Height conditions salary expectations: Evidence from large-scale data in China

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Abstract

Height premium has been revealed by extensive literature, however, evidence from China based on large-scale data remains still lacking. In this paper, we study how height conditions salary expectations by exploring a dataset covering over 140,000 Chinese job seekers. By using graphical and regression models, we find evidence in support of height premium that tall people expect a significantly higher salary in career development. In particular, regression results suggest stronger effects of height premium on female than on male, however, the gender differences decrease as the education level increases and become insignificant after holding all control variables fixed. Further, results from graphical models suggest three promising ways in helping short people: i) to accumulate more working experiences, since one year seniority can respectively make up about 3 cm and 7 cm shortness for female and male; ii) to increase the level of education, since one higher academic degree may eliminate all disadvantages that brought by shortness; iii) to target jobs in regions with a higher level of development. Our work provides a cross-culture supportive evidence of height premium and contributes two novel features to the literature: the compensation story in helping short people, and the focus on salary expectations in isolation from discrimination channels.

Keywords: Height premium, Regression model, Salary expectation, Statistical method, Data analysis

1. Introduction

Height is the most revealed physical appearance that one person has across the entire lifetime. Previous literature has uncovered strong impact of height on people's daily living and working, for example, physical health, social well-being and profession status [1, 2, 3]. Body height not only affects the ability of one person and how he/she regards himself/herself, but also affects how others view one person and the future career development [4]. In the past decades, a large amount of studies have found evidences in support of the height premium across countries and genders [5], where tall people receive more benefits across several domains [6], and the height discrimination [7], where short people are discriminated on the basis of their body height in workplace [8].

On the one hand, many factors determine the height of people [9, 10], such as genetic makeup [11], demography [12], socioeconomic indicators [13], evolution trends [14, 15], etc. Recently, a study of 105 countries provided a better understanding of the environmental determinants of height like the consumption rates of the most correlated proteins [16]. On the other hand, height has been found strong effects on people's psychological abilities [17, 18, 19]. For example, tall people are less jealous [18], more happy [21, 22], more likely to be married [23, 24] and have better educational attainment [26]. More importantly, height has significant impact on people's future career development. Extensive previous studies have shown that height strongly affects the wages in different countries like Germany, Finland and US [27, 28, 29] and especially for female [30]. In particular, there has been found a non-linear relationship between height and wages [31, 32]. The height premium has been explained by various factors like cognitive and non-cognitive skills [33] and perceptions associated with height [34].

Although there are extensive studies suggesting the effects of height, most of previous literature mainly focused on western countries [35], while China with the world largest population and rapid economic development has not

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been sufficiently considered [36, 37, 38, 39]. Also, most of previous studies used data from administrative records and surveys [30], which potentially limit not only the timeliness of analysis due to the long time delay in the aggregation of administrative data [40], but also the sample size of observations due to the high cost of conducting large scale surveys. Besides, previous work showed extensive evidences of height discrimination in career development but few suggestions on how to solve the dilemma.

Considering it is less possible to rule out discrimination entirely [26], improving education and increasing seniority may help improve the situation of short people [41]. Moreover, height discrimination only expresses how short people are treated unfairly from outside, however, mainly due to the lack of better data [28], less has been considered on whether short people themselves are expecting a low salary. Fortunately, with the rapid development of information and technology in recent years [42], large amount profile data of Chinese job seekers with salary expectations and demographic information are available in many online socioeconomic systems (e.g., human resource service [43], online rating systems [44, 45] and reputations systems [46, 47]), which makes it possible to investigate how height conditions salary expectations in different culture backgrounds and how to reduce height discrimination.

In this paper, we study the relationship between height and salary expectations by exploring a dataset covering over 140,000 job seekers in China. Using a graphical model, we find that height positively and significantly affects salary expectations for both genders, suggesting the presence of height premium. Then, we study how working experience estimated by seniority and age can offset the disadvantages brought by shortness. Next, we explore whether the education level drives salary expectations by looking at the effects of academic degree and school of graduation. Further, we consider the effects of the economic status in the born, living and targeting cities of job seeking. Finally, we check the robustness of our results using two regression models respectively on sub-sample and pooled sample, and suggest three promising ways for helping short people out. Our work provides cross-culture evidences of height premium and suggests promising directions in getting rid of height discrimination in labor market.

The remainder of this paper is organized as follows. Section 2 briefly summaries the relevant literature. Section 3 introduces the used dataset and the analytic methods for exploring the data. Section 4 presents the results on how height affects salary expectations. Finally, Section 5 provides the conclusions along with discussion.

2. Relevant Literature

Height is a reflection of investment in health [48, 49], given a variety of factors will affect how tall one person will grow [16], such as genetic constitution [11], malnutrition in childhood [16, 50], weather shocks [51], medical and health conditions [52, 53], neighborhood characteristics [54], economic status [55, 56], socioeconomic indicators [57] and economic development trends [14]. In turn, height has effects on various physical abilities and health outcomes. For example, Jackson and Ervin [1] showed height stereotypes that shortness is more of a liability in an asset for both genders, Stulp et al. [58] found the negative effect of women height on reproductive success in western populations, and Dercon and Sánchez [19] showed that the height in mid childhood tends to increase a set of psychosocial competencies in late childhood. For the cognitive ability, Case and Paxson [20] found that taller children have higher cognitive scores which results in more earnings, Spears [59] found that taller Indian children perform better on tests of cognitive achievement, Heineck [60] found that height is non-linearly associated to male's cognitive abilities, and Guven and Lee [61] showed that height is positively associated with cognitive functioning in later life, which is in line with results reported by Maurer [62]. Moreover, height has been found a negative relationship with total mortality in Norway [63], early life mortality in India [64], and infant mortality in Spain [65].

