistically distinctive structure within the extracted sample[14].

V. Results

[13] The 25th percentile might be suitable for obtaining a sufficient sample size in order to for prevent a potential multi-collinearlity problem, and simultaneously, for targeting the founding managers.
[14] With F-value 2.45 (P-value: 0.001)

As discussed earlier, within high-tech industries, there appears to be the effect of university education. It would also be expected that within high-tech industries, education in terms of a science degree has a comparatively large effect than that in terms of a liberal arts degree.

Table II shows the results of reduced forms in the first step. The result of Equation (1) in Section IV is shown in Column 1, and that of Equation (2), in Column 2. In Column 1, we can observe strongly significant coefficients on most of the variables. There appears to be a distinct selection procedure, resulting in some bias among the surviving firms.

As shown in Column 2, the signs of the parameters in Equation (2) were as expected, showing that younger males from Mainlander families reap the advantages of human capital investment[15].

[Insert Table II about here]

Each column of Table III provides estimates by means of OLS, Heckman's sample selection model (SSM), and the sample selection model with an endogenous dummy (ED). In every specification, university education has no statistically significant impact on firm growth. Based on the coefficients on *FAGE,* we can observe that younger firms tend to grow faster.

A comparison between three models revealed that with the exception of the change on *EMPL*, little deference was found. The change in the parameter of *EMPL* might be attributable to the correction of the selection bias and is reflective of the fact that small firms are less likely to survive. Nevertheless, the choice of the econometric model does appear not to have a major impact on the result.

[15] In the preceding tables, the results of the reduced probit in the first step are not shown due to space constraints.

[Insert Table III about here]

Table IV provides the result concerning university education in high-tech industries. The effect of university education and the fields of specialization were examined in each electronics industry and the information device industry. Although industry dummies were actually included in the specification, they are not presented in the table due to space constraints. Industry dummies are neither presented in the series of tables that follows, although the specifications virtually included them. In order to explore the effect of education in specific industries, we used interaction terms in which each educational variable was multiplied with the respective industry dummy variables.

[Insert Table IV about here]

As is evident, *UNIV* has a significant and positive impact on each of high-tech industries[16]. The interaction terms in which the industry dummies other than *ELEC* and *INFOD* are multiplied with *UNIV* were not significant. The effect of university education which was found here appears to be confined to high-tech industries.

Moreover, it is noteworthy that the magnitude of the impact in the information device industry is larger than that in the electronics industry. This additional impact in the industry in which advanced technologies are used suggests that the effect of university education appears to be intensified with a rise in the technological level.

When comparing with other parameters in the same column, the interaction terms exhibit distinctly large coefficients. Hence, among most of the high-tech firms during

[16] This significant and positive impact was stable even when we conducted a simple OLS procedure.

the period of the study, the manager's education was the most important factor for firm growth.

As shown in Columns 3 and 4, managers with science degrees have a significant and positive impact. On the other hand, managers with liberal arts degrees have no significant impact.

These results indicate that managers with science degrees tend to have a greater advantage in understanding technologies within high-tech industries. In addition, similar to the result in Columns 1 and 2, the impact of managers with science degrees in the information device industry is more substantial than that in the electronics industry.

Although this result appears to suggest that liberal arts degrees are not important, it should be noted that the focus of this study was restricted to chairpersons. In other words, the presidents who hold the second-most influential position in Taiwanese firms were beyond the scope of our study, leaving behind the possibility that presidents having majored in liberal arts assisted chairpersons having majored in science.

Since our model includes two inverse mills ratios and interaction terms, one might suspect whether the multi-collinearity problem will be of importance. However, a diagnostic test suggested that there is no serious correlation among the variables[17]. (The correlation matrix is provided in the Appendix B)

As discussed earlier, education might serve to facilitate an understanding of international business information as well as high technologies. Table V shows the effect of university education in exporting industries. As shown in Column 1, the interaction term *UNIV*EXP* has a significant and positive impact at the 1% level. However, when considering Column 2, this positive impact was observed in the case of managers with science degrees and not liberal arts degrees.

