Foreign Experience and Corporate Innovation in China

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Submit date: 19/10/2018

Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

(Signed)___Ao Shu_____ 舒傲 _ Date: ____19/10/2018_____

Abstract

In this thesis, we examine whether Board of Directors and senior executives with foreign experience affect a firm's innovation performance which determines firm's long-term competitive, by utilizing the data on foreign experience of directors and senior executives of all A-share listed company in China from 1990 to 2010. We find that directors and senior executives with foreign experience increase innovative efficiency and result in more innovation output. It appears that the effect is more pronounced for senior-level overseas returnees who accumulated their foreign experience from countries with higher standard of corporate governance, management practice and intellectual property rights protection, relative to their count parts. Further, overseas returnees with commerce related degrees demonstrate a better performance in a firm's innovation output than overseas returnees with non-commerce related degrees. Our study document that foreign back ground of senior level returnees is able to increase the human capital of the firm that is benefit to the long-term firm's value adding by boosting the firm's innovation output.

Keywords: Innovation, Firm Value, Human Capital

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1. Introduction

Technical innovation is one of the most important factors that determine the long-term economic growth of a country (Solow,1957). The competitive advantages of a firm also contribute to the success of its innovations and help determine the firm's long-term success ((Porter, 1992; Chemmanur et al., 2015). Therefore, a firm's innovation can add value to the firm. One of the most important factors affecting a firm's innovation output is human capital , which is known as the "brain gains". It is evident that increasing human capital can raise a firm's innovation output, especially the efficiency of the top management team and board of directors, who ultimately decide which innovative projects to pursue(Dakhli & Clercq, 2010; Chemmanur et al., 2015; Giannetti, Liao, & Yu, 2015).

Given the importance of human capital on firm innovation, however, there have been few studies that examine how overseas backgrounds of the senior executives and Board of Directors can influence the firm's innovation performance, especially in emerging markets. In this thesis, we fill this gap by examining whether employing executives with overseas experiences impact the innovative output of Chinese firms.

We hand-collect the biographical features of all board members and senior executives in Chinese A-share listed companies, including their foreign work experience and education, for the 1990 to 2010 period. China offers an excellent research environment for several reasons. Firstly, as the result of internationalization, the majority of the managers and the board members in Chinese firms lack cross-country and cross-language experience. This prevents them from working effectively in an international environment (Farrell & Grant, 2005). Also, skilled executives with overseas experience are highly demanded in China and this results in a significant variation in

firms. This thus provides an unique setting to observe how board members and senior executives with foreign experience can affect the innovation performance of the firm. Secondly, individuals gain their overseas experience in a wide variety of countries, which allows us to investigate if senior executives' foreign experiences from different countries affect firms' innovation output differently.

We defined skilled returnees as individuals who studies or working in overseas countries, including Hong Kong, Tai Wan and Macau. The baseline results show that the higher ratio of board members and executives with foreign experience in a firm can significantly increase the innovation of a firm (measured by the total number of patents).[1]

Examining the relation between the overseas background of senior executives and board member and a firm's innovation performance may face an endogeneity concern. This issue was potentially caused by three factors: insufficient control variables (omitted variables), sample selection bias and simultaneity between the independent variable and the dependent variable. For instance, it is possible that a reverse causality exists where the firm with higher innovation output can attract more people with overseas experience.

To address the potential endogeneity concerns, we conduct instrumental variables analyses (IV) by substituting the ratio of directors and executives with the overseas experience and applied the policy year dummy. We find that our results is robust when the IV analysis is applied.

To explain the above main finding, we develop three channels. In the first channel, we capture personal work and education status of the senior level returnees and argue that they have more advanced professional skills or abundant knowledge in particular fields (patents or publications) would enhance the innovation efficiency and capacity of the firm (Jones & Romer,

[1] We also apply alternative measures on the overseas background of board members and senior managers, such as overseas dummy, foreign board ratio, and foreign executive ratio, etc. The results are qualitative the same.

2010). We use *Age, Level of Education, and Foreign Working Experience*, to measure the ability of senior-level returnees to provide advice to the firm. We find that firms hired the elder in age, the higher level of degree achieved and the longer foreign working experience of senior level returnees are able to show a better innovation performance.

Second, we test the country channel. Senior returnees with overseas experience in countries with higher standards of corporate governance are able to perform a better monitoring function and improve corporate governance, resulting in a better innovative performance. We use *Corporate Governance*, *Management Practice* and *Intellectual Property* to capture the different countries that senior level returnees accumulated their foreign experience. A firm undertaking more innovative projects will increase its innovation output. We find that firms hired senior level returnees who accumulated their foreign experience from countries with higher standard of corporate governance, higher level of management practice and more stringent intellectual property right protection are able to show a better innovation performance.

The last channel is education channel. The advanced business-related knowledge the executives acquired at overseas universities, especially in the business related subjects, allows them to manage firms more efficiently and produce more innovative products. We use *Non-bus/econ* to capture different knowledge expertise that senior level returnees studies in foreign universities. It is observed that firms hired senior level returnees with business-related degrees show a better innovation performance than those firms employed senior level returnees who rewarded non-business related degrees.

This paper contributes to several strands of the literature. First, it contributes to the work investigating the effects of board members and managers on firm value and performance who mainly investigate this issue with the US data (e.g., Bertrand & Mullainathan, 2001; Carter,

Simkins, & Simpson, 2003; Malmendier & Tate, 2009; Cohen & Wang, 2013; Appel, Gormley , & Keim, 2016).To the best of our knowledge, this is the first study that examines the influence of hiring senior executives with overseas experience affects firm performance. More importantly, in this paper we focus on an emerging market, China, where has more space for directors and executives with overseas background transferring their knowledge that accumulated overseas (Potterie & Lichtenberg, 2001).

Second, this paper sheds additional lights on the determinants of innovation by investigating the role of overseas work and education experience of the executives on firm performance (e.g., Kortum & Lerner, 2000; Rhodes-Kropf & Robinson, 2008; Manso, 2011; Chemmanur, Loutskina, & Tian, 2014) and their influence on firm value (e.g., Eberhart, Maxwell, & Siddique, 2004; Belenzon & Patacconi, 2013; Hirshleifer, Hsu, & Li, 2013).

Third, by examining the places where the overseas background of board members and senior executives influences a firm's innovation output, this thesis provides additional insights on the mechanisms by what the foreign experience of directors and managers affect corporate governance, firm policy, as well as the absorptive knowledge capacity of the firm.

The rest of the paper is organized as follows. We discuss the related literature and theory in the next section. The data and research models are described in Section three and is followed by a discussion of the results in Section four. Additional analysis on three channels are reported in Section five. Section six presents the results of robust checks. The paper closes with concluding remarks in Section seven.

2. Related Literature and Hypothesis

2.1 literature review

The topic of corporate innovation has recently become a hot topic with majority of research investigating how the firm-level characteristics, such as capital structure and human capital, affect firm's innovation performance.

The capital structure is one of the most important determinant of firm's innovation (Holmstrom, 1989; Manso, 2011). Tian & Wang (2014) find that the higher level corporate governance in a firm can result to the higher tolerance for failure that increase the firm's innovation output and the quality of their innovation output, which received more citations for their generated patents. Chemmanur, Loutskina, and Tian (2014) find that firms with corporate venture capital background are able to have more tolerance for failure. Therefore, firms backed with corporate venture capital background are newer, higher risk taken and less profit generated than firms with independent venture capital background, thus have higher innovation ability. Mao, Tian, and Yu (2016) examine a unique feature of venture capital financing called stage financing to the firm's innovation output. Stage financing defined as the step-by-step payment of capital (instead of a lump sum capital supplied initially) from the venture capital investors to start-up firms. They found that this stage financing may hurt incentives to innovate of the firm since the firm has too much pressure on the short-term performance which determined whether they are able to receive follow-up capital supply. Further, Ferreira, Manso, and Silva (2014) derive a theoretical model to show that the different impact of public and private ownership structures of firm to their innovation output. They argue that public-owned firms are able to benefit from explaining existing ideas; however, private-owned firms are more encouraged to the investigation of new ideas. The main idea this model is that a large amount of public investors of public-owned firms kept their eyes on

the firms' short-term performance. Thus, managers in public-owned firms have less tolerance of failure that they intend to "play safe" and maintain the share price affected from the bad news. Public-owned firms may generate patents similar to their previous innovation. On the contrary, private-owned firms with more professional investors which have a higher tolerance of failure leads to managers have less pressures on short-term cash flow. Therefore, managers are willing to undertake risky projects with new ideas that leads to private-owned firms may generate new patents which different from their previous patents category. Further, Acharya & Xu (2017) and Gao, Hsu, & Li (2018) showed that public-owned firms tend to undertake more exploitative innovation as the new generated patents are more related to exist knowledge. On the other hand, private-owned firms tend to undertake more exploratory innovation that the new generated patents are wider in scope.

Apart from the capital structure of the firm, human capital also plays a determinant role in firm's innovation performance. Some researches show that managerial overconfidence is able to affect corporate innovation (e.g., Malmendier & Tate, 2005; Galasso & Simcoe, 2011). They defined a CEO is overconfident if the CEO holds a large amount of in-the-money stock options after they are fully vested. They argue that overconfident CEO intends to undertake risky project, which is usually innovative, rather than "play safe". Therefore, once a firm hired an overconfident CEO will increase the innovation output. Hirshleifer, Low, and Teoh (2012) also examine whether the overconfidence of CEO can affect firms' innovation output. Different to previous option-based measurement, they used word-based proxy by calculating the proportion of overconfident words used in their speech. They find that overconfident CEOs are able to exploit innovative growth opportunity in the firm. Sunder, Sunder, and Zhang (2017) also investigate the personality of CEO can influence firms' innovation output. They find that if the CEO has a risky hobby like flying

airplanes is more likely to undertake innovative project in their daily management and result to higher innovation output of the firm.

Apart from investigating the hobbies of CEO, Custodio, Ferreira, and Matos (2017) examine the previous working experience of CEO and the firm's innovation output. They classify a CEO as generalist CEO if this person gained general managerial skills over their lifetime working experience and find that generalist CEO can increase firm's innovation output by their excellent managerial skills accumulated from their previous working experience. Moreover, CEOs' social connection can also boost firms' innovation output (Faleye, Kovacs, & Venkateswaran, 2014). This effect can be explained by two aspects. Firstly, CEOs who participate more social activities may have higher labor market insurance that leads to CEOs intend to have a higher risk taking incentives. Secondly, social activities are able to help CEOs obtained more innovation related information that eventually helps firm's innovation ability. Apart from CEOs' personality, several researches show that CEOs' compensation schemes are also able to affect their decision making behavior and the incentives of innovation. Ederer and Manso (2013) find that CEOs who paid with pay-for-performance compensation intend to undertake innovative project rather than those who paid with fixed salary. This finding is consistent with that CEOs who paid with more deferred compensation like unexercised stock option are more willing to undertake innovative projects and achieve a long-term value adding of the firm (Manso, 2011). In addition, the length of contract remaining can also positive associate with firm's innovation output (Gonzalez-Uribe & Xu, 2015). Human capital is not only CEOs, but also non-CEO executives and other lower-ranked employees can affect firm's innovation performance significantly. Chemmanur, Kong, Krishnan, and Yu (2015) shows that the quality of human capital, which measured both senior and junior managers, is positively associate with firm's innovation output.