Height as a useful measure of human welfare affects people's social well-being like self-efficacy, self-esteem and aspirations [66], which are unrelated to the physical features. For personality, Melamed [17] found significant correlations between height and suspiciousness for both genders, Buunk et al. [18] found that male height has negatively correlated jealousy whereas female height is curvilinearly related to jealousy, Carrieri and De Paola [21] found a positive relationship between height and individual happiness using Italian survey data, and Persico et al. [67] found the relationship between height and extracurricular activities. For love and marriage, Herpin [23] showed that tall men are more likely to be married or live in a permanent relationship. Manfredini et al. [35] revealed a negative selection of short men on marriage and a differential effect of tallness on mate choice after analyzing two Italian historical populations, Sohn [68] quantified the effect relative height to spouse in marriage using Indonesian survey data, and Yamamura and Tsutsui [37] recently showed that height in the marriage market has changed among generations. For education, Mora [25] found a negative association between height and school satisfaction in Catalonia, and Cinnirella

Table 1: Some basic statistics of the Chinese resume data.

Gender	Observations	Height (cm)	Age (year)	Seniority (year)	Degree	School	Salary (CNY)
Female	62,651	162.0 [150, 175]	27.64 [18, 57]	3.801 [0, 31]	1.773 [1, 4]	2.210 [1, 4]	5,017 [1,000, 50,000]
Male	78,413	173.4 [160, 185]	29.67 [18, 66]	5.475 [0, 36]	1.805 [1, 4]	2.312 [1, 4]	8,039 [1,000, 50,000]

Notes: To ensure sufficient observations, only data in the corresponding height and salary ranges are used in the analysis. Academic degree is vectored as 4 for PhD, 3 for Master, 2 for Bachelor, and 1 for Others. School of graduation is vectored as 4 for 985 PRG, 3 for 211 PRG, 2 for College, and 1 for Others. Mean values of the metrics are reported in the table with corresponding ranges of variables in brackets.

et al. [26] found a positive association between height and educational attainment and further proposed a possible explanation of the height-school in terms of non-cognitive skills.

Height has been shown strong effects on the profession status in support of the height premium. For job market and human resource management, Agerström [69] found height predicted recruiters' hiring intentions, Egolf and Corder [70] found that employees occupying management positions were significantly taller, and Gawley et al. [71] found significant positive relationships between height and holding a position of authority for male Canadian workers. Even in the US presidential elections, height is indeed an important factor [34]. Similarly, Yamamura et al. [72] found that taller people are more likely to be a Communist Party member in China. For workplace success, Judge and Cable [4] showed that tall individuals have advantages in their career success and organizational livings using a theoretical model, and Case et al. [41] further explained the height premium by the higher average educational attainment. For income and earnings, a large body of previous literature have shown evidences on height-wage premium that tall people earn more in Korea [32], Indonesia [30], Finland [28], UK [73], Germany [27], India [50], US [74], etc. In particular, Hübler [31] and Kim and Han [32] found non-linear relationships of height with wages, Sohn [30] estimated that a 10cm increase in height increases in earnings of 7.5% for men and 13.0% for women, and Tao [75] found the discrimination of height in determining the entry earnings. Recently, alternative explanations of height premium have been proposed, including the cognitive and non-cognitive skills [33], the role of physical strength [28], the unobserved heterogeneity on the sibling level [29], and the role of market and political channels [37].

3. Data and Methods

3.1. Large-scale Resume Data

We used resume data of 142,190 job seekers from 287 prefecture-level cities in 31 provinces of China. The data were crawled in 2014 from two public websites of Chinese human resource service providers, namely, Qiancheng-wuyou (http://www.51job.com) and Zhonghuayingcai (http://www.chinahr.com). The data contain basic self-reported information of job seekers, including height, gender, age, seniority, academic degree, school of graduation, the city of born (Native), the city of current living (Living), the city of seeking the job (Targeting), and the expected monthly salary in Chinese Yuan (CNY). The academic degree contains four levels: PhD, Master, Bachelor, and Others. The schools of graduation are further aggregated into four categories according to the Ministry of Education of China (http://www.moe.gov.cn) in 2014: Highest level "985 Program" universities (985 PRG), high level "211 Program" universities (211 PRG), other higher education universities (College), and non-higher education schools (Others). The list of cities correspond to the official book entitled "China City Statistical Yearbook (2012)", which was compiled by the National Statistic Bureau of China (http://www.stats.gov.cn).

To consider ordinary job seekers with usual salary expectations and to ensure sufficient observations, we only used data that meet two conditions: 1) Expected salary is within range [1000, 50,000] CNY (about [150, 7000] USD); 2) Height is within range [150, 175] cm for female and [160, 185] cm for male. After filtering, data from 62,651 females and 78,413 males are analyzed. Summary statistics of the data are shown in Table 1. Only for statistics, the academic degree is vectorized as 4 for PhD, 3 for Master, 2 for Bachelor, and 1 for Others, and the school of graduation is vectorized as 4 for 985 PRG, 3 for 211 PRG, 2 for College, and 1 for Others. We also used GDP per capita (GDP pc) data for prefecture-level cities and provinces, collected respectively from the "China City Statistical Yearbook (2014)" and the "China Statistical Yearbook (2014)" compiled by the National Bureau of Statistics of China.