[17] The diagnostic test rejected the existence of a serious correlation among the variables in all the estimations that follow.

Under the fierce competition prevailing in the export market, managers are not only required to understand international business information but also to possess technological specialties (Hayes and Abernathy, 1980). These results indicate that under severe product competition, managers with science degrees that possess additional technological specialty appear to contribute to firm growth.

[Insert Table V about here]

Table VI shows the result for the sample in the start-up period. With regard to *UNIV*, the result is almost similar to that for the entire period, albeit with a weaker significance. Moreover, the result was also similar in the case of *UNIVSC* and *UNIVLA*. *UNIVSC* has a statistically significant and positive impact at the 5% level, whereas *UNIVLA* has no statistically significant coefficient.

Nevertheless, there remains the possibility that the presidents who majored in liberal arts support the chairpersons who majored in science. In such a case, most of the founding managers might specialize in technologies, while the presidents engage in legal affairs and finance.

[Insert Table VI about here]

Overseas Education

As can be observed in Table VII, the impact of overseas education is significant and positive across the entire industry sample, as well as in the electronics industry and the information device industry. However, the magnitude of the impact in the electronics industry is approximately five times larger than that in the entire industry sample.

Therefore, in Taiwan, managers educated overseas are likely to be in an advantageous position. Moreover, their experiences appear to be particularly beneficial in high-tech industries, in which case the relationship with manufacturers in the United States is crucial.

[Insert Table VII about here]

However, the results shown in Table VII do not completely specify the effect peculiar to education in the United States. Therefore, we conducted another analysis using *USA*.

As can been observed in Table VIII, science degrees in the United States have a significant and positive impact, whereas liberal arts degrees have no statistically significant impact. This result implies that the managers majoring in natural science in the United States might be of great advantage in acquiring OEM/ODM contracts with manufacturers in the United States. In addition, the magnitude of the impact in the information device industry is more substantial than that in the electronics industry.

[Insert Table VIII about here]

However, from this table, it remains unclear whether the managers contributed to the development of the high-tech industries through the creation of new businesses. Therefore, we conducted the same analysis by using the sample in the start-up period.

Table IX provides the same model by using the sample in the start-up period. As can be observed, *USASC* has significant and positive coefficients in both industries. This finding is consistent with the result over the entire period, as shown in Table VIII.

Thus, by establishing new businesses, returnees contributed to the development of high-tech industries.

[Insert Table IX about here]

For the purpose of highlighting the foreign language abilities of managers, we compared managers educated in the United States and those educated in Japan. Table X shows that education in Japan has no statistical significance, whereas education overseas and in the United States has significant and positive impacts. It is self-evident that while English is widely spoken in international business, the use of the Japanese language is comparably limited. Therefore, this difference between the two groups might be attributed to the language used. Knowledge of a foreign language is likely to be a beneficial ability from the viewpoint of managers.

[Insert Table X about here]

When dividing the sample into large firms and SMEs, as shown earlier, we proposed two opposing hypotheses. The first hypothesis is that as the tasks related international businesses are increasing, the necessity of the overseas education appears to be relatively high in large firms. The second one is that in the small businesses that are highly dependent on the ability of a single manager, the overseas education of the managers might more directly improve firm performance.

As shown previously in Column 1 of Table VII, overseas education has a significant and positive impact across the entire industry sample. In this regard, overseas education is analyzed separately in the case of each the large firm and SME.

As can be observed in Table XI, *ABROAD* has no significance among large firms. In

contrast, among the SMEs, the managers educated overseas are more likely to contribute to greater firm growth. In addition, among the SMEs, *AGE* has a significant and positive impact, implying that the experiences of managers are important.

Thus, in our data, the second hypothesis seems to be more appropriate. In the case of SMEs, the overseas education of the managers appears to improve firm performance more efficiently, due to the smaller organizational size. Recently, as compared to large firms, the Taiwanese SMEs is declining in the overseas market. However, many of the managers of SMEs that have been educated overseas successfully contribute to firm growth.