2.2 Development of Hypotheses

This study is motivated by Giannetti, Liao, and Yu (2015), who examine the relationship between board members who have studied or worked abroad and firm performance. They find that firms perform better when the board contains members with overseas experience and conclude that these employees contribute a "brain gain," resulting in an increase in the quality of human capital for the firm. Therefore, it would have a positive effect on a firm's innovation processes.

Since the late 1970s, China has been experiencing a remarkable economic growth, from 92.6 billion USD in 1970 to 11.2 trillion USD in 2016 (China NBS data). Consequently, Farrell and Grant (2005) state that China is encountering a severe talent shortage in order to sustain this rapid growth. Especially for Chinese companies, there is a supply shortage of managers who are fluent in English or can work efficiently in a bilingual or even multilingual environment. Nevertheless, based on data from the National Bureau of Statistics of China, there are only about 4,000 managers who have studied or worked abroad among all Chinese firms (including private firms). Based on Farrell and Grant's (2005) estimation, firms in China needs at least 75,000 managers who are able to work efficiently and effectively in an international environment. The supply gap is enormous.

By training and working in developed countries, returnees usually have higher professional ethics standards and a better understanding of the importance of innovation. Ethical considerations can profoundly influence the directors' decisions (Tuttle, Harrell, & Harrison, 1997). Thus, individuals with overseas experience appear to be eager for innovative projects which have long-term value, whereas local directors tend to focus on maximizing their short term and/or personal benefits. Moreover, a higher standard of corporate governance may also increase the tolerance for failure, thereby reducing management myopia. Subsequently, these managers experience less

pressure for short-term performance and are more willing to undertake on long-term innovative projects. This activity partially solve the moral hazard problem, which will likely reduce agency costs while increasing the incentives for innovation (Tian & Wang, 2011).

Directors and senior managers with foreign experience tend to exhibit superior management practices and may have a higher code of ethics (Giannetti, Liao, & Yu, 2015). This results in a reduction in moral hazard and managerial myopia. A shift in management strategy by focusing on long-term innovative projects and increasing innovation efficiency would contribute to the success of firm innovation. Managers with overseas experience observed how overseas companies operate, learnt how to work in an international environment, and were familiar with a higher level of moral standard (Bloom & Van Reenen, 2007). Thus, these managers are expected to exhibit superior management practices with less agency problems and help to eliminate productivity gaps between countries and firms (Hall & Jones, 1999). As the result, daily operating efficiency and resource allocation are expected to rise, which may eventually increase a firm's innovation output.

In addition, according to board diversity theory, there is a significantly positive relationship between the fraction of women or minorities on the board of directors and firm value (Carter, Simkins, & Simpson, 2003). Directors with foreign experience result in board diversity, which enhance firm innovation by providing more creative ideas or new effective management practices, which may eventually lead to better innovation processes. Hence, we posit that:

H1: *Board members and senior managers with overseas experience positively influence the firm's innovation performance. Higher the proportion of overseas returnees in firm executives composition result in a better innovation performance*.

3. Data and Descriptive Statistics

In this section, we introduce our primary data source our sample selection， including the detailed categorizing method in constructing foreign experience information. We present descriptive statistics of our full sample at industry level, firm level, and individual level.

3.1 Data and Samples

The data are collected from various data sources. The biography information (including nationality, birthplace, gender, age, university attended, shareholding, salary, resume, and other personal information) of the board and senior executives in the Chinese A share markets are obtained from the CSMAR database over the period 1990 to 2010[2]. We then manually go through each resume to obtain personal information. We also cross-check the reliability of their resumes with sina.com.cn executives' profile database and other online resources.

We categorize the managers' background as follows: (1) whether an executive has foreign work experience or education at an overseas university and related work and/or education details; (2) the country or countries where the experience took place; (3) for those with an overseas education experience, the level of their degrees and related disciplines.

We define an executive as having overseas experience if they worked or studied in foreign countries. We included Hong Kong, Macau, and Taiwan as "foreign countries" due to their different social systems from mainland China.[3]

We first construct the dummy variable *indicator*, which equals one if at least one senior executive or director in a firm has overseas experience, and zero otherwise. The *ratio* is the total

[2] Note that we only use sample data from 1990 to 2010 since the full matched patent data from CPDP database is only available for this period. Patent data after 2010 has not check for validity, thus could be unreliable (also see footnote 4).

[3] Note that we use geographic location to determine whether an individual has overseas experience. Thus, this also includes those who had worked at a foreign subsidiary of a Chinese company, but deletes those who had worked at a Chinese subsidiary of a foreign firm.

number of board members and senior executives who have foreign experience divided by the total number of board members and senior executives in the firm. Moreover, to isolate the impact from directors and senior executives on decision making in the firm, we constructed two variables: *boardratio* and *exeratio*. The *boardratio* is the total number of board members who have foreign working experience and/or education experience divided by the total number of board members. Similarly, the *exeratio* is the total number of senior managers who have foreign working experience and/or education experience divided by the total number of senior managers. We define *forchair* as a dummy variable which equal to 1 if the chairman of the board has overseas experience and 0 otherwise, and *foreco* as a dummy variable which equal to 1 if the CEO has overseas experience and 0 otherwise. In total, there are information on 79,038 executive managers and directors which represents 293,915 firm-year observations.

Detailed information on patents for all A-share listed Chinese companies are sourced from the Chinese Patent Data Project (CPDP) data set created by He et al. (2017). This data set contains 222,651 patent information on both public and private firms who applied for and/or granted patents over the period 1990 to 2010. We used CPDP data for reliability since it has been cross-checked and verified[4].

The provincial policy year data are collected from the *Guidelines for Overseas Returnees to Set Up Ventures in China* (Wang, Zeng, and Pu, 2011), which includes policies about attracting highly skilled returnees in each of the province in China. The policies are designed to attract qualified people with foreign experience who return to China by providing them with substantial

[4] Moreover, patent data from the CSMAR database were gathered by calculating the total number of patents from the firms' annual reports. However, some firms do not report patent information in their annual reports, while some firms report the total number of patents including the ones they purchased in the previous year. Moreover, we count only the patents that a firm applied for in a given year and that were actually granted to, which reflects the innovation abilities of firms during each year.

benefits such as partial tax exemptions, unrestricted housing, priority education for children, government grants or subsidies, etc. We also cross-checked the accuracy of this dataset with other reliable online sources (e.g., the state council of the People's Republic of China website news database)[5]. After that, we manually match firms with the their headquarters' provincial locations and created a policy year dummy variable as the instrument variable, which is 0 if a firm's headquarter is located in the province before the overseas talent attracting policy issuing year, and 1 after the policy issuing year.

Following the innovation literature (e.g., Chemmanur, Loutskina, & Tian, 2014), we also apply a control vector of the firm and industry characteristics in the models, which are proven to influence a firm's innovation performance. The data is collected from the CSMAR database over the period 1990-2010. Those control variables include industries, classified according to the China Industry Classification National Standard; *capital expense*, measured by total capital expenditure divided by total assets; *firm size*, measured by the natural logarithm of book value; firm *leverage*; asset *tangibility*, measured by tangible assets divided by the total assets; the Herfindahl-Hirschman Index (*HHI*) based on sales; profitability, measured by *ROA*; *Tobin's Q*; and *share return*. According to Aghion et al. (2005), to capture the potential non-linear effect of market competition between firms that may impact innovation output, we also controlled for the squared Herfindahl-Hirschman Index (*squared HHI*) in the baseline regression. All control variables are winsorized at the 1% and 99% levels.

After we remove private firms and public firms with missing financial information, the full sample dataset included 1,403 unique firms with 14,328 firm-year observations.

[5] http://english.gov.cn/

3.2 Descriptive Statistics

Table 1 illustrates the summary statistics for provincial-level policy data. *Policy year* measures the policy adopting year in each province to attract skilled returnees. This allows us to examine whether the ratio of skilled returnees in firms increased after each province adopted attracting skilled returnees policy. It appears that the ratio of senior returnees in the firm significantly increases subsequent to the policy (see the last two columns in the table, before vs. after).

Panel A of Table 2 provides the summary statistics for the variables relating to overseas experience. In general, only 5.5% of individuals (16,268 senior returnees out of 293,917[6]) have an overseas background (e.g. either have overseas working experience or overseas education experience or both). The overseas background of returnees is classified into three categories: foreign education (1.8%), foreign work experience (3.2%), and foreign visiting scholars (1.0%). Note that a senior returnee may have more than one kind of foreign experience, thus the sum of the percentages of three categories is higher than the total percentage. The average overseas working experience of returnees is about 12 years. In terms of foreign education, 1,200 returnees completed a bachelor's degree overseas, 3,338 completed a master's degree, and 1,360 completed a doctoral degree. The United States is the most popular country for foreign experiences (around 31%), followed by the United Kingdom (27%), Japan (18%), Hong Kong (15%), Canada (13%), and Australia (11%). The mean age of all directors and senior managers is approximately 47, which is close to the median age of 46. In addition, the mean age 48 and median age 47 of returnees with foreign experience is slightly higher than the full sample. 81.4% of returnees who accumulated

[6] 293,917 is the total number of individual-firm-year observations. 16,268 individual-firm-year observations contain overseas experience.

foreign experience in a country with a higher level of corporate governance[7], 35.6% of returnees who accumulated foreign experience in a country with a higher level of management practice[8], and 41.6% of returnees who accumulated foreign experience in a country with a higher level of intellectual property rights protection[9].

Panel B of Table 2 provides the summary statistics for firm-level data. Since a patent granted is normally lagged , we use a three-year window and the total number of patents in a three-year period to measure firms' innovation performance. On average, a sample firm has 8.07 granted patents each year and has 23.04 granted patents in a three years period. In addition, the standard deviations of granted patent in each year and in a three years period are 49.52 and 130.13 respectively, which shows the innovation output is highly varied from firm to firm. Although the mean ratio of the foreign returnee in the sample is only 5%, 46% of the firm-year observations have at least one senior executive or director with overseas experience. We also present summary statistics of control variables that used in our regression models in this table. An average firm has a natural logarithm of firm size 21.56, ROA of 136%, leverage of 63%, firm age of 2.12, Tobin's Q of 5.32, capital expense of 6%, net profit of 137%, share return of 33% and 28% of total assets as the tangible assets.

Panel C of Table 2 presents the summary statistics for the industry-level data. All industries have at least one firm with a senior executive or director with foreign experience except for industry Q, Health, Social Security, and Welfare. The finance industry has the highest foreign returnee ratio (12.1%), followed by commercial service (9.1%), resident service (7.8%),

[7] We classify countries with advanced corporate governance if the country has the highest anti-director right index which constructed by Bloom et al. (2012).