3.2. Analytic Methods

First, we use a set of simple linear regressions to model the relationship between the dependent variable as expected salary in natural logarithmic form $\log(Salary)$ and the explanatory variable $Height$ for job seekers with different $Seniority$. Formally, the linear regression model is given by:

$$\log(Salary)_s = \beta_{0,s} + \beta_{1,s} Height_s + \varepsilon_s, \tag{1}$$

where $\log(Salary)_s$ and $Height_s$ are expected salary and height of individuals with seniority s, respectively. $\beta_{0,s}$ is the constant term, $\beta_{1,s}$ is the slope of linear fit, and ε_s is the error term for each value of seniority s. Then, we can calculate the distance $\Delta Height$ between two neighboring fits. Here, the distance $\Delta Height$ is the minimal height that one fitted $Height - \log(Salary)$ curve will be moved in order to be overlapped with its neighboring curve. Indeed, the distance $\Delta Height$ measures the height gap between two individuals with neighboring seniority in order to have the same salary expectation. To reduce noises, we move the fits using different coordinate origins of height in range [150, 175] cm for female and [160, 185] cm for male, respectively. Finally, we calculate the averaging $\Delta Height$ for each neighboring seniority comparison, for example, Seniority 1 to Seniority 2 as Seniority Comparison 1∼2.

Next, we use a multivariate statistical method to check the robustness of our results on how height conditions salary expectations of Chinese job seekers. The ordinary least-squares (OLS) regression model is used to regress expected salary on height with controlling for the effects of seniority, age, the GDP pc of Targeting city ($GDPpc^T$), the GDP pc of Living city ($GDPpc^L$), and the GDP pc of Native city ($GDPpc^N$). We also dummy the two variables $Degree$ and $School$ to capture the degree of human capital [76], since the two variables shouldn't be treated as linear. Based on the sub-sample of male (or female), the estimated equation is given by

$$\begin{aligned}\log(Salary) = \beta_0 &+ \beta_1 Height + \beta_2 Seniority + \beta_3 Age \\ &+ \beta_4 \log(GDPpc^T) + \beta_5 \log(GDPpc^L) + \beta_6 \log(GDPpc^N) \\ &+ \beta_7 D^{Degree} + \beta_8 D^{School} + \varepsilon,\end{aligned} \tag{2}$$

where $\log(GDPpc^T)$, $\log(GDPpc^L)$ and $\log(GDPpc^N)$ denote respectively the GDP pc in natural logarithmic for the Targeting, Living and Native city, D^{Degree} and D^{School} denote respectively the dummy variables of $Degree$ and $School$, β_0 is the constant term, and ε_i is the error term. The regression coefficient of interest is β_1, which captures the effects of height on the expected salary for male (or female).

In the empirical specification given by Eq. (2), variances of the residual for female and male groups are not constrained to be the same due to the separated estimations based on each sub-sample. For purposes of comparison, we explore the difference in the intercept and the slope with respect to $Height$ between female and male groups. To do this, we further estimate the OLS model given by Eq. (3) based on the pooled sample of female and male groups. Specifically, the estimated equation includes the dummy variable $Female$ and the interaction terms between $Female$ and all other control variables [76]:

$$\begin{aligned}\log(Salary) = \beta_0 &+ \delta_0 Female + \beta_1 Height + \delta_1 Female \cdot Height \\ &+ \beta_2 Seniority + \delta_2 Female \cdot Seniority + \beta_3 Age + \delta_3 Female \cdot Age \\ &+ \beta_4 \log(GDPpc^T) + \delta_4 Female \cdot \log(GDPpc^T) + \beta_5 \log(GDPpc^L) \\ &+ \delta_5 Female \cdot \log(GDPpc^L) + \beta_6 \log(GDPpc^N) + \delta_6 Female \cdot \log(GDPpc^N) \\ &+ \beta_7 D^{Degree} + \delta_7 Female \cdot D^{Degree} + \beta_8 D^{School} + \delta_8 Female \cdot D^{School} + \varepsilon,\end{aligned} \tag{3}$$

where $Female = 0$ corresponds to the base male group. The regression coefficients of interest are δ_0 (the intercept difference between female and male) and δ_1 (the slope difference with respect to $Height$ between female and male).

4. Results

In this section, we first present the relationship between height and expected salary for female and male, respectively. Then, we show how working experience affect the expected salary for people with different height. Next, we explore whether the level of education can contribute to make up the disadvantages that brought by shortness. Further, we show the effects of economic geography on height and expected salary. Finally, we check the robustness of our results by estimating the regression models based on both the sub-sample of female (or male) and the pooled sample.