[Insert Table XI about here]

Human Networks

Table XII examines the impact of human networks established through golfing activities. As can be observed, *GOLF* has a significant and positive impact at the 5% level. One explanation for this result is that many of the managers benefit from golfing activities. Another possible explanation might be provided by the so-called "income effect"— well-performing managers are taking up golf since it is considerably expensive. However, this income effect appears to be less influential on the result over the sample in which a majority of managers are taking up golf[18].

As shown in Column 2 of Table XII, in the start-up period, no significant impact is found in the case of the coefficient of *GOLF*. This result suggests that in the start-up period, the managers tend not to depend on human networks based on leisure activities. This is possibly because many of these managers are in the process of laboriously setting up their businesses, and their return from the networks through

[18] According to our data set, over half the managers had taken up golf.

golfing activities is comparatively small.

[Insert Table XII about here]

VI. Conclusions

Several educational factors that contribute to management in specific industries were presented. Education in terms of science degrees has a positive impact on the high-tech industries, suggesting that technological knowledge is essential in the understanding of technology. In the export-oriented industries, overseas education contributes to firm growth. This is due to its assistance in comprehending international business information. Education obtained from the United States has a positive impact on the export-oriented industries, whereas that obtained from Japan is not significant. This result shows that foreign language abilities appear to be one of the major advantages of managers.

Hence, the education of managers serves as the necessary background in the specific industries. Education assists managers in specific industries to comprehend technologies and international business information, and thus, it indirectly contributes to the management.

The returnees from the United States contributed to the rapid development in the Taiwanese electronics industry. Their education and work experiences with manufacturers in the United States could draw a number of OEM/ODM orders from the United States. In fact, the major reason why they had left Taiwan was because the Taiwanese educational system had been less developed at that time. Upon returning to Taiwan, they had played an important part in emerging industries. Our empirical findings suggest that human resources overseas should not be neglected in the context of developmental policies. The government should organize a supportive environment

for new businesses established by returnees.

The contribution of overseas education is more substantial in the case of SMEs than in that of large firms. The education of managers is more likely to have a deep impact on smaller organizations. As compared to large firms, Taiwanese SMEs are disadvantageous in the export market. However, some SMEs led by well-educated managers could grow successfully. In the face of the expansion of the large firm sector, the characteristics of Taiwanese small business managers appear to be changing.

We found that the human networks through golfing contribute to firm growth. The human networks provide managers with a considerable number of new business opportunities and assistance through golfers. Considering this finding, human networks among managers should not be overlooked in the economic analysis. However, the prevalence of golfing activities might be a characteristic specific to Taiwanese business communities. On that account, human networks established through golfing should be examined in the case of other countries. Moreover, other forms of human networks also should be discussed. These points are our goals for future research.

Appendix A: The Definition of Business Groups

In the "The Business Groups in Taiwan", the criteria used for connecting subsidiaries with a parent firm are described below.

i. The parent firm owns more than 50% of the shares of the subsidiary either through another subsidiary or an investment firm.

ii. More than 50% of the shares of both the firms are owned by the same investor.

iii. Half of the board seats in both the firms are shared by the same members.

iv. Half of the board members in both the firms are connected by either marital

relationship or the third-degree of relationship.

v. Both firms are dominated by an identical management organization or organizer.

After connecting subsidiaries to the parent firm, business groups are defined as below.

i. Comprising three or more firms

ii. Private firms in which 51% or more of the shares are owned by Taiwanese locals

iii. Having a key person with substantial influence

iv. Domestic company

Appendix B: Pearson's Correlation Coefficients between Variables of Interest

[Insert Table A1 about here]

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Table I　A Summary of Variables

This table shows the definition of variables and their descriptive statistics. With regard to educational variables, university graduates account for approximately 40 percent. With regard to overseas education, one fourth of the university graduates were educated at universities or graduate schools overseas. The United States and Japan are the most frequent destinations for overseas education. The fact that over half of the managers take up golf indicates the widespread nature of this leisure activity.