[8] We classify countries with advanced management practice based on the country's monitoring production index is highest three in monitoring management index constructed by Bloom et al. (2012).

[9] We classify countries with higher level of intellectual property rights protection according to the country's intellectual property rights protection index is in the tier one category from TaylorWessing (2009)

construction (6.5%), and software (6.0%). We excluded firms in the finance industry as in other innovation literature because they generate a low number of patents.

4. Empirical Tests and Results

In this section, we first discuss the methodology in this research and define all variables contained in our models. Then, we present the result of our baseline model. Lastly, we show the instrumental analysis applied in our research and also give out the reason for us to choose our instrumental variable.

4.1 Baseline Model

To test the relationship between the overseas background of directors and senior executives in a firm and the innovation performance of the firm, we construct the baseline ordinary least squares (OLS) regression as follows:

$$Ln(patent_{i,t+n}) = \alpha + \beta \times indicator_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t}, \qquad (1)$$

Where *Ln*(*patent*) is the dependent variable as measured by the natural logarithm of the number of patent applications in a given year. The independent variable is *indicator*, which is a dummy variable defined as 1 if there is at least one director or senior executive with foreign working or education experience in the firm, and as 0 otherwise. The *controls* is a vector of firm characteristics consisting standard control variables as suggested in the literature (Chemmanur, Loutskina, & Tian, 2014) that may influence a firm's innovation performance, such as industry, capital expenditures, firm size, ROA, asset tangibility, leverage, Herfindahl-Hirschman Index, Herfindahl-Hirschman Index squared, Tobin's Q, and share return. α is the estimated constant, β is estimated coefficient of variable *indicator*, γ is the estimated coefficient of *controls*. The *industry* captures industry fixed effects that may influence innovation output. Finally, *year* captures the year fixed effects.

Our second proxy for the foreign experience of senior level returnees captures the effect that the proportion of senior level returnees may impact on the firm's innovation output differently. Therefore, the second model we constructed is

$$Ln(patent_{i,t+n}) = \alpha + \beta \times ratio_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t}. \quad (2)$$

Although equation (2) is similar to equation (1), it tests whether the higher ratio of directors and senior managers with foreign experience increases the innovation output of a firm. The variable *ratio* is the total number of directors and senior executives who have either foreign working or education experience, divided by the total number of directors and senior executives in a firm. All other variables (dependent variables, control variables and fixed effects) remain the same.

Table 3a provides the baseline regression results for equation (1). Columns (1) to (3) provide the results for the natural logarithm of total patents generated in year t, t+1, and t+2. Column (4) provides the results for the natural logarithm of the number of patents generated over a three-year period. The estimated coefficients of the variable *indicator* in columns (1)-(4) are all positive and significant. Specifically, the coefficients of *indicator* in column (1) is 0.159, suggesting that directors or senior executives with foreign experience increase a firm's patent by 1.442 units in the current year. The higher coefficients of *indicator* in columns (2)-(4) suggest an even stronger effect on firms' innovation output in the following years.

Table 3b provides the baseline regression results from equation (2). The key independent variable of interest is *ratio*. In columns (1)-(4), the estimated coefficients of *ratio* are all positively significant at the 1% level. Overall, the results of Table 3 support our hypothesis that foreign experience of the executives positively affects a firm's innovation performance and higher proportion of experienced foreign returnees in a firm, higher the firm's innovation output.

4.2 Baseline Model with Instrumental Variables

The main concern in examining the relationship between the foreign experience of senior executives and board members with firms' innovation performance is the potential endogeneity problem. This problem can be caused by three factors: insufficient control variables (omitted variables), sample selection bias, and the simultaneity between the independent variable and the dependent variable. In particular, it is challenging to examine whether firms with higher innovation output can attract more people with foreign experience or directors and senior executives with foreign experience will boost the innovation output of the firms. To address the potential endogeneity concerns, we conducted instrumental variables (IV) analyses by using the policy year dummy as our instrumental variable. The rationale is that, a series of policies have been adopted by provincial governments to attract skilled individuals who had studied or worked abroad since the late 1990s, (Zweig, 2006), which represents a so-called human capital supply shock in some degrees. After that, the ratio of board and managers with foreign backgrounds employed in Chinese firms increased over times. Hence, the policy year dummy generated exogenous variation in the ratio of managers and board members with overseas experience, but the same time, it is unrelated to a firm's innovation. Note that we applied IV analysis to a continuous variable, *ratio*, instead of a dummy variable, *indicator*, since a continuous variable shows a stronger correlation with the instrument, which improved the accuracy of the IV analysis. The instrument variable *policy dummy* is 0 for a firm's headquarters located in province that province, before the overseas talent attracting policy issuing year, and 1 for after the policy issuing year.

Table 2 shows that the average ratio of managers and board members with foreign experience in each province increased significantly after the policy was adopted. This suggests that after policy adoption, a large number of people with foreign experience were willing to work

in those provinces; therefore, a human capital supply shock indeed existed. Then, we applied the policy year dummy as the instrumental variable, which generated exogenous variation in the ratio of managers and board members with foreign experience, although this instrumental variable had no direct relation to firms' innovation performance. The two stages of IV regression are:

Stage 1 Regression:

$$ratio_{i,t} = \alpha + \beta\, policydummy_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t} \quad (3)$$

Stage 2 Regression:

$$Ln(patent_{i,t+n}) = \alpha + \beta\, fittedratio_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t}. \quad (4)$$

All notations are the same as for the previous model, except *policydummy* and *fittedratio.* The *fittedratio* is the predicted ratio by stage 1 regression. In the stage 1 regression (3), we regressed *ratio* as the dependent variable, along with independent variables *policydummy* (IV) and *controls.* In addition, the *fittedratio* is also as projected in (4). In next stage of IV analysis (4), we substituted the original *ratio* with *fittedratio* and re-ran the regression as for baseline model (4).

Since the sample selection bias can affect the model output, we constructed a two-stage sample selection test according to Heckman (1974). The first stage of the test is to build up an inverse Mills ratio (IMR) by constructing a logit generalized linear model (GLM). As the logit GLM is constructed with a binomial link function, we used the variable *indicator* instead of *ratio* for this test. Then, we ran the following linear regression model, which is similar to (1), with the addition of IMR as an extra independent variable:

$$Ln(patent_{i,t+n}) = \alpha + \beta \times indicator_{i,t} + IMR_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t}. \quad (5)$$

The results show that both *indicator* and *IMR* are significant, indicating that there is no sample selection bias in the empirical analysis. Furthermore, we compared instrumental analyses between sample firms that have at least one director or senior executive with foreign experience (e.g.,

indicator dummy is 1) and all sample firms, in order to make sure ratio of the foreign returnees does increase a firm's innovation even if the firm does employ a director or senior executives with foreign experience.

Table 4 provides the two-stage least squares (2SLS) regression results when the *policy year dummy* is used as the instrument variable. Column (1) provides the results of the first first-stage OLS (7). As illustrated previously, the variable *ratio* is regressed by the *policy year dummy* and other control variables in the first stage. The estimated coefficients of the *policy year dummy* (IV) are positive and significant, suggesting that the IV does increase the ratio of the foreign returnees in a firm. Therefore, this IV is applicable for the second stage regression. Columns (2)-(5) show the second stage (8) results of this IV analysis. Again, the dependent variable is the same as in the baseline model. However, the variable *ratio* in this regression is the fitted ratio used in the first-stage regression instead of the original ratio. Based on stage two results, the estimated coefficients of *ratio* in columns (2)-(5) are also positive and significant, which provides support for hypothesis H1.

Table 5 shows the results of the Heckman two stage model. The results in column (1) are from the first-stage probit GLM, where the estimated coefficient of policy year dummy (IV) is 0.338, which is significant at the 1% level. Columns (2)-(5) show the results of the second-stage OLS, where the estimated coefficients of *indicator* and *IMR* are significant at the 1% level. Overall, the results indicate that sample selection bias is not a concern in the analysis.

To address the sample selection bias, we further constructed a foreign subset if a firm hired at least one senior returnee (e.g., *indicator* is 1) and ran the regression by using foreign subset instead of the full sample. The results in Table 6 also show that the estimated coefficients of *ratio* are positive and significant in both the subset sample regression and the full sample regression.

Note that the estimated coefficient of *ratio* in firms with at least one director or senior executive with foreign experience (7.632) has a higher positive effect on a firm's innovation than the full sample (5.428). Thus, after controlling for the potential endogeneity concerns, the number of foreign returnees in a firm will still have a positive effect on a firm's innovation performance and endogeneity does not impact this relation.

5. Underlying Mechanisms

In this section, we examine the possible underlying mechanisms behind the generation of more patents when directors and senior executives have foreign experience. Since innovation takes place over time, we focus on one innovation measuring proxy. This proxy is the natural logarithm of the total number of patent applications over a three-year period in three years, so as to capture the lagging effect of innovation after directors and senior executives with foreign experience joined the firms. In addition, we want to determine how various aspects of returnees' foreign experience affect firms' innovation output. We test three possible channels that may drive our results, which are age, level of degree and foreign work length channel, country channel and education area channel. In first channel, we choose returnees' age, level of degree and foreign working length as three main proxies to measure the knowledge amount of directors and senior executives. In country channel, we compare whether skilled returnees accumulated their foreign experience from countries with higher standard of corporate governance, management practice and intellectual property rights protection can perform better than other returnees. Finally, in education area channel, we compare the different impact of returnees who have commerce related degree or non-commerce related degree. To test these channels, we focus on the firms with at least one director or manager with foreign experience.

5.1 Age, Level of Degree and Work Length Channel

In the first channel, the senior level returnees with more advanced professional skills or abundant knowledge in particular fields (patents or publications) would enhance the innovation efficiency and capacity of the firm (Jones & Romer, 2010). These individuals would fill positions and likely transfer their technological and managerial knowledge. In contrast, skilled employees returned from developing country may be incapable of doing so (Harzing, 2001).

To examine whether the age of senior level returnees is a determinant of firm's innovation output, which corresponds to H7, we split the sample of firms into two subsets according to the average age of senior returnees': one sample where their average age is greater or equal to 50 and another where their average age is less than 50. We set the age boundary as 50 because Confucius stated that "At fifteen I set my heart upon learning. At thirty, I had planted my feet firm upon the ground. At forty, I no longer suffered from perplexities. At fifty, I knew what were the biddings of Heaven. At sixty, I heard them with docile ear. At seventy, I could follow the dictates of my own heart; for what I desired no longer overstepped the boundaries of right." (Translation from goodreads.com.)

"子曰：吾十有五，而志于学。三十而立。四十而不惑。五十而知天命。六十而耳顺。七十而从心所欲，不逾矩。"

It is possible that senior returnees in their fifties could be less driven to achieve success in short-term goals. Many may have shifted their focus to long-term value creation for the firm by promoting more innovative projects. Moreover, senior returnees likely have much more experience than young returnees. Hence, senior returnees in the top management will have a positive influence on firms' innovation performance. Another reason for choosing age 50 as the cut-off is that the median age of senior returnees is 47, which is close to 50; thus, the two subsets contain a similar

number of observations.