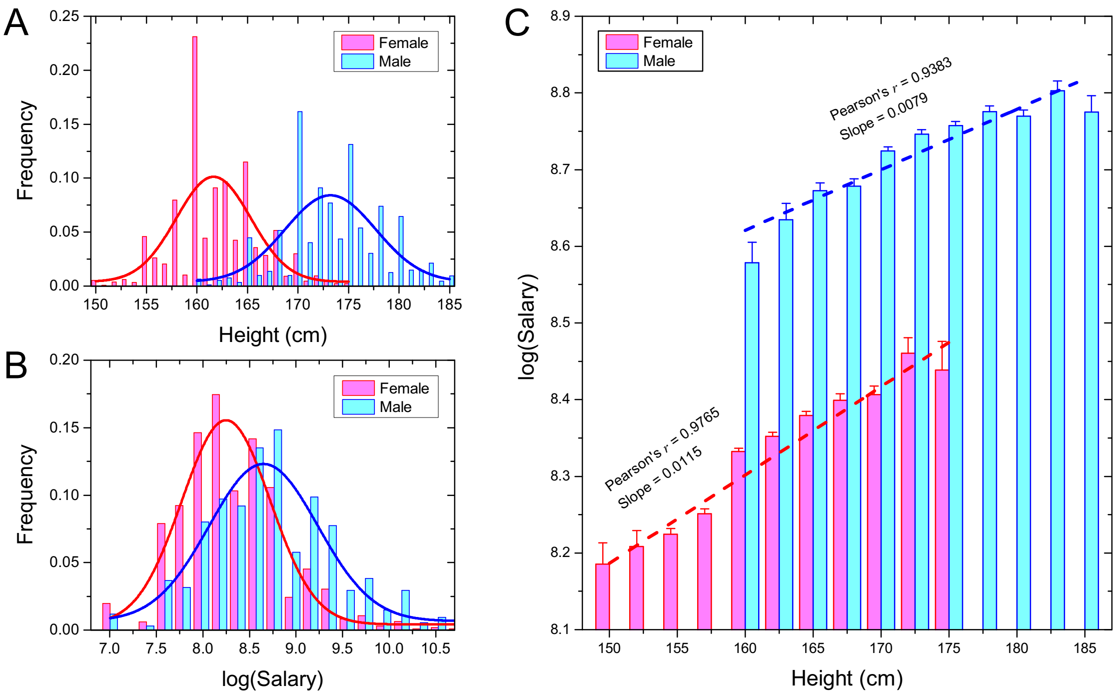

Figure 1: Relationship between height and expected salary. (**A**) Distributions of height for female (in pink) and male (in blue). Curves are normal fits of bar plots. (**B**) Distributions of expected salary in natural logarithmic form for female (in pink) and male (in blue). (**C**) Relationship between height and expected salary for female (in pink) and male (in blue). Bar corresponds to the average expected salary in natural logarithmic form and error bar corresponds to the standard error. Dash lines are the linear fits of bar plots, with slope 0.0115 for female and 0.0079 for male, respectively. Pearson's correlation coefficients between Height and Ln(Salary) are based on the bar plots.

4.1. Height Conditions Salary Expectations

For the graphical illustrations, we present the relationship between expected salary and height in Fig. 1 after dividing the full data into female and male groups. Specifically, Figure 1A presents the distributions of height for female (in pink) and male (in blue), respectively. The results show that the average height of male at about 173 cm is significant larger than that of female at about 162 cm. Figure 1B presents the distributions of expected salary in natural logarithmic form for female (in pink) and male (in blue), respectively. We notice that male have remarkably higher averaging expected salary than female with a shift at about 0.5. The results suggest the gender differences in salary expectations with male expecting higher salary than female in job seeking.

Figure 1C presents the expected salary as a function of height for female (in red) and male (in blue), respectively. We notice that the averaging expected salary in natural logarithmic form grows linearly with height for both genders, showing a strong height premium that tall people expect higher salary than short people. Together, we find that height has remarkably stronger effects on the salary expectations of female than that of male, as indicated by the larger slope (0.0155) of the linear fit for female than the slope (0.0079) for male. These observations suggest the presence of height premium for both genders in China, and especially for female. In the following, we will explore the effects of other variables on the height premium.

4.2. Effects of Working Experience

In this section, we consider the effects of previous working experience on the height premium. As an estimation of previous working experience, seniority is used to check the effects on the relationship between height and expected salary. Figure 2 reports the results after dividing the data according to seniority values and genders. Specifically, Figs. 2A and 2B show the expected salary as a function of height for different values of seniority for female and male, respectively. To reduce noises that may be caused by the insufficient of data, we only illustrate results from Seniority