Variable Name	Definition	Mean	Observations
SURV	Data is avaluable in 2001	0.499	1350
GROW	Employment growth rate 1992–2001	0.262	674
EMPL	Logarithm of the number of employees in 1992	5.215	674
FAGE	1992–the year of establishment	29.591	674
BUSIG	Featured on *The business groups in Taiwan* (dichtomous variable)	0.139	674
GEND	Female (dichtomous variable)	0.064	674
AGE	Manager's age in 1992	63.368	674
MAINL	Manager born in the Mainland China (dichtomous variable)	0.110	674
UNIV	University graduate (dichtomous variable)	0.395	674
UNIVSC	University graduate with sciense degrees (dichtomous variable)	0.163	619
UNIVLA	University graduate with liberal arts degrees (dichtomous variable)	0.178	619
ABROAD	Graduate of overseas university (dichtomous variable)	0.106	654
USA	Graduate of U.S. university (dichtomous	0.072	654
JPN	Graduate of Japanese university (dichtomous	0.031	654
USASC	Graduate of U.S. university in science degrees (dichtomous variable)	0.023	615
USALA	Graduate of U.S. university in liberal arts degrees (dichtomous variable)	0.046	615
GOLF	Manager's hobby includes golfing (dichtomous variable)	0.526	365
ELEC	Electronics industry in 1992 (including INFOD, dichtomous variable)	0.197	674
INFOD	Information device industry in 2001 (dichtomous variable)	0.105	674
EXPORT	Industries in which export accouts for 50% or more in 1992 production amounts (dichtomous variable)	0.463	674

Table II The Results of Reduced Form Probit Estimations

This table shows the result of the reduced forms in the first step. The result of Equation (1) in Section IV is shown in Column 1, and that of Equation (2), in Column 2. In Column 1, we can observe strongly significant coefficients on most of the variables. There appears to be a distinct selection procedure, resulting in some bias among surviving firms. As shown in Column 2, the signs of the parameters in Equation (2) were as expected, showing that younger males from Mainlander families had advantage in the human capital investment.

Probit Estimation							
N	1350			N	674		
Pseudo R^2	0.162			Pseudo R^2	0.042		
Variable				Variable			
Dependent Variable: SURV				Dependent Variable: UNIV			
EMPL	0.512	***	(0.040)	MAINL	0.748	***	(0.162)
FAGE	0.013	***	(0.005)	GEND	−0.431	**	(0.218)
BUSIG	0.112		(0.149)	AGE	−0.019	***	(0.005)
GEND	−0.210		(0.144)	Constant	0.893	***	(0.309)
AGE	−0.009	**	(0.004)				
UNIV	0.048		(0.080)				
MAINL	−0.508	***	(0.112)				
Industry Dummies							
Food	0.134		(0.181)				
Textile	0.094		(0.143)				
Chemical	0.577	***	(0.143)				
Metal	0.569	***	(0.147)				
Machinery	0.522	***	(0.176)				
Electronics	0.280	*	(0.145)				
Transp. Equip.	0.468	**	(0.190)				
Constant	−2.474	***	(0.292)				

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table III The Effect of University Education in the Entire Manufacturing Sector

Each column of this table provides estimates by means of OLS, Heckman's sample selection model (SSM), and the sample selection model with an endogenous dummy (ED). In every specification, university education has no statistically significant impact on firm growth. Based on the coefficients on *FAGE,* we can observe that younger firms tend to grow faster. A comparison between three models revealed that with the exception of the change on *EMPL*, little deference was found.