Column (1) in Table 7a presents the subsample results for the group where the average age of returnees is less than50, while column (2) presents the subsample results for the group where the average age of returnees is greater or equal to 50. Although, the estimated coefficient of the variable *ratio* is 0.929, which is significant at 1% level in column (1), it is still much less than the estimated coefficient of *ratio* in column (2), which is 1.747 and also is significant at the 1% level. Therefore, the results suggest that the higher age of senior returnees can benefit firms' innovation performance. These results provide evidence to support hypothesis H2.

Based on the Hambrick and Mason's (1984) argument, the higher the average level of education in the top management team, the larger the amount of innovation generated. We next examine the effect of level of education degree by dividing the full sample into two sub samples. The test sample is constructed using returnees who have a master's or doctoral degree, which account for more than 50% of all returnees in a firm. The rest of the firms are used as the control sample. There are two reasons to choose a master's degree as a cut-off. First, there are more returnees with master's degree than with any other degree, followed by a bachelor's degree and a doctoral degree. If we separate the sample by doctoral degree, it will lead to overly unbalanced two sub-samples. In addition, a master's program in most countries offers course-work classes as well as research classes, whereas bachelor's programs tend to offer only course-work classes. The completion of degrees with these two types of classes demonstrates the difference in their modes of study. Course-work classes tend to offer knowledge, while research courses expect students to rely on their own research to learn about a particular field. An individual with a research background will be more aware of the importance of innovation and thus willing to undertake innovative projects. Therefore, we choose to use master's degree as the cut-off

Column (3) of Table 7a presents the results of the subset of returnees who have a bachelor's degree, while column (4) presents the results of the subset of returnees who have a master's or a doctoral degree. The estimated coefficient of the variable *ratio* in column (3) is -1.096, which is significant at the 10% level. The estimated coefficient of *ratio* in column (4) is 0.804.

Overall, the results suggest that returnees with a master's or doctoral degree are more likely to improve their firms' innovation performance. The results provide evidence to support hypothesis H3.

Finally, we analysis the length of returnees' foreign work. China currently faces a severe shortage of people who are able to work efficiently in an international environment (Farrell & Grant, 2005). Although many of the directors and senior executives in China have foreign experience, this does not mean that all of them can work independently in an international environment. Therefore, the length of their foreign work experience could be the best tool to measure their capability in such a setting. Thus, the longer their work experience abroad, the broader horizon they may have, and the more likely they are to be more efficient when working in an international environment. Therefore, the foreign work length of returnees may affect firms' innovation performance. However, one concern could be the age difference among returnees. The timeframe of an individual's foreign experience during their life could make a difference in forming their behaviors. For example, comparing a director who is 30 years old and has worked overseas for 10 years with another director who is 50 years old who also has 10 years of overseas work experience, the 10 years of experience will have different degrees of influence on their behaviors. To eliminate this potential bias, we first adjusted the variable *length* by dividing it by returnee age to calculate the duration of overseas work experience in their life, rather than using their actual overseas work length. Then, we took natural logarithms of the average amount of

adjusted foreign work length of all returnees in a firm and use the calculated values in the regression to examine the work length effect.

Columns (5) and (6) in Table 7 present the regression results. In column (5), when we included both *ratio* and *log* (*mean work length*) in the regression, the estimated coefficients are 1.039 and 0.509 respectively, significant at the 1% level. In column (6), when we include only *log* (*mean work length*) in the regression, the estimated coefficient is 0.666, which is significant at the 1%. This suggests that the foreign work length of returnees affects firms' innovation performance. The results provide evidence to support hypothesis H4.

5.2 Country Channel

In the country channel, senior-level returnees who accept employment in China are able to keep their overseas acquired working style. Senior returnees with overseas experience in countries with higher standards of corporate governance are able to perform a better monitoring function and improve corporate governance. This can be attributed to their expertise accumulated abroad, although relatively weaker local ties could also mean that they may have more motivation to create profits for a firm, instead of sightlessly satisfying local politicians with an expectation of potential benefits (Giannetti, Liao, & Yu, 2015). Overseas experience may partially resolve the moral hazard problem, which may reduce the agency cost while increasing innovation incentives. Moreover, senior returnees with foreign experience would demonstrate superior management practices and also likely work for firms exhibiting a higher code of ethics. In some firms, this could reduce moral hazard and managerial myopia. The change in management strategy to focus on long-term innovative projects and increase innovation efficiency will leads to the innovation success (Chemmanur et al., 2015). Finally, senior returnees with experience in countries with more

stringent intellectual property right protection are more likely to have a better awareness of the importance of innovation. Therefore, they may undertake more innovative projects instead of plagiarizing intellectual property from others.

Therefore, the country or countries where returnees gained their experience is able to affect their foreign experience and eventually impact on innovation performance of the firms hired them. We used three methods to examine whether there is a country-specific effect that impacts their current firm's innovation. The first method was inspired by La Porta et al. (1998), who created a corporate governance ranking index for many countries based on the level of anti-director rights. Thus, based on our hypothesis H5, we can deduce that returnees who gained their foreign experience from countries with higher standards of investor protection might work to advance their current firms' level of corporate governance, which would likely reduce agency costs. Once the level of corporate governance increases, the tolerance of failure will also increase. In addition, managers may also have stronger incentives to maximize firm value, rather than seek potential personal benefits. Thus, decision makers in firms may be more willing to undertake long-term innovative projects to increase firm value long-term, rather than focusing on making short-term returns to satisfy stakeholders. Returnees trained or educated in countries with higher investor protection may also demonstrate higher ethical standards, which will reduce the firm's moral hazard problem. Consequently, the firm's innovation output should also increase. To test the levels of corporate governance in different countries, we split the full sample into a treatment group, which are the firms where greater than 50% of returnees gained their experience in higher corporate governance ranking countries, and a control group of others.

In Table 7b, the estimated coefficient of *ratio* in column (1) is -1.437, which is significant, and suggests that returnees whose foreign experience was in low corporate governance countries

has a negative impact on their current firm's innovation performance. In contrast, the result in column (2) illustrates the estimated coefficient of *ratio* is 1.987, suggests that returnees who accumulated their foreign experience in countries with higher corporate governance have a substantial positive effect on their current firm's innovation. These results provide evidence that supports hypothesis H5.

The key responsibility of managers is that they need to have the ability to run the daily operations of firms. We next examine whether foreign experience that was accumulated from countries with a higher management practice level can be differentiated using the monitoring management score of Bloom et al. (2012). The skilled returnees from countries with a higher standard of management practice are able to show their managerial skills in more effective resources allocation as well as far-sight of their decisions. Here too we split the full sample into a high management practice group, which are the firms where greater than 50% of returnees gained their experience in higher management practice ranking countries, and a control group of others.

In columns (3) and (4) in Table 7b, the estimated coefficients of *ratio* are 0.691 and 2.249, respectively, which are both significant at the 1% level. However, the value of the coefficient in column (4) is more than three times higher than the value in column (3), which implies that the foreign experience *ratio* in the high management practice group has higher effect to innovation than in the control group. In other words, returnees who have experience working in countries with higher management practice standards can eventually contribute to their firm's innovation performance. These results provide evidence that supports hypothesis H6.

According to Fang, Lerner, and Wu (2017), intellectual property rights protection can eventually increase the incentives of firms to undertake investment in innovation. We extended this idea by applying this notion to the foreign experience of senior returnees. Directors and

managers who gained their experience in countries with higher intellectual property rights protection may have a better understanding of the importance of innovation to a firm. Thus, after senior returnees join a firm, they are likely to encourage other members of the board to realize the importance of innovation and thus shift their focus to invest in innovative projects. To examine the plausibility of this argument, we split the full sample into two groups: the treatment group contains firms where greater than 50% of returnees gained their experience in countries with the top-tier intellectual property rights protection, which is based on the global intellectual property index (TaylorWessing, 2009), and a control group of others.

In column (6) of Table 7b, the estimated coefficient of *ratio* is 2.198, significant at the 1% level, which is higher than the 0.634 estimated coefficient in column (5), which is significant at the 5% level. The results provide supportive evidence that returnees who have experience in countries with higher intellectual property rights protection perform better in raising firms' innovation output than those without such experience. These results provide evidence that supports hypothesis H7.

5.3 Education Area Channel

We next examine whether returnees' foreign experience can be perceived as ambiguous, as many have argued that directors and managers who completed non-commerce related degrees can in fact benefit firms' innovation even more than those who completed commerce-related degrees while others consider have the opposing view (Leiponen & Helfat, 2010).

Returnees who completed degrees overseas in non-humanities or non-social science related disciplines gained knowledge and professional skills in those particular fields. Once they are employed by firms, they use their knowledge to support firm efforts in the research and

development of patents. In addition, patents are more likely to be generated in science or engineering related industries (see Panel C in Table 2).

On the other hand, as our research tends to focus on returnees who are in the top management level, professional knowledge in a particular field is considered less useful than managerial skills. Hence, returnees who completed degrees in commerce related disciplines will likely assist firms with increasing the efficiency of their resource allocations, making decisions in dynamic market environments, and altering managerial strategies when facing policy uncertainty. To examine whether these professional skills will have an effect on firms' innovation, we again constructed two groups: a treatment group with firms employing greater than 50% of returnees who completed at least one non-commerce related degree in foreign countries, and a control group of others.

In column (7) of Table 7b, the estimated coefficient of *ratio* for the non-commerce group is insignificant, which suggests that increasing the number of senior level returnees on the board who completed non-commerce related degrees overseas has no direct impact on the number of patents generated. In addition, the 1.000 estimated coefficient of *ratio* in column (8) is significant at the 1%. This result demonstrates evidence that supports hypothesis H9 in which we posited that senior level returnees who completed a commerce related degree overseas would have a positive effect on firms' innovation performance.

6. Robustness Checks

In order to check the robustness of our baseline model, we further construct several models to make sure our baseline result is solid. The test results of robustness check listed in table 8, we only used three-years total number of patents as the dependent variable.

By considering the directors and senior executives separately, we are able to investigate whether the foreign experience of directors can increase the firm's innovation performance. We built up the model as below:

$$Ln(patent_{i,t+3}) = \alpha + \beta \times boardratio_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t} \quad (6)$$

In this model, other settings are the same as our baseline model, but we only consider the foreign experience of directors. The independent variable *boardratio* is calculated by the number of board of directors who have foreign experience divided by the total number of board members. The column (1) in table 8 shows that the estimated coefficient of *boardratio* equals to 1.091 which is significant at 1% level.

In addition, the foreign experience of directors and managers can also increase the firm's innovation performance, we built up another model as follow.

$$Ln(patent_{i,t+3}) = \alpha + \beta \times exeratio_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t} \quad (7)$$

Similar to the previous model (3), now we consider the foreign experience of executives in this model. The *exeratio* is the number of senior executives with foreign experience divided by the total number of senior executives. The column (2) in table 8 shows that the estimated coefficient of *exeratio* equals to 0.789 which is significant at 1% level.