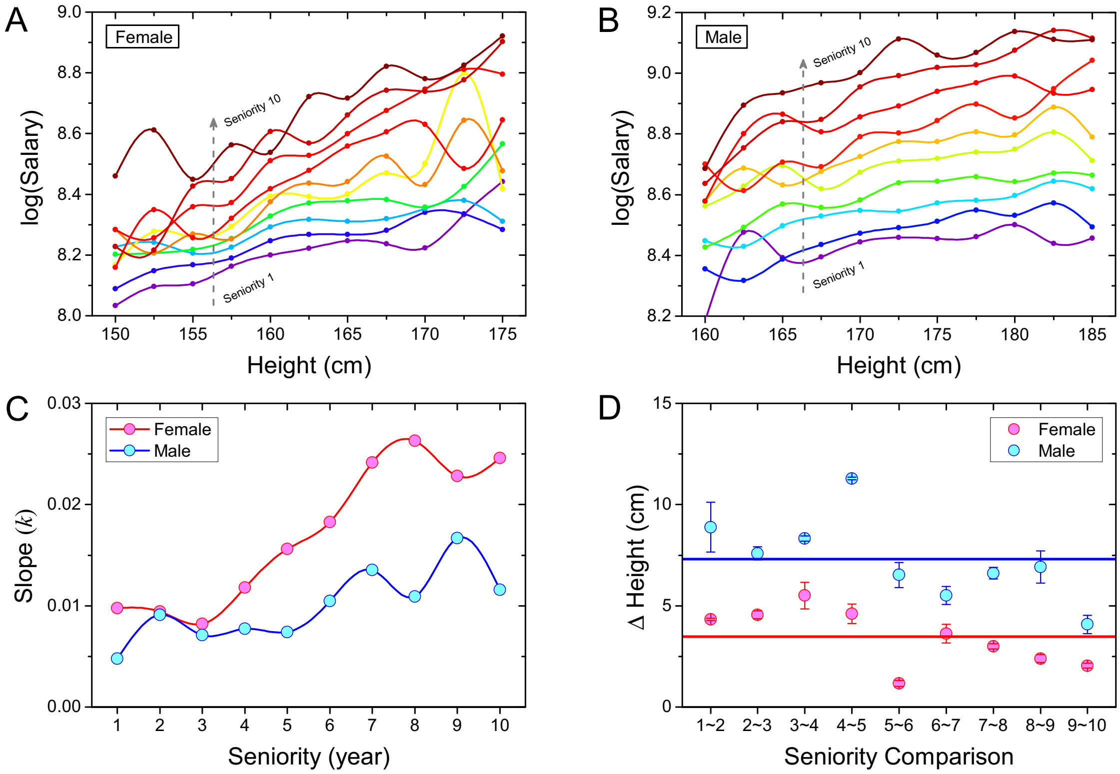

Figure 2: Relationship between height and salary after grouping by seniority. (**A**) and (**B**) show the average expected salary in natural logarithmic form as a function of height after grouping seniority into ten cohorts from 1 to 10 for female and male, respectively. (**C**) Slopes of linear fitting curves $Height - \log(Salary)$ in (**A**) and (**B**) respectively for female (in pink) and male (in blue) as a function of seniority. (**D**) The height differences between two neighboring seniority cohorts with the same salary expectation, i.e., the minimal distance in height $\Delta Height$ that one fitted $Height - \log(Salary)$ curve has to move to overlap with its neighboring seniority cohort fitted curve. For example, the Seniority Comparison 1-2 stands for overlapping the fit of seniority cohort 1 with the fit of seniority cohort 2. Horizontal line corresponds to mean value. Error bar corresponds to standard error.

1 to Seniority 10. We find that, overall, the expected salary grows linearly with height for both genders across all seniority cohorts, and the observations are robust when using age in estimating previous working experience.

Next, we explore the effects of seniority in a quantitative way using the simple linear regression model in Eq. (1) (see Methods). Figure 2C shows the slopes of the corresponding linear fits as a function of seniority for female (in red) and male (in blue), respectively. We find that the effects of height on the expected salary increase as the seniority increases especially for female, as indicated the larger slopes of the fits for larger seniority cohorts. These results are also robust when using age as the estimation of previous working experience.

We further quantify how much previous working experience can contribute to make up the disadvantages that are faced by short people in expecting the same salary. We calculate the height that one year seniority can make up for female (in red) and male (in blue) by overlapping the linear fits of $Height - \log(Salary)$ curves for neighboring seniority from Seniority 1 to Seniority 10 (see Methods). We find that one year seniority can make up about 7 cm shortness in height for male, as shown by the horizontal blue line in Fig. 2D. By contrast, one year seniority can only make up about 3 cm shortness in height for female, as shown by the horizontal red line in Fig. 2D.

These results, one the one hand, provide further evidences in support of the stronger height premium for female than for male in China, where tall female enjoy relatively larger benefit in job market. On the other hand, it suggests a promising way to get rid of the disadvantages of being short in salary expectations through accumulating more working experience. Nevertheless, female will have to work longer than male in making up for the same shortness in height. Even though time is equal for everyone, the results are still meaningful since more working experience can be accumulated within the same length of time through better professional training and learning.