	OLS		SSM		SSM plus ED	
N	674		674		674	
R^2	0.074		0.080		0.080	
Variable						
EMPL	−0.134 ***	(0.049)	0.074	(0.111)	0.064	(0.144)
FAGE	−0.017 ***	(0.005)	−0.013 **	(0.006)	−0.013 **	(0.006)
BUSIG	0.163	(0.149)	0.154	(0.149)	0.154	(0.149)
GEND	−0.121	(0.183)	−0.211	(0.187)	−0.193	(0.245)
AGE	0.001	(0.005)	−0.003	(0.005)	−0.003	(0.009)
Industry Dummies						
Food	0.331	(0.212)	0.333	(0.211)	0.332	(0.211)
Textile	0.239	(0.155)	0.208	(0.156)	0.209	(0.156)
Chemical	0.140	(0.145)	0.325 *	(0.170)	0.316 *	(0.186)
Metal ind.	0.087	(0.158)	0.276	(0.182)	0.268	(0.199)
Machinery	0.142	(0.192)	0.321	(0.210)	0.313	(0.222)
General Electronics	−0.010	(0.450)	0.056	(0.450)	0.053	(0.452)
Information Device	0.717 ***	(0.174)	0.727 ***	(0.174)	0.723 ***	(0.178)
Transp. Equip.	0.073	(0.194)	0.211	(0.205)	0.204	(0.213)
UNIV	0.105	(0.094)	0.099	(0.094)	0.097	(0.095)
LAMDA1			0.773 **	(0.371)	0.737	(0.494)
LAMDA2					−0.046	(0.416)
Constant	1.115 ***	(0.352)	−0.372	(0.796)	−0.288	(1.100)

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level * Significant at the 10% level

Table IV The Effect of University Education in High-tech Industries

This table provides the result concerning university education in high-tech industries. The effect of university education and the fields of specialization were examined in each electronics industry and information device industry. In order to explore the effect of education in specific industries, we used interaction terms in which each educational variable was multiplied with the respective industry dummy variables. As is evident, *UNIV* has a significant and positive impact on each of the high-tech industries. As shown in Columns 3 and 4, managers with science degrees have a significant and positive impact. On the other hand, managers with liberal arts degrees have no significant impact.

N	674			674			619			619		
R^2	0.100			0.094			0.102			0.109		
Variable												
EMPL	0.116		(0.143)	0.068		(0.143)	0.146		(0.147)	0.126		(0.146)
FAGE	−0.011	*	(0.006)	−0.012	**	(0.006)	−0.012	**	(0.006)	−0.013	**	(0.006)
BUSIG	0.151		(0.147)	0.156		(0.148)	0.061		(0.152)	0.051		(0.151)
GEND	−0.250		(0.243)	−0.219		(0.244)	−0.222		(0.252)	−0.225		(0.250)
AGE	−0.006		(0.009)	−0.004		(0.009)	−0.006		(0.010)	−0.005		(0.010)
UNIV*ELEC	0.795	***	(0.209)									
UNIV*INFOD				0.929	***	(0.293)						
UNIVSC*ELEC							1.032	***	(0.268)			
UNIVLA*ELEC							0.443		(0.275)			
UNIVSC*INFOD										1.557	***	(0.362)
UNIVLA*INFOD										0.311		(0.377)
UNIV	−0.058		(0.103)	−0.003		(0.100)	−0.011		(0.110)	0.042		(0.105)
LAMDA1	1.008	**	(0.495)	0.782		(0.491)	1.038	**	(0.513)	0.908	*	(0.504)
LAMDA2	0.136		(0.415)	0.038		(0.414)	0.034		(0.463)	0.081		(0.460)
Constant	−0.884		(1.100)	−0.323		(1.093)	−0.958		(1.134)	−0.728		(1.115)

*Industry dummies are not presented due to space constraints,

although the actual specification includes those dummies.

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table V The Effect of University Education in Export-oriented Industries

Education might serve to facilitate an understanding of international business information as well as high technologies. This table shows the effect of university education in exporting industries. As shown in Column 1, the interaction term *UNIV*EXP* has a significant and positive impact at the 1% level. However, in Column 2, this positive impact was observed in the case of managers with science degrees and not liberal arts degrees.