The major responsibility of CEO is in charge of the daily operations of the firm and making key strategic corporate decisions including innovation decisions. Therefore, when the CEO realizes that innovation plays an important role in creating long-term firm value, he may want to invest more in innovative projects, which may increase the firm's innovation output. As discussed above, the foreign experience of returnees can increase the awareness of the importance of innovation. It is also reasonable to expect that the foreign experience of the CEO is able to contribute to raising the innovation output of the firm.

$$Ln(patent_{i,t+3}) = \alpha + \beta \times forceo_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t} \quad (8)$$

In equation (5), we consider whether CEO has foreign experience is able to boost a firm's innovation output. The *forceo* is dummy variables defined as 1 if the CEO has foreign experience, and as 0 otherwise. The column (3) in table 8 shows that the estimated coefficient of *forceo* equals to 0.115 which is significant at 1% level.

Similarly, the chairman of the board is also powerful that may influence CEO potentially. Therefore, the last robustness check is regarding to whether the foreign experience of the chairman of the board may contribute to raising the innovation output of the firm as well.

$$Ln(patent_{i,t+3}) = \alpha + \beta \times forchair_{i,t} + \gamma controls_{i,t} + industry + year + e_{i,t} \quad (9)$$

In equation (6), we consider whether the chairman of board has foreign experience is able to boost a firm's innovation output. The *forchair* is dummy variables defined as 1 if the chairman of board has foreign experience, and as 0 otherwise. The column (3) in table 8 shows that the estimated coefficient of *forchair* equals to 0.226 which is significant at 1% level.

7. Conclusions

Innovation plays a major role in determining a firm's long-term competitive advantage, and contributes to long-term firm value. Raising human capital will boost a firm's innovation output, and senior managers and board of directors are the main contributors to a firm's human capital. In this paper, we document a specific way to test how the foreign experience of managers and directors can affect a firm's innovation performance. Senior level returnees with advanced knowledge and experience gained overseas will contribute their expertise to their current firm, thereby improving the human capital in the firm. Thus, their foreign experience will eventually increase firm-level innovation output, especially for firms in emerging countries like China. We

show that senior returnees with foreign experience do exert a positive effect on a firm's innovation performance.

We tackle the endogeneity issue by applying a policy year dummy as an instrumental variable. The instrumental variable analysis generates extra variation and has no direct correlation to a firm's innovation. This positive effect may be explained by directors and senior managers with foreign experience who transfer their accumulated experience to their current firms in China. This knowledge transfer will help firms in China to break the current research barrier, improve their daily management routines, and increase the firm-level corporate governance.

We show that senior returnees who are older, holding higher educational degrees, and having longer foreign working experience show superior knowledge that can contribute to increase a firm's innovation output. We also show that senior returnees who gained their foreign experience in countries with a higher level of management practice, corporate governance or intellectual property rights protection will improve the firm's innovation output more. In addition, we test the effect between those senior returnees who are awarded a commerce related degree and those who are awarded a non-commerce related degree. The results show that senior returnees with business or economics degree are able to contribute more toward a firm's innovation output.

In general, China adopted a series of policies to attract profoundly skilled returnees who can increase the human capital supply in the market. The higher quality of human capital is able to boost firm value by generating more patents, which helps to increase the firm's long-term competitive advantages.

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Appendix: Definitions of Variables and Source

Variable	Definition
Dep. Var.	
No. Patent in t	Granted patents measured by applied year, t. Source: CPDP database
No. Patent in t+1	Granted patents measured by applied year, t+1. Source: CPDP database
No. Patent in t+2	Granted patents measured by applied year, t+2. Source: CPDP database
No. Patent 3 years total	Total 3 years granted patents started from year, t to t+2. Source: CPDP database
LN(No. Patent in t)	Natural logarithm of granted patents measured by applied year, t. Source: CPDP database
LN(No. Patent in t+1)	Natural logarithm of granted patents measured by applied year, t+1. Source: CPDP database
LN(No. Patent in t+2)	Natural logarithm of granted patents measured by applied year, t+2. Source: CPDP database
LN(No. Patent 3 years total)	Natural logarithm of total 3 years granted patents started from year, t to t+2. Source: CPDP database
Ind. Var	
Indicator	A foreign dummy variable, 0 for a firm did not hire any directors or senior executives with foreign experience, 1 for otherwise. Source: Manual collection and CSMAR database.
Ratio	Number of directors and senior executives with foreign experience divided by total number of directors and senior executives. Source: Manual collection and CSMAR database.
boardratio	Number of directors with foreign experience divided by board size. Source: Manual collection and CSMAR database.
exeratio	Number of senior executives with foreign experience divided by total number of senior executives. Source: Manual collection and CSMAR database.
forchair	A dummy variable that 1 for chairman has foreign experience, 0 otherwise. Source: Manual collection and CSMAR database.
forceo	A dummy variable that 1 for chairman has foreign experience, 0 otherwise. Source: Manual collection and CSMAR database.
LN(Mean Age)	Natural logarithm of one plus mean age of all returnees measured by applied year, t. Source: Manual collection and CSMAR database
Age Dummy	A dummy variable that 1 for LN(Mean Age) is over 50, 0 otherwise.

Master 50%	A dummy variable that equals 1 if more than 50% of returnees rewarded a master or higher abroad , 0 otherwise.
LN(Mean length)	Natural logarithm of one plus mean working length abroad of all returnees measured by applied year, t. Source: Manual collection and CSMAR database
LN(Mean length adjusted by age)	Natural logarithm of one plus mean working length abroad that adjusted by age of all returnees measured by applied year, t. Source: Manual collection and CSMAR database
CG	A dummy variable that equals 1 if over 50% of returnees gained foreign experience in at least one country with the highest anti-director rights index, and zero otherwise. Source: Manually collected and La Porta et al. (1998).
MP	A dummy variable that equals 1 if over 50% of returnees gained foreign experience in at least one country from highest three monitoring management index, and zero otherwise. Source: Manually collected and Bloom et al. (2012).
IP	A dummy variable that equals 1 if over 50% of returnees gained foreign experience in at least one country from tier one intellectual property rights protection index, and zero otherwise. Source: Manually collected and TaylorWessing (2009).
Non-Bus/Econ	A dummy variable that equals 1 if over 50% of returnees gained rewarded at least one non-business or non-economics related degree overseas. Source: Manually collected and CSMAR database.
Controls	
LN(Firm Size)	Natural logarithm of firm's book value. Source: CSMAR database.
HHI	Herfindahl index, classified by 3-digit industry code in China. Source: CSMAR database.
HHI2	Squared Herfindahl index. Source: CSMAR database
ROA	Operating income divided by total assets. Source: CSMAR database.
Leverage	Total liabilities divided by total assets. Source: CSMAR database.
Firm age	Total Year Established. Source: CSMAR database.
IPO Age	Total Year after IPO. Source: CSMAR database.
LN(firmage)	Natural logarithm of total Year Established. Source: CSMAR database.
LN(IPOage)	Natural logarithm of total Year after IPO. Source: CSMAR database.
Q	Market to book value of a firm. Source: CSMAR database.

Capital Expense	Total capital expenditure divided by firm's book value. Source: CSMAR database.
Net Profit	Net profit divided by firm's book value. Source: CSMAR database.
Share Return	Annually share return without dividend and reinvestment. Source: CSMAR database.
Tangibility	Tangible asset divided by firm's book value. Source: CSMAR database.

Tables

Table 1: The Impact of Attracting Skilled Returnees Policies

This table shows the policy adoption year in each province, the total number of sample firms, and the ratio of senior level returnees with overseas experience in each province before and after adopted a policy to attract highly skilled returnees. The sample period is 1990 to 2010. "Policy Year" is the year that the policy was adopted. "After" corresponds to observations after the policy year. "Before" corresponds to firm level observations before and during the policy year. For "ratio," the percentage of investigation is firm-year-observation.

Province	Policy Year	No. of Unique Firms	Firm Year				ratio(%)	
			%	Total	Before	After	Before	After
Guangdong	1999	157	11.18%	2066	533	1533	0.98%	9.91%
Jiangsu	2004	82	5.84%	907	427	480	2.86%	5.37%
Liaoning	1999	56	3.99%	659	123	536	0.66%	3.67%
Beijing	2000	113	8.05%	1077	171	906	2.63%	8.98%
Anhui	1994	45	3.21%	455	2	453	0.00%	4.26%
Sichuan	2005	63	4.49%	756	466	290	1.96%	3.81%
Hunan	2001	44	3.13%	480	118	362	0.14%	5.31%
Hebei	2001	32	2.28%	349	81	268	0.64%	3.20%
Xinjiang	2003	28	1.99%	308	112	196	1.63%	2.77%
Shandong	2005	72	5.13%	809	463	346	2.63%	5.69%
Henan	1992	33	2.35%	364	0	364	NA	2.76%
Shanxi	2007	31	2.21%	334	241	93	1.99%	3.31%
Jiangxi	2003	22	1.57%	242	89	153	2.30%	5.59%
Zhejiang	2001	79	5.63%	880	226	654	1.65%	5.83%
Jilin	2001	31	2.21%	384	126	258	0.39%	3.35%
Hubei	2002	61	4.34%	725	258	467	0.61%	4.32%
Inner Mongolia	2001	19	1.35%	205	47	158	0.76%	1.98%
Hainan	2001	23	1.64%	288	99	189	2.06%	7.14%
Chongqing	2005	28	1.99%	353	215	138	1.98%	5.46%
Shaanxi	1995	30	2.14%	342	11	331	0.00%	3.01%
Fujian	2000	45	3.21%	535	141	394	1.21%	5.86%

Guangxi	2005	23	1.64%	254	140	114	1.98%	4.94%
Tianjin	2001	27	1.92%	312	82	230	0.95%	6.26%
Yunnan	2001	20	1.42%	225	62	163	0.80%	3.95%
Guizhou	2003	14	1.00%	151	55	96	1.64%	3.97%
Gansu	2003	19	1.35%	218	89	129	0.37%	1.78%
Ningxia	2003	11	0.78%	131	54	77	1.53%	2.34%
Qinghai	1999	10	0.71%	120	21	99	0.53%	2.83%
Heilongjiang	2002	33	2.35%	382	145	237	0.32%	4.24%
Shanghai	2005	145	10.33%	2051	1375	676	2.70%	8.50%
Tibet	NA	8	0.57%	99	NA	NA	NA	NA

Table 2: Summary Statistics

Panel A summarizes features of the foreign returnees in our samples from 1990 to 2010, which in firm-year-individual level. "Age of Returnees" is the current age of returnees, which can be varied in different year of observation. "Female" is a dummy equal to one if an individual is female. "Foreign working length" is a total working length in overseas. "LN(Mean Age)" is natural logarithm of average age of returnees in a firm. "Age Dummy" is a dummy equal to one if average age of returnees in a firm is more than 50. "Master 50%" a dummy equal to one if more than 50% of returnees hold a master or doctoral degree overseas. "LN(Mean Length Adjusted by Age)" is natural logarithm of average number of foreign working length adjusted by returnees' age in a firm. " CG" is a dummy equal one if more than 50% of returnees have foreign experience in higher corporate governance countries. " MP" is a dummy equal one if more than 50% of returnees have foreign experience in higher management practice countries. " IP" is a dummy equal one if more than 50% of returnees have foreign experience in higher intellectual property rights protection countries. " Non-Bus/ECON" is a dummy equal one if more than 50% of returnees graduated from a business or economics related degree in the foreign university. Panel B presents summary statistics of sample firms in firm-year observations during the period from 1990 and 2010. All variable definitions are in the Appendix. Panel C illustrates the distribution of industry-level observation of the sample firms. Summary statistics are presented based on firm-year formatting. The 18 industries are classified according to the official industry classification of the China Securities Regulatory Commission.