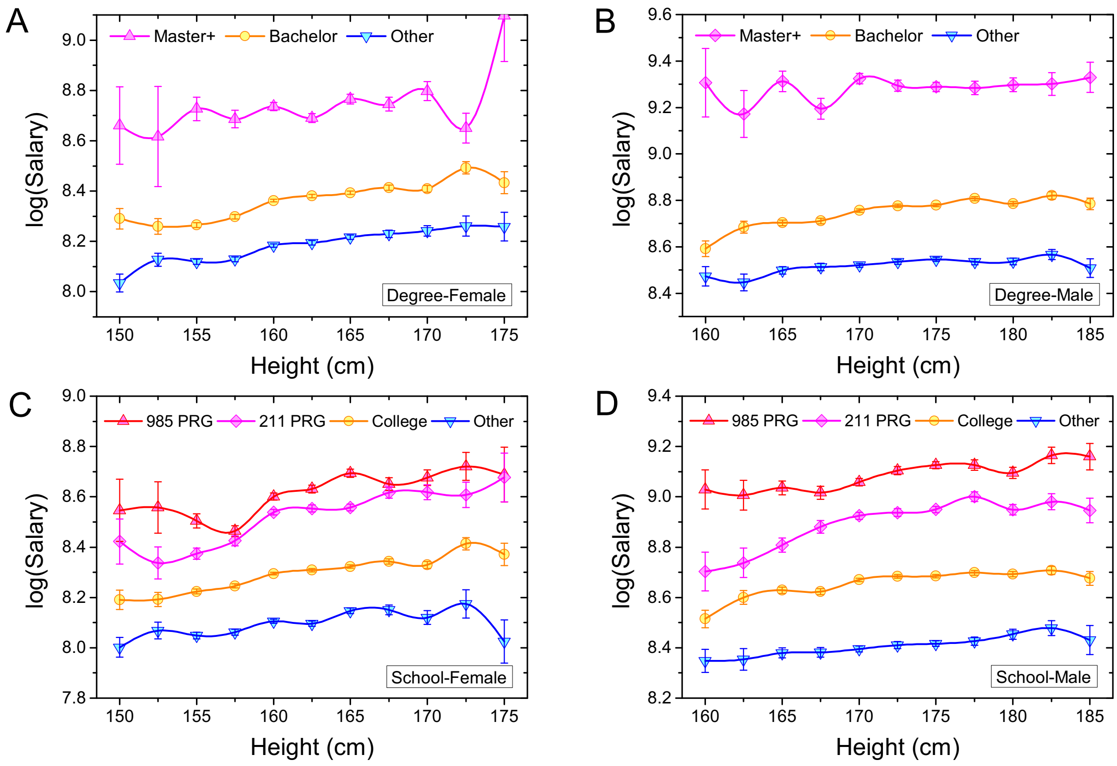

Figure 3: Relationship between height and salary after grouping by academic degree and school of graduation. (**A**) and (**B**) show the average expected salary in natural logarithmic form as a function of height for different academic degree for female and male, respectively. (**C**) and (**D**) show the average expected salary in natural logarithmic form as a function of height for different school for female and male, respectively.

4.3. Effects of Education

In this section, we explore the effects of education on the height premium and whether better education can help make up the disadvantages brought by shortness. We use the academic degree and the school of graduation as the estimations of the level of education that one received. The results on how the academic degree affects the relationship between height and expected salary are reported in Fig. 3.

Figures 3A and 3B present the effects of academic degree on the relationship between height and expected salary for female and male, respectively. For both genders, the expected salary increases slightly with the increasing of height across all academic degree cohorts. We notice that the expected salary with a higher level of academic degree is significant larger than the lower level of academic degree regardless of the height. In other words, the expected salary grows strongly with the academic degree for both genders, suggesting the driven force of education towards high salary expectation. Moreover, we notice the significant gender differences in salary expectations for individuals in the same academic degree cohort. In particular, the expected salary of female is one academic degree behind that of male. For example, the expected salary of female with Master (and PhD) degree (yellow curve in Fig. 3A) is similar to the expected salary of male only with Bachelor degree (blue curve in Fig. 3B). Furthermore, we notice that the effects of height on expected salary are stronger for lower level of academic degree, as indicated by the larger slopes of the $Height - \log(Salary)$ curves. For example, the slope of Other degree curve (in blue) is larger than that of Master (and PhD) degree curve (in pink) in Figs 3A and 3B. In short, these results suggest that getting a higher academic degree can help people overcome all disadvantages associated with shortness.

Figures 3C and 3D present the effects of school of graduation on the relationship between height and expected salary for female and male, respectively. For both genders, the expected salary increases with the increasing of height across all school cohorts, especially for middle ranked school cohort. Similarly, we found the expected salary of job seekers who graduated from better schools is much larger. Also, the gender difference is kept, where the expected salary of female is more than two levels behind that of male in school of graduation. For example, the expected salary

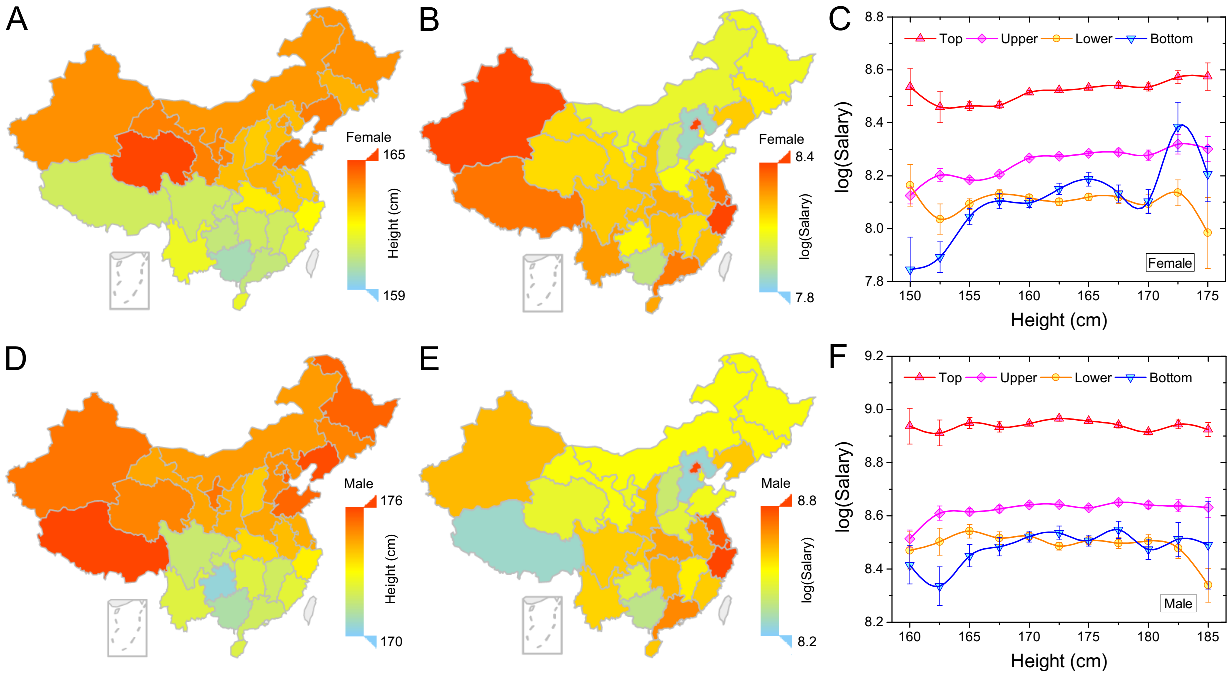

Figure 4: Geographic illustrations of height and salary. (**A**) The average height (by color) in different provinces for female. (**B**) The average expected salary in natural logarithmic form (by color) in targeting provinces for female. (**C**) The average expected salary in natural logarithmic form as a function of height for different geography groups for female. (**D**), (**E**) and (**F**) show the corresponding results for male, respectively.