N	674			619		
R^2	0.087			0.098		
Variable						
EMPL	0.068		(0.143)	0.107		(0.467)
FAGE	−0.012	**	(0.006)	−0.013	**	(0.023)
BUSIG	0.150		(0.148)	0.061		(0.689)
GEND	−0.191		(0.245)	−0.163		(0.517)
AGE	−0.002		(0.009)	−0.001		(0.914)
UNIV*EXPORT	0.401	**	(0.177)			
UNIVSC*EXPORT				0.759	***	(0.001)
UNIVLA*EXPORT				0.240		(0.267)
UNIV	−0.089		(0.126)	−0.084		(0.522)
LAMDA1	0.770		(0.493)	0.818		(0.108)
LAMDA2	−0.042		(0.415)	−0.162		(0.727)
Constant	−0.425		(1.098)	−0.620		(0.582)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table VI The Effect of University Education in High-tech Industries: Start-up Period

This table shows the result for the subsample in the start-up period. With regard to *UNIV*, the result is almost similar to that for the entire period, albeit with a weaker significance. Moreover, the result was also similar in the case of *UNIVSC* and *UNIVLA*. *UNIVSC* has a statistically significant and positive impact at the 5% level, whereas *UNIVLA* has no statistically significant coefficient.

N	189		189		173		173	
R^2	0.166		0.171		0.212		0.212	
Variable								
EMPL	0.027	(0.436)	−0.085	(0.425)	−0.182	(0.430)	−0.317	(0.420)
FAGE	−0.073	(0.046)	−0.085 *	(0.044)	−0.071	(0.044)	−0.085 **	(0.043)
BUSIG	0.111	(0.394)	0.087	(0.393)	0.067	(0.394)	−0.006	(0.392)
GEND	0.333	(0.637)	0.426	(0.628)	0.757	(0.581)	0.791	(0.579)
AGE	0.009	(0.012)	0.009	(0.012)	0.022	(0.015)	0.026 *	(0.015)
UNIV*ELEC	0.781 *	(0.471)						
UNIV*INFOD			1.033 *	(0.534)				
UNIVSC*ELEC					1.327 **	(0.581)		
UNIVLA*ELEC					−0.129	(0.524)		
UNIVSC*INFOD							1.561 **	(0.639)
UNIVLA*INFOD							0.059	(0.634)
UNIV	0.047	(0.288)	0.074	(0.268)	0.209	(0.291)	0.208	(0.273)
LAMDA1	0.723	(1.254)	0.341	(1.207)	−0.065	(1.278)	−0.498	(1.241)
LAMDA2	−0.639	(0.774)	−0.796	(0.752)	−1.589 *	(0.816)	−1.659 **	(0.811)
Constant	0.877	(4.201)	2.267	(4.036)	2.842	(3.901)	4.075	(3.812)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table VII The Effect of Overseas Education in High-tech Industries

As can be observed in this table, the impact of overseas education is significant and positive across the entire industry sample, as well as in the electronics industry and the information device industry. The magnitude of the impact in the electronics industry is approximately five times larger than that in the entire industry sample.

N	654			654			654		
R^2	0.078			0.110			0.094		
Variable									
EMPL	0.057		(0.150)	0.088		(0.147)	0.050		(0.148)
FAGE	−0.011	*	(0.006)	−0.010	*	(0.006)	−0.011	*	(0.006)
BUSIG	0.119		(0.150)	0.054		(0.149)	0.104		(0.149)
GEND	−0.222		(0.190)	−0.174		(0.187)	−0.184		(0.189)
AGE	−0.006		(0.005)	−0.005		(0.005)	−0.006		(0.005)
ABROAD*ELEC				1.552	***	(0.326)			
ABROAD*INFOD							1.301	***	(0.390)
ABROAD	0.332	**	(0.155)	−0.092		(0.177)	0.107		(0.168)
LAMDA1	0.748		(0.506)	0.846	*	(0.499)	0.711		(0.503)
LAMDA2	0.065		(0.358)	0.130		(0.352)	0.043		(0.355)
Constant	−0.274		(1.608)	−0.745		(1.585)	−0.175		(1.596)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures within parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table VIII The Effect of U.S. Education in High-tech Industries

As can be observed in this table, science degrees in the United States have a significant and positive impact, whereas liberal arts degrees have no statistically significant impact. This result implies that the managers majoring in natural science in the United States might be of great advantage in acquiring OEM/ODM contracts with manufacturers in the United States. In addition, the magnitude of the impact in the information device industry is more substantial than that in the electronics industry.