Panel A: Individual's Characteristics				
	Mean	**Median**	**Std. Dev.**	**N**
Age of Returnees	47.960	47	8.984	14133
Foreign working length	11.978	8	11.128	2957
LN(Mean Age)	0.772	0.845	0.338	14133
Age Dummy	0.680	1	0.466	14133
Master 50%	0.668	1	0.470	2534
LN(Mean Length Adjusted by age)	0.027	0	0.072	6429
CG	0.814	1	0.388	6445
MP	0.356	0	0.478	6445
IP	0.416	0	0.392	6445
Non-Bus/Econ	0.042	0	0.264	6445

Panel B: Firms level Characteristics						
	P25	**MEDIAN**	**MEAN**	**P75**	**S.D.**	**N**
Dep. Var.						
No. Patent in t	0.00	0.00	8.07	3.00	49.52	14328
No. Patent in t+1	0.00	0.00	8.34	3.00	49.53	14328
No. Patent in t+2	0.00	0.00	8.73	3.00	50.71	13796
No. Patent 3 years total	0.00	1.00	23.04	10.00	130.13	14328
LN(No. Patent in t)	0.00	0.00	0.73	1.10	1.28	14328
LN(No. Patent in t+1)	0.69	1.79	1.93	2.89	1.49	7188

LN(No. Patent in t+2)	0.69	1.79	1.96	2.89	1.48	6796
LN(No. Patent 3 years total)	1.10	2.20	2.34	3.43	1.64	8876
Ind. Var						
Indicator	0.00	0.00	0.46	1.00	0.50	14328
Ratio	0.00	0.00	0.05	0.07	0.08	14328
Raito of Boards	0.00	0.00	0.07	0.11	0.11	14328
Ratio of Managers	0.00	0.00	0.04	0.00	0.10	14328
Chairman with Foreign Experience	0.00	0.00	0.05	0.00	0.23	14328
CEO with Foreign Experience	0.00	0.00	0.05	0.00	0.22	14328
Controls						
LN(Firm Size)	20.86	21.44	21.56	22.09	1.07	14328
HHI	0.04	0.05	0.11	0.11	0.15	14328
Squared HHI	0.00	0.00	0.03	0.01	0.12	14328
ROA	0.01	0.03	1.36	0.06	184.12	14328
Leverage	0.33	0.47	0.63	0.61	7.26	14328
Firm Age	1.79	2.20	2.12	2.56	0.63	14328
IPO Age	1.10	1.79	1.70	2.30	0.77	14328
Q	0.89	1.51	5.32	2.51	401.16	14328
Capital Expense	0.01	0.04	0.06	0.08	0.07	14328
Net Profit	0.01	0.03	1.37	0.06	185.37	14328
Share Return	-0.24	0.00	0.33	0.63	0.97	14328
Tangibility	0.14	0.25	0.28	0.39	0.19	14328

Panel C: Industry's Summary

Industry Name	Unique Firm	Firm Year Observations	%	No. Patent in t	No. Patent in t+1	No. Patent in t+2	No. Patent for 3 years total	Indicator	Ratio	Chairman has foreign experience	CEO has foreign experience	Raito of boards	Ratio of Managers
Finance and Insurance	29	255	2.07%	286	267	226	779	57.3%	12.1%	16.1%	11.0%	16%	10%
Renting and lending, commercial service	16	170	1.14%	174	153	141	468	46.5%	9.1%	12.9%	3.5%	10%	8%
Science research, technique service and geologic perambulation	2	2	0.14%	53	0	0	53	50.0%	5.9%	0.0%	0.0%	0%	13%
Resident service and other service	5	62	0.36%	17	17	17	51	45.2%	7.8%	3.2%	16.1%	9%	7%
Construction	34	307	2.42%	4669	2714	2273	9656	46.6%	6.5%	4.2%	12.4%	7%	9%
Information transmission, computer services and software	67	674	4.77%	918	874	814	2606	52.1%	6.0%	9.3%	3.6%	9%	4%

Whole sell and retail sell	8	101	0.57 %	12	10	10	32	52.5%	5.4%	5.0%	5.0%	6%	5%
Accommodation and Restaurants	49	593	3.49 %	2867	2848	2822	8537	47.7%	5.4%	6.4%	6.7%	8%	3%
Real estate	92	957	6.55 %	634	580	543	1757	38.0%	4.9%	4.9%	5.1%	7%	3%
Water conservancy, Environment resource, Management of public infrastructure	9	134	0.64 %	315	468	463	1246	51.5%	4.6%	0.0%	9.0%	7%	4%
Mining	40	269	2.85 %	8550	7283	5812	21645	39.4%	4.4%	3.7%	4.5%	7%	4%
Manufacture	787	9422	56.05 %	107991	104610	101104	313705	39.3%	4.1%	4.4%	4.2%	6%	3%
Culture, Sports and Recreation	7	63	0.50 %	30	26	23	79	31.7%	3.9%	12.7%	0.0%	5%	1%
Commonality manage and social organizations	71	1055	5.06 %	2456	2503	2446	7405	38.8%	3.7%	4.2%	5.5%	5%	4%
Transport, Storage and Post	92	1340	6.55 %	1716	1686	1671	5073	34.0%	3.5%	4.4%	2.7%	5%	3%

Reduction and distribution of electricity, gas and water	62	689	4.42 %	1586	1571	1557	4714	37.2%	3.2%	2.9%	2.9%	5%	2%
Agriculture, Forestry, Animal husbandry and Fishing	33	365	2.35 %	493	517	517	1527	34.2%	3.1%	0.8%	5.8%	4%	3%
Health, Social security and Welfare	1	3	0.07 %	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0%	0%
total	1403	16461	1	132767	126127	120439	379333						

Table 3a: Main Result (*indicator*)

This table reports main interest variable, *indicator*, and firm characteristics to dependent variables, LN(No. Patent in t), LN(No. Patent in t+1), LN(No. Patent in t+2) and LN(total No. Patent for 3 years). The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:			
	log NO. Patent in t	**log NO. Patent in t+1**	**log NO. Patent in t+2**	**log NO. Patent in for 3 years total**
Variable	**(1)**	**(2)**	**(3)**	**(4)**
indicator	0.159***	0.160***	0.163***	0.239***
	(0.02)	(0.022)	(0.024)	(0.025)
log firm size	0.529***	0.553***	0.579***	0.694***
	(0.013)	(0.014)	(0.016)	(0.016)
HHI	0.468**	0.186	0.217	0.385
	(0.230)	(0.246)	(0.263)	(0.284)
Squared HHI	-0.530*	-0.290	-0.307	-0.578
	(0.284)	(0.303)	(0.323)	(0.352)
ROA	0.150	0.506***	0.665***	0.741***
	(0.129)	(0.140)	(0.153)	(0.159)
Leverage	0.086**	0.152***	0.149***	0.152***
	(0.042)	(0.046)	(0.051)	(0.052)
Q	-0.096***	-0.089***	-0.089***	-0.134***
	(0.007)	(0.008)	(0.009)	(0.009)
Capital Expense	-0.594***	-0.28	0.010	-0.353*
	(0.168)	(0.179)	(0.191)	(0.208)
tangibility	-0.791***	-0.864***	-0.937***	-1.141***
	(0.058)	(0.063)	(0.069)	(0.072)

Share Market Return	-0.119***	-0.133***	-0.124***	-0.117***
	(0.019)	(0.022)	(0.023)	(0.024)
log IPO age	0.223***	0.211***	0.191***	0.218***
	(0.042)	(0.044)	(0.047)	(0.052)
foreign ownership	0.214	0.214	0.106	0.127
	(0.143)	(0.153)	(0.165)	(0.177)
Constant	-11.310***	-11.642***	-12.221***	-14.436***
	(0.293)	(0.319)	(0.354)	(0.363)
Industry fixed	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES
Firm fixed	No	No	No	No
N	13,165	11,902	10,643	13,165
Adj. R^2	0.293	0.288	0.283	0.336
F Statistic	140.892***	131.206***	117.803***	171.572***

Table 3b: Main Result (*ratio*)

This table reports main interest variable, ratio, and firm characteristics to dependent variables, LN(No. Patent in t), LN(No. Patent in t+1), LN(No. Patent in t+2) and LN(total No. Patent for 3 years). The detailed definition of other variables are illustrated in the Appendix. We report t-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:			
	log NO. Patent in t	**log NO. Patent in t+1**	**log NO. Patent in t+2**	**log NO. Patent in for 3 years total**
Variable	**(1)**	**(2)**	**(3)**	**(4)**
ratio	1.101***	1.155***	1.226***	1.552***
	(0.133)	(0.145)	(0.160)	(0.164)
log firm size	0.524***	0.547***	0.572***	0.689***
	(0.013)	(0.014)	(0.016)	(0.016)
HHI	0.419*	0.134	0.163	0.308
	(0.229)	(0.245)	(0.263)	(0.284)
Squared HHI	-0.526*	-0.282	-0.295	-0.562
	(0.284)	(0.303)	(0.322)	(0.352)
ROA	0.169	0.521***	0.679***	0.769***
	(0.129)	(0.140)	(0.153)	(0.159)
Leverage	0.088**	0.152***	0.146***	0.155***
	(0.042)	(0.046)	(0.051)	(0.052)
Q	-0.096***	-0.088***	-0.088***	-0.133***
	(0.007)	(0.008)	(0.009)	(0.009)
Capital Expense	-0.605***	-0.288	-0.005	-0.369*
	(0.168)	(0.179)	(0.191)	(0.208)
tangibility	-0.793***	-0.864***	-0.933***	-1.149***

	(0.058)	(0.063)	(0.069)	(0.072)
Share Market Return	-0.117***	-0.130***	-0.121***	-0.115***
	(0.019)	(0.022)	(0.023)	(0.024)
log IPO age	0.228***	0.217***	0.197***	0.225***
	(0.042)	(0.044)	(0.047)	(0.052)
foreign ownership	0.073	0.069	-0.043	-0.054
	(0.147)	(0.157)	(0.169)	(0.182)
Constant	-11.186***	-11.498***	-12.043***	-14.286***
	(0.295)	(0.321)	(0.357)	(0.365)
Industry fixed	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES
Firm fixed	No	No	No	No
N	13,165	11,902	10,643	13,165
Adj. R^2	0.293	0.289	0.284	0.336
F Statistic	141.142***	131.559***	118.207***	171.480***