of female who graduated from 985 PRG (red curve in Fig. 3C) is similar to the expected salary of male who only graduated from College (yellow curve in Fig. 3D). Moreover, we find that the effects of height are slightly stronger for job seekers who graduated from higher level of school, as indicated by the larger slopes of the $Height - \log(Salary)$ curves. For example, the slope of the 211 PRG curve (in pink) is slightly larger than that of the Other curve (in blue) in Figs 3C and 3D. Furthermore, we notice that the effects of school is weaker than that of academic degree especially for those with PhD degree. In short, graduating from a better school will help short people reduce the disadvantages in salary expectation.

4.4. Effects of Economic Geography

Economic geography may also have effects on the height and salary expectation, considering the huge area of China. On the one hand, different regions may have different environments and the localization of genetic makeup, which may affect the height of people. On the other hand, the regional economic development is not always perfectly equal in China [77]. Therefore, the expected salary of job seekers should depend on where to find the job and the economic status of the targeting provinces. In this section, we explore the effects of economic geography on how the height affects the expected salary.

Figure 4A presents the geographic visualizations of average height of female job seekers according to their targeting provinces. We find a clear pattern for both genders showing that job seekers who aim to find a job in the north part of China have a remarkable larger height. The results are robust if using living or native provinces. Figure 4B presents the geographic visualizations of average expected salary of female job seekers according to their targeting provinces. We find that job seekers who target the provinces in the southeast part of China have significantly high salary expectation. That is mainly because these coast-located provinces have higher level economic development. Similar results are found for male in Figs. 4D and 4E for average height and average expected salary, respectively.

Further, Figures 4C and 4F show how the level of economic development affects the height premium for female and male, respectively. In categorizing the level of economic development, we first sort all cities according to their GDP pc in the descending order. Then, we divide the list of cities from bottom to top into four categories with equal size,

Table 2: Robustness check the effects of height on expected salary based on the sub-sample of female or male.

Variables	OLS Regression Model with Dependent Variable: $\log(Salary)$							
	Female				Male			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Height$	0.0129***	0.0085***	0.0095***	0.0080***	0.0072***	0.0047***	0.0092***	0.0071***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
$Seniority$			0.0191***	0.0201***			0.0205***	0.0206***
			(0.0009)	(0.0008)			(0.0008)	(0.0007)
Age			0.0398***	0.0394***			0.0481***	0.0482***
			(0.0008)	(0.0008)			(0.0007)	(0.0007)
$\log(GDPpc^T)$				0.2174***				0.1925***
				(0.0088)				(0.0081)
$\log(GDPpc^L)$				0.1591***				0.2077***
				(0.0085)				(0.0075)
$\log(GDPpc^N)$				−0.0396***				−0.0085**
				(0.0037)				(0.0038)
Constant	6.2424***	6.7294***	5.4516***	1.9159***	7.4855***	7.5976***	5.3930***	1.3625***
	(0.0876)	(0.0837)	(0.0802)	(0.0925)	(0.0884)	(0.0836)	(0.0785)	(0.0939)
D^{Degree}	NO	YES	YES	YES	NO	YES	YES	YES
D^{School}	NO	YES	YES	YES	NO	YES	YES	YES
Obs.	62,651	62,651	62,651	62,651	78,413	78,413	78,413	78,413
F	573	996	2147	2192	202	1417	3375	3179
Adj. R^2	0.0090	0.1001	0.2357	0.2956	0.0026	0.1123	0.2792	0.3272
RMSE	0.5627	0.5363	0.4942	0.4744	0.6859	0.6471	0.5831	0.5633

Notes: The regressions use the ordinary least-squares (OLS) model on the sub-sample of female or male. D^{Degree} and D^{School} are dummy variables, which are included in the regressions if marked YES and not if otherwise. Standard errors are reported in parentheses. Significant level: $*p < 0.1$, $**p < 0.05$, and $***p < 0.01$.

namely, Bottom, Lower, Upper and Top. We find the stronger effects of economic development on expected salary for Upper and Top city groups while the effects are not remarkable for Lower and Bottom city groups. Moreover, we find that the height premium is not remarkable within the same city group, especially for male, as suggested by the trends of $Height - \log(Salary)$ curves. These results suggest that the level of economic development of targeting cities is driving the salary expectations of job seekers. In short, short people can try to find a job in Top (at least Upper) city group to overcome disadvantages than in Bottom city group.

4.5. Robustness Check Using Regressions

In this section, we check the robustness of the results on how height affects expected salary using two regression models. First, we use the OLS regression model in Eq. (2) to regress expected salary $\log(Salary)$ against $Height$ with controlling for the effects of other demographic and macro-economic indicators, including the level of education (D^{Degree} and D^{School}), the previous working experience ($Seniority$ and Age), and the level of economic development ($\log(GDPpc^T)$, $\log(GDPpc^L)$, and $\log(GDPpc^N)$). The OLS model is estimated based on the sub-sample of female or male. Results of all the estimations are summarized in Table 2.