N	615			615		
R^2	0.103			0.115		
Variable						
EMPL	0.057		(0.148)	0.059		(0.145)
FAGE	−0.012	**	(0.006)	−0.012	**	(0.006)
BUSIG	0.020		(0.152)	0.044		(0.150)
GEND	−0.194		(0.192)	−0.196		(0.191)
AGE	−0.005		(0.006)	−0.006		(0.005)
USASC*ELEC	2.313	***	(0.548)			
USALA*ELEC	0.115		(0.476)			
USASC*INFOD				3.046	***	(0.602)
USALA*INFOD				−0.014		(0.547)
ABROAD	0.043		(0.189)	0.047		(0.183)
LAMDA1	0.696		(0.504)	0.704		(0.498)
LAMDA2	−0.043		(0.288)	−0.016		(0.285)
Constant	−0.045		(1.470)	−0.075		(1.450)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures within parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table IX The Effect of U.S. Education in High-tech Industries: Start-up Period

This table provides the same model by using the sample in the start-up period. As can be observed, *USASC* has significant and positive coefficients in both industries. This finding is consistent with the result over the entire period, as shown in Table VIII. Thus, by establishing new businesses, returnees contributed to the development of high-tech industries.

N	160			160		
R^2	0.258			0.258		
Variable						
EMPL	−0.311		(0.462)	−0.310		(0.445)
FAGE	−0.084	*	(0.048)	−0.085	*	(0.048)
BUSIG	0.142		(0.401)	0.136		(0.399)
GEND	(Excluded)			(Excluded)		
AGE	−0.015		(0.016)	−0.015		(0.016)
USASC*ELEC	4.158	***	(0.962)			
USALA*ELEC	−0.164		(0.871)			
USASC*INFOD				4.151	***	(0.959)
USALA*INFOD				−0.215		(0.890)
ABROAD	−0.423		(0.569)	−0.417		(0.570)
LAMDA1	−0.335		(1.424)	−0.329		(1.371)
LAMDA2	−1.260		(0.812)	−1.245		(0.770)
Constant	6.984		(5.764)	6.923		(5.480)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table X The Difference in the Effect of Education: The United States and Japan

This table shows that education in Japan has no statistical significance, whereas education overseas and in the United States has significant and positive impacts. It is self-evident that while English is widely spoken in international business, the use of the Japanese language is comparably limited. Therefore, this difference between the two groups might be attributed to the language used. Knowledge of a foreign language is likely to be a beneficial ability from the viewpoint of managers.

N	654			654			654		
R^2	0.091			0.091			0.079		
Variable									
EMPL	0.075		(0.149)	0.064		(0.149)	0.059		(0.150)
FAGE	−0.010	*	(0.006)	−0.011	*	(0.006)	−0.011	*	(0.006)
BUSIG	0.096		(0.150)	0.059		(0.151)	0.123		(0.151)
GEND	−0.207		(0.189)	−0.211		(0.189)	−0.221		(0.190)
AGE	−0.005		(0.005)	−0.004		(0.005)	−0.006		(0.005)
ABROAD*EXPOR	0.900	***	(0.302)						
USA*EXPORT				0.973	***	(0.330)			
JPN*EXPORT							0.119		(0.473)
ABROAD	−0.012		(0.193)	0.088		(0.175)	0.318	*	(0.165)
LAMDA1	0.828		(0.504)	0.780		(0.504)	0.754		(0.507)
LAMDA2	0.115		(0.356)	0.155		(0.357)	0.062		(0.359)
Constant	−0.574		(1.601)	−0.577		(1.602)	−0.276		(1.609)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures within parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table XI The Effect of Overseas Education: Large and Small Firms

As shown previously in Column 1 of Table VII, overseas education has a significant and positive impact across the entire industry sample. In this regard, overseas education is analyzed separately in the case of each large firm and SME. As can be observed in this table, *ABROAD* has no significance among large firms. In contrast, among the SMEs, the managers educated overseas are more likely to contribute to greater firm growth.