Table 4: Instrument Variable Analysis Result

This table reports the instrument variable regression results of innovation output on foreign *ratio*. The instrumental variable used is *policy dummy*, which defined in appendix.. In first stage, we regressed the instrument variable *policy dummy to* dependent variables, and second stage we regressed the model by using estimated value of variable *ratio* in the first stage. We reports second-stage results using dependent variables, *LN(No. Patent in t), LN(No. Patent in t+1), LN(No. Patent in t+2)* and *LN(total No. Patent for 3 years).* The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:				
	stage1 ratio	**log NO. Patent in t**	**log NO. Patent in t+1**	**log NO. Patent in t+2**	**log NO. Patent in for 3 years total**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
policy year dummy	0.009***				
	(0.001)				
ratio		5.522***	4.683***	3.677***	5.428***
		(0.676)	(0.713)	(0.756)	(0.722)
log firm size	0.001	0.287***	0.297***	0.236***	0.189***
	(0.001)	(0.016)	(0.018)	(0.021)	(0.017)
HHI	-0.079***	0.563**	0.269	0.34	0.058
	(0.014)	(0.270)	(0.288)	(0.305)	(0.289)
Squared HHI	0.080***	-0.259	-0.064	-0.119	0.089
	(0.016)	(0.300)	(0.314)	(0.328)	(0.321)
ROA	0.007	-0.090	0.292***	0.321***	0.464***
	(0.005)	(0.101)	(0.109)	(0.116)	(0.108)
Leverage	-0.004	-0.008	0.095**	0.087*	0.126***
	(0.002)	(0.044)	(0.048)	(0.052)	(0.047)

Q	-0.002***	-0.073***	-0.049***	-0.055***	-0.078***
	(0.0004)	(0.007)	(0.008)	(0.009)	(0.008)
Capital Expense	0.024***	-0.039	0.187	0.387**	0.457***
	(0.008)	(0.141)	(0.147)	(0.154)	(0.151)
tangibility	-0.020***	0.045	0.075	0.078	0.319***
	(0.004)	(0.067)	(0.073)	(0.081)	(0.072)
Share Market Return	0.001	-0.057***	-0.072***	0.015	-0.014
	(0.001)	(0.010)	(0.011)	(0.013)	(0.010)
log IPO age	0.032***	0.758***	0.762***	0.625***	0.491***
	(0.002)	(0.045)	(0.049)	(0.057)	(0.048)
foreign ownership	0.059	0.073	0.069	-0.043	-0.054
	(0.125)	(0.147)	(0.157)	(0.169)	(0.182)
Constant	-11.185***	-11.186***	-11.498***	-12.043***	-14.286***
	(0.025)	(0.467)	(0.516)	(0.587)	(0.500)
Industry fixed	YES	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES	YES
Firm fixed	No	No	No	No	No
N	13,344	13,344	12,052	10,767	13,344
Adj. R^2	0.708	0.644	0.662	0.681	0.751
F Statistic	24.031***	18.163***	17.863***	17.497***	29.554***

Table 5: Heckman Test Output

This table reports the results of Heckman Regression in our IV analysis. In the first stage regression, we constructed a GLM model with the instrumental variable *policy dummy* to estimate inverse miller ratio (IMR), and we regressed both main interest variable *indicator* and IMR in the second stage. The dependent variables in second stage are *LN(No. Patent in t), LN(No. Patent in t+1), LN(No. Patent in t+2)* and *LN(total No. Patent for 3 years)*. The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:				
	stage1 indicator probit	**log NO. Patent in t**	**log NO. Patent in t+1**	**log NO. Patent in t+2**	**log NO. Patent in for 3 years total**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
policy year dummy	0.338***				
	(0.058)				
indicator		0.132***	0.134***	0.139***	0.197***
		(0.019)	(0.021)	(0.022)	(0.023)
IMR		-0.082***	-0.080***	-0.087***	-0.077***
		(0.022)	(0.024)	(0.027)	(0.027)
log firm size	0.002	0.509***	0.532***	0.554***	0.671***
	(0.040)	(0.012)	(0.014)	(0.015)	(0.015)
HHI	-4.905***	0.548	-0.168	-0.111	0.171
	(0.670)	(0.368)	(0.398)	(0.430)	(0.450)
Squared HHI	4.644***	-0.286	0.291	0.211	-0.058
	(0.710)	(0.396)	(0.421)	(0.451)	(0.484)
ROA	0.300	0.093	0.431***	0.592***	0.655***
	(0.242)	(0.123)	(0.133)	(0.146)	(0.150)
Leverage	0.011	0.079*	0.140***	0.133***	0.147***

	(0.105)	(0.041)	(0.045)	(0.049)	(0.049)
Q	-0.074***	-0.103***	-0.098***	-0.099***	-0.144***
	(0.018)	(0.007)	(0.008)	(0.009)	(0.009)
Capital Expense	1.096***	0.027	0.342**	0.622***	0.547***
	(0.366)	(0.163)	(0.173)	(0.184)	(0.199)
tangibility	-0.404**	-0.267***	-0.291***	-0.335***	-0.387***
	(0.166)	(0.058)	(0.063)	(0.069)	(0.071)
Share Market Return	-0.044*	-0.099***	-0.103***	-0.098***	-0.096***
	(0.024)	(0.018)	(0.021)	(0.022)	(0.022)
log IPO age	1.814***	0.214***	0.190***	0.162***	0.198***
	(0.115)	(0.040)	(0.042)	(0.045)	(0.049)
foreign ownership	0.078	0.089	0.086	-0.059	-0.046
	(0.122)	(0.152)	(0.159)	(0.165)	(0.177)
Constant	-1.456	-11.012***	-11.287***	-11.781***	-14.101***
	(1.052)	(0.294)	(0.319)	(0.354)	(0.358)
Industry fixed	YES	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES	YES
Firm fixed	No	No	No	No	No
N	13,344	13,344	12,052	10,767	13,344
Adj. R^2		0.349	0.349	0.347	0.407
Log Likelihood	-3,845.06				
Akaike Inf. Crit.	10,504.110				
F Statistic		77.228***	72.901***	65.377***	98.393***

Table 6: Instrument Variable Analysis: Foreign Samples vs All Samples

This table reports the instrument variable regression results of innovation output on foreign *ratio*. We compared the IV regression output between subset sample, firms employed at least one senior returnees, and full samples. The instrumental variable used is *policy dummy*, which defined in appendix. In first stage, we regressed the instrument variable *policy dummy to* dependent variables, and second stage we regressed the model by using estimated value of variable *ratio* in the first stage. We reports first-stage results and second-stage results using dependent variables, *LN(total No. Patent for 3 years)*. The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:			
	Subset Foreign Stage1 Ratio	**log total NO.Patent for 3 years total**	**All Sample Stage1 Ratio**	**log total NO.Patent for 3 years total**
Variable	**(1)**	**(2)**	**(3)**	**(4)**
policy year dummy	0.017***		0.009***	
	(0.003)		(0.002)	
ratio		7.632***		5.428***
		(1.175)		(0.722)
log firm size	0.015***	0.129***	0.021***	0.189***
	(0.001)	(0.026)	(0.001)	(0.017)
HHI	0.0001	0.193	-0.028	0.058
	(0.037)	(0.414)	(0.025)	(0.289)
Squared HHI	0.018	-0.033	0.053**	0.089
	(0.042)	(0.484)	(0.026)	(0.321)
ROA	-0.012	0.437***	-0.001	0.464***
	(0.013)	(0.163)	(0.008)	(0.108)
Leverage	-0.007*	0.207***	0.002	0.126***
	(0.004)	(0.076)	(0.003)	(0.047)

Q	0.001	-0.067***	0.0002	-0.078***
	(0.001)	(0.012)	(0.0005)	(0.008)
Capital Expense	0.037**	0.540**	0.005	0.457***
	(0.017)	(0.234)	(0.011)	(0.151)
tangibility	-0.008	0.521***	-0.027***	0.319***
	(0.006)	(0.113)	(0.004)	(0.072)
Share Market Return	-0.005***	0.003	-0.006***	-0.014
	(0.002)	(0.014)	(0.001)	(0.010)
log IPO age	-0.006	0.454***	-0.008***	0.491***
	(0.004)	(0.073)	(0.003)	(0.048)
foreign ownership	-0.008	0.074	0.006	-0.056
	(0.021)	(0.225)	(0.016)	(0.279)
Constant	-0.234***	-5.476***	-0.434***	-5.861***
	(0.030)	(0.704)	(0.019)	(0.500)
Industry fixed	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES
Firm fixed	No	No	No	No
N	6,323	6,323	13,344	13,344
Adj. R^2	0.153	0.804	0.187	0.751
F Statistic	13.928***	25.287***	34.026***	29.554***

Table 7a: Mechanisms Output A

This table reports the results of testable mechanism analyses of the first channel, age, level of degree and work length channel. In columns (1) and (2), we presents different regression results of using a subset which mean age of returnees in the firm is less 50, and another subset which mean age of returnees in the firm is over or equal 50, respectively. In columns (3) and (4), we presents different regression results of using a subset which majority of returnees holds a bachelor degree in foreign university, and another subset which majority of returnees holds a master or doctoral degree in foreign university, respectively. In columns (5), we added a variable *lnmeanlength*, the natural logarithm of average overseas working length of returnees in a firm, to the baseline regression. Moreover, in columns (6), we only focused on variable *lnmeanlength.* The dependent variable of all models is *LN(total No. Patent for 3 years)*, and control variables are all the same as baseline model. The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: log total NO.Patent for 3 years						
Variable	**age less 50 (1)**	**age over 50 (2)**	**master less 50% (3)**	**master over 50% (4)**	**log mean working length with ratio (5)**	**log mean working length without ratio (6)**
ratio	0.929***	1.747***	-1.096*	0.804**	1.039***	
	-0.266	(0.472)	(0.612)	(0.367)	(0.233)	
lnmeanlength					0.509**	0.666***
					(0.256)	(0.254)
log firm size	0.696***	0.658***	0.820***	0.757***	0.682***	0.695***
	(0.025)	(0.039)	(0.068)	(0.038)	(0.021)	(0.021)
HHI	0.958*	2.560***	3.276**	0.058	1.371***	1.399***
	(0.517)	(0.857)	(1.317)	(0.851)	(0.445)	(0.446)
Squared HHI	-1.320**	-3.470***	-4.291***	-0.433	-1.882***	-1.814***
	(0.628)	(1.079)	(1.636)	(0.988)	(0.546)	(0.547)
ROA	0.457	0.720	0.611	0.908*	0.571**	0.556**
	(0.282)	(0.477)	(0.888)	(0.494)	(0.245)	(0.246)