	Large firms			SMEs		
N	295			359		
R^2	0.171			0.083		
Variable						
EMPL	−0.145		(0.166)	0.640		(0.689)
FAGE	−0.020	**	(0.009)	−0.001		(0.014)
BUSIG	−0.130		(0.162)	0.691		(0.433)
GEND	−0.068		(0.231)	1.249		(0.775)
AGE	0.001		(0.007)	0.046	*	(0.025)
ABROAD	0.297		(0.191)	0.764	**	(0.328)
LAMDA1	−1.382		(1.077)	2.551		(1.735)
LAMDA2	−0.977	**	(0.397)	6.286	*	(3.618)
Constant	3.616	*	(1.848)	−21.130		(13.770)

Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures in parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table XII　The Effect of Human Networks

This table examines the impact of human networks established through golfing activities. As can be observed, *GOLF* has a significant and positive impact at the 5% level. As shown in Column 2, in the start-up period, no significant impact is found in the case of the coefficient of *GOLF*. This result suggests that in the start-up period, the managers tend not to depend on human networks based on leisure activities.

	Entire period			Start-up period	
N	365			90	
R^2	0.075			0.207	
Variable					
EMPL	0.155		(0.186)	0.125	(0.579)
FAGE	0.000		(0.010)	−0.047	(0.085)
BUSIG	0.151		(0.215)	0.132	(0.549)
GEND	−0.636		(0.699)	(Excluded)	
AGE	−0.013		(0.013)	−0.010	(0.018)
GOLF	0.340	**	(0.151)	0.190	(0.359)
UNIV	0.025		(0.136)	0.281	(0.370)
LAMDA1	1.389	**	(0.696)	1.378	(1.729)
LAMDA2	0.150		(0.817)	−0.889	(1.058)
Constant	−1.241		(1.670)	0.728	(6.398)

*Industry dummies are not presented due to space constraints,

although the actual specification includes the dummies.

The figures within parentheses are standard errors. ***Significant at the 1% level

**Significant at the 5% level *Significant at the 10% level

Table A1 Pearson's Correlation Coefficients between Variables of Interest

	GROW	EMPL	FAGE	BUSIG	GENDER	AGE	UNIV
GROW	1.000						
EMPL	−0.103	1.000					
FAGE	−0.188	0.307	1.000				
BUSIG	−0.037	0.486	0.195	1.000			
GENDER	−0.037	0.048	0.032	0.038	1.000		
AGE	−0.100	0.230	0.393	0.240	0.040	1.000	
UNIV	0.061	0.064	−0.013	0.079	−0.066	−0.152	1.000
UNIVSC	0.092	−0.005	−0.071	−0.058	−0.101	−0.146	0.622
UNIVLA	−0.014	0.085	0.053	0.155	0.016	−0.047	0.641
ABROAD	0.059	0.239	0.037	0.248	0.009	0.020	0.436
USA	0.027	0.268	0.039	0.273	0.005	0.015	0.380
USASC	0.089	0.174	−0.032	0.123	−0.041	−0.048	0.214
USALA	−0.031	0.200	0.070	0.243	0.035	0.053	0.307
JPN	0.065	−0.002	0.043	0.020	0.017	0.047	0.181
LAMDA1	0.142	−0.844	−0.356	−0.381	0.051	−0.095	−0.060
LAMDA2	−0.124	0.059	0.245	0.089	0.394	0.618	−0.220

	UNIVSC	UNIVLA	ABROAD	USA	USASC	USALA	JPN
UNIVSC	1.000						
UNIVLA	−0.202	1.000					
ABROAD	0.142	0.406	1.000				
USA	0.124	0.354	0.873	1.000			
USASC	0.344	−0.070	0.492	0.564	1.000		
USALA	−0.097	0.479	0.704	0.807	−0.033	1.000	
JPN	0.047	0.180	0.414	−0.035	−0.020	−0.028	1.000
LAMDA1	−0.008	−0.067	−0.171	−0.193	−0.103	−0.160	0.010
LAMDA2	−0.169	−0.109	−0.131	−0.171	−0.166	−0.088	0.069

	LAMDA1	LAMDA2
LAMDA1	1.000	
LAMDA2	−0.124	1.000

**LAMDA1* and *LAMDA2* are derived from the Table IV.