Leverage	0.173*	0.196	-0.134	0.506***	0.184**	0.179**
	(0.093)	(0.149)	(0.292)	(0.164)	(0.079)	(0.080)
Q	-0.172***	-0.215***	-0.012	-0.247***	-0.190***	-0.190***
	(0.016)	(0.028)	(0.054)	(0.030)	(0.014)	(0.014)
Capital Expense	-0.668*	-0.927	-0.974	-0.318	-0.646**	-0.620*
	(0.388)	(0.616)	(1.043)	(0.681)	(0.330)	(0.330)
tangibility	-1.111***	-1.688***	-1.330***	-0.865***	-1.286***	-1.309***
	(0.130)	(0.205)	(0.355)	(0.219)	(0.110)	(0.110)
Share Market Return	-0.086**	-0.049	-0.289***	-0.05	-0.078**	-0.081**
	(0.039)	(0.061)	(0.096)	(0.062)	(0.033)	(0.033)
log IPO age	-0.113	0.297**	0.917***	-0.111	0.004	-0.007
	(0.088)	(0.145)	(0.223)	(0.145)	(0.076)	(0.076)
foreign ownership	0.631**	-1.415***	-0.727	0.144	-0.225	-0.016
	(0.271)	(0.362)	(0.521)	(0.338)	(0.217)	(0.212)
Constant	-14.236***	-14.853***	-18.902***	-16.754***	-14.311***	-14.486***
	(0.662)	(1.012)	(1.750)	(1.148)	(0.553)	(0.553)
Industry fixed	YES	YES	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES	YES	YES
Firm fixed	No	No	No	No	No	No
N	4,334	1,849	815	1,639	6,168	6,168
Adj. R^2	0.38	0.388	0.352	0.450	0.375	0.373
F Statistic	72.814***	32.701***	12.933***	37.167***	98.208***	100.018***

Table 7b: Mechanisms Output B

This table reports the results of testable mechanism analyses rest of two channels, country channel and education area expertise channel. In columns (1) and (2), we presents different regression results of using a subset which majority of returnees accumulated their overseas experience in lower CG level countries, and another subset which majority of returnees accumulated their overseas experience in higher CG level countries, respectively. In columns (3) and (4), we presents different regression results of using a subset which majority of returnees accumulated their overseas experience in lower MP level countries, and another subset which majority of returnees accumulated their overseas experience in higher CG level countries, respectively. In columns (5) and (6), we presents different regression results of using a subset which majority of returnees accumulated their overseas experience in lower IP level countries, and another subset which majority of returnees accumulated their overseas experience in higher IP level countries, respectively. In columns (7) and (8), we presents different regression results of using a subset which majority of returnees hold an non-commerce related degree in a firm, and another subset which majority of returnees hold a commerce related degree in a firm, respectively. The dependent variable of all models is *LN(total No. Patent for 3 years)*, and control variables are all the same as baseline model. The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: log total NO.Patent for 3 years							
	CG less 50%	**CG over 50%**	**MP less 50%**	**MP over 50%**	**IP less 50%**	**IP over 50%**	**non-BUS/ECO degree**	**BUS/ECO degree**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
ratio	-1.437***	1.981***	0.691**	2.249***	0.634**	2.198***	-0.465	1.000***
	(0.521)	(0.262)	(0.270)	(0.452)	(0.281)	(0.402)	(1.006)	(0.281)
log firm size	0.845***	0.631***	0.737***	0.598***	0.692***	0.661***	0.868***	0.662***
	(0.050)	(0.023)	(0.026)	(0.039)	(0.027)	(0.034)	(0.092)	(0.028)
HHI	-0.954	1.767***	0.958*	1.885**	1.786***	0.619	5.751***	0.873
	(1.050)	(0.493)	(0.545)	(0.767)	(0.563)	(0.722)	(2.053)	(0.599)
Squared HHI	0.554	-2.609***	-1.243*	-2.748***	-1.932***	-1.775**	-7.126***	-0.994
	(1.347)	(0.607)	(0.669)	(0.953)	(0.728)	(0.853)	(2.319)	(0.725)
ROA	0.118	0.739***	0.474	0.657	0.876***	0.122	0.861	0.903***

	(0.504)	(0.278)	(0.293)	(0.443)	(0.303)	(0.407)	(1.333)	(0.347)
Leverage	0.187	0.144	0.121	0.234*	0.280***	-0.038	0.861*	0.056
	(0.186)	(0.088)	(0.096)	(0.140)	(0.099)	(0.131)	(0.478)	(0.110)
Q	-0.145***	-0.191***	-0.210***	-0.159***	-0.202***	-0.168***	-0.163*	-0.202***
	(0.035)	(0.015)	(0.017)	(0.024)	(0.018)	(0.022)	(0.083)	(0.019)
Capital Expense	-0.935	-0.573	-0.942**	-0.295	-0.818**	-0.547	-0.104	-0.849*
	(0.785)	(0.361)	(0.407)	(0.560)	(0.413)	(0.539)	(1.362)	(0.459)
tangibility	-0.981***	-1.282***	-1.364***	-1.379***	-1.148***	-1.499***	-1.884***	-1.010***
	(0.264)	(0.121)	(0.137)	(0.186)	(0.141)	(0.175)	(0.508)	(0.149)
Share Market Return	-0.136*	-0.073**	-0.088**	-0.065	-0.064	-0.095*	-0.206	-0.066
	(0.074)	(0.037)	(0.040)	(0.059)	(0.041)	(0.054)	(0.143)	(0.043)
log IPO age	-0.079	0.037	-0.016	0.133	0.015	0.089	0.322	-0.119
	(0.192)	(0.081)	(0.094)	(0.127)	(0.097)	(0.118)	(0.373)	(0.099)
foreign ownership	-0.189	-0.330	-0.004	-0.123	-0.135	0.138	1.075	0.086
	(0.567)	(0.233)	(0.250)	(0.430)	(0.253)	(0.399)	(1.064)	(0.265)
Constant	-17.012***	-13.371***	-15.242***	-12.937***	-14.514***	-14.061***	-18.794***	-14.512***
	(1.282)	(0.614)	(0.660)	(1.010)	(0.701)	(0.910)	(2.157)	(0.743)
Industry fixed	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed	No	No	No	No	No	No	No	No
N	1,150	5,033	3,963	2,220	3,589	2,594	383	3,477
Adj. R^2	0.401	0.382	0.408	0.328	0.387	0.369	0.410	0.381
F Statistic	21.776***	85.115***	74.877***	30.244***	62.338***	41.897***	8.799***	58.907***

Table 7c: Mechanisms Summary

This table shows the summary of testable mechanisms model outputs. “Subset” stands for the name of subset regression model. “Estimated Coefficient” is the estimated coefficient of main interested variable, ratio. “Significant” demonstrates whether the estimated coefficient of variable, ratio, is significant or not. Insignificant estimated coefficient represent the estimated value is equal to 0. “Sign” illustrates whether the estimated coefficient of variable, ratio, is positive or negative. Negative sign of estimated coefficient shows ratio appears a negative correlation to firm’s innovation output. “Difference” measured the difference in value of the estimated coefficient of variable, ratio, between two subset groups.

Subset	Estimated Coefficient	Significant	Sign	Difference
Mean Age less than 50	0.929	Yes	Positive	0.818
Mean Age over 50	1.747	Yes	Positive	
Master’s degree less 50%	-1.096	Yes	Negative	1.9
Master’s degree over 50%	0.804	Yes	Positive	
CG less 50%	-1.437	Yes	Negative	3.418
CG over 50%	1.981	Yes	Positive	
MP less 50%	0.691	Yes	Positive	1.558
MP over 50%	2.249	Yes	Positive	
IP less 50%	0.634	Yes	Positive	1.564
IP over 50%	2.198	Yes	Positive	
Non-Business/ Economics Degree	-0.465	No	Negative	1
Business/ Economics Degree	1	Yes	Positive	

Table 8: Robustness Checks

This table reports the results of robustness check. In columns (1), we present the result of main interested variable, ratio of boards, the ratio of total number of directors with foreign experience to the board size in the firm. In columns (2), we present the result of main interested variable, ratio of managers, the ratio of total number of senior executives with foreign experience to the total number of senior executives in the firm. In columns (3), we present the result of main interested variable, CEO with foreign experience, a dummy variable that equals to one if the CEO of the firm has foreign experience and 0 otherwise. In columns (4), we present the result of main interested variable, Chairman with foreign experience, a dummy variable that equals to one if the chairman of board in the firm has foreign experience, and 0 otherwise. The dependent variable of all models is LN(total No. Patent for 3 years), and control variables are all the same as baseline model. The detailed definition of other variables are illustrated in the Appendix. We report *t*-statistics for all variables and an estimated constant included in our model that associated with standard error which clustered at the year level. We further report whether firm, year or industry fixed effects has applied on our models. F-test and Adjusted R squared value have also demonstrated in this table that measuring the overall significance of the models. Note that, ***, **, and * stand for the significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable:			
Variable	**log NO. Patent in t+3 (1)**	**log NO.Patent in t+3 (2)**	**log NO.Patent in t+3 (3)**	**log NO.Patent in t+3 (4)**
boardratio	1.091***			
	(0.111)			
exeratio		0.789***		
		(0.118)		
forceo			0.115**	
			(0.053)	
forchair				0.226***
				(0.052)
log firm size	0.690***	0.706***	0.719***	0.719***
	(0.016)	(0.015)	(0.015)	(0.015)
HHI	0.281	0.301	0.295	0.265
	(0.284)	(0.284)	(0.285)	(0.285)
Squared HHI	-0.513	-0.532	-0.464	-0.461

	(0.352)	(0.352)	(0.353)	(0.353)
ROA	0.765***	0.776***	0.766***	0.758***
	(0.159)	(0.160)	(0.160)	(0.160)
Leverage	0.156***	0.160***	0.161***	0.155***
	(0.052)	(0.052)	(0.052)	(0.052)
Q	-0.133***	-0.134***	-0.134***	-0.134***
	(0.009)	(0.009)	(0.009)	(0.009)
Capital Expense	-0.367*	-0.370*	-0.370*	-0.358*
	(0.208)	(0.209)	(0.209)	(0.209)
tangibility	-1.153***	-1.183***	-1.200***	-1.194***
	(0.072)	(0.072)	(0.072)	(0.072)
Share Market Return	-0.114***	-0.122***	-0.125***	-0.125***
	(0.024)	(0.024)	(0.024)	(0.024)
log IPO age	0.224***	0.217***	0.212***	0.209***
	(0.052)	(0.052)	(0.052)	(0.052)
foreign ownership	0.176	0.181	0.184	173
	(0.165)	(0.165)	(0.165)	(0.165)
Constant	-14.304***	-14.649***	-14.929***	-14.916***
	(0.361)	(0.359)	(0.357)	(0.356)
Industry fixed	YES	YES	YES	YES
Year fixed	YES	YES	YES	YES
Firm fixed	No	No	No	No
N	13,165	13,165	13,165	13,165
Adj. R^2	0.336	0.333	0.331	0.332
F Statistic	176.063***	174.031***	172.464***	173.030***