Columns (1)-(4) of Table 2 present the estimated results for female. In column (1), without controlling any other variables, we find the positive and significant effects of $Height$ on $\log(Salary)$ with the regression coefficient $\beta_1 = 0.0129$. In column (2), we notice that the coefficient of $Height$ decreases to 0.0085 while remaining significant, holding D^{Degree} and D^{School} fixed. In column (3), after additionally controlling $Seniority$ and Age, the coefficient of $Height$ increases to 0.0095, and the explanatory power of all variables together increases to 0.2357. In column (4), once the three variables of GDP pc are included, the explanatory power of all variables together increases to 0.2956, and the coefficient of $Height$ decreases to 0.0080 while remaining very significant with t statistic $t_{Height} = 0.0080/0.0005 \approx 16$. These results confirm the presence of height premium for Chinese female job seekers, where a female expects, on average, about 0.080 more salary if she is 10% higher, holding other factors fixed.

Table 3: Robustness check the effects of height on expected salary based on the pooled sample of female and male.

Explanatory Variables	OLS Regression Model with Dependent Variable: $\log(Salary)$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Female$	−1.2431***	−0.9988***	−0.1514	0.0195	0.4063***	0.5347***
	(0.1281)	(0.1856)	(0.1181)	(0.1739)	(0.1378)	(0.1849)
$Height$	0.0072***	0.0047***	0.0116***	0.0092***	0.0082***	0.0071***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$Female \cdot Height$	0.0057***	0.0038***	0.0020***	0.0003	0.0029***	0.0008
	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
$Seniority$			−0.0026***	0.0205***	−0.0011	0.0206***
			(0.0007)	(0.0007)	(0.0007)	(0.0007)
$Female \cdot Seniority$			−0.0023**	−0.0014	−0.0020*	−0.0005
			(0.0012)	(0.0012)	(0.0011)	(0.0012)
Age			0.0711***	0.0481***	0.0686***	0.0482***
			(0.0006)	(0.0007)	(0.0006)	(0.0007)
$Female \cdot Age$			−0.0104***	−0.0083***	−0.0101***	−0.0088***
			(0.0010)	(0.0011)	(0.0010)	(0.0011)
$\log(GDPpc^T)$					0.1960***	0.1925***
					(0.0078)	(0.0075)
$Female \cdot \log(GDPpc^T)$					0.0293**	0.0249**
					(0.0128)	(0.0123)
$\log(GDPpc^L)$					0.2044***	0.2077***
					(0.0073)	(0.0070)
$Female \cdot \log(GDPpc^L)$					−0.0529***	−0.0485***
					(0.0122)	(0.0117)
$\log(GDPpc^N)$					0.0470***	−0.0085**
					(0.0037)	(0.0036)
$Female \cdot \log(GDPpc^N)$					−0.0468***	−0.0312***
					(0.0056)	(0.0055)
Constant	7.4855***	7.5976***	4.6361***	5.3930***	0.3085***	1.3625***
	(0.0817)	(0.0775)	(0.0757)	(0.0734)	(0.0899)	(0.0877)
D^{Degree}	NO	YES	NO	YES	NO	YES
D^{School}	NO	YES	NO	YES	NO	YES
Obs.	141,064	141,064	141,064	141,064	141,064	141,064
F	4914	2185	7658	3663	5326	3427
Adj. R^2	0.0946	0.1884	0.2754	0.3303	0.3292	0.3778
RMSE	0.6342	0.6004	0.5673	0.5454	0.5459	0.5257

Notes: The regressions use the ordinary least-squares (OLS) model on the pooled sample of female and male. D^{Degree} and D^{School} are dummy variables, which are included in the regressions if marked YES and not if otherwise. Standard errors are reported in parentheses. Significant level: $*p < 0.1$, $**p < 0.05$, and $***p < 0.01$.

Columns (5)-(8) of Table 2 present the estimated results for male. In column (5), we find the positive and significant effects of $Height$ on $\log(Salary)$ for male, but with a smaller coefficient ($\beta_1 = 0.0072$) compared to that for female. In columns (6) and (7), after gradually controlling the education level (D^{Degree} and D^{School}) and the previous working experience ($Seniority$ and Age), the coefficient of $Height$ remains positive and significant, and the explanatory power of all variables together increases. In column (8), holding all other variables fixed, we notice that the effects of height on expected salary are still positive ($\beta_1 = 0.0071$) and very significant ($t_{Height} = 0.0071/0.0004 \approx 18$). These results confirm the height premium for male job seekers, where a male of 10% higher expects, on average, about 0.071 more salary. Moreover, among the three variables of GDP pc, we notice that $\log(GDPpc^T)$ contributes relatively the most, while $\log(GDPpc^N)$ has the negative and significant effects on $\log(Salary)$ for both genders.

For purposes of comparison between the female and the male height premium, we further estimate the OLS model given by Eq. (3) based on the pooled sample, where the variances of the residual are constrained. The estimated results are summarized in Table 3. In column (1), without controlling any other variables, the intercept difference between female and male (δ_0, the coefficient of $Female$) is negative and significant (−1.2431), showing that female expects, on average, 1.2431 less salary than male. Together, the slope difference (δ_1, the coefficient of $Female \cdot Height$)

is positive and significant (0.0072), showing that the female height premium is stronger. Similar results are found in column (2) after additionally controlling the education level. Further, we notice that the effects of the intercept difference lose significance after controlling the previous working experience in column (3) and additionally holding the education level fixed in column (4). After including the three variables of GDP pc and controlling the previous working experience in column (5), the intercept difference turns to be positive and significant (0.4063), while the slope difference remains positive and significant (0.0029). Holding all control variables fixed in column (6), we notice that the intercept difference is still positive and significant (0.5347), meaning that female expects on average 0.5347 more salary than male. Interestingly, once the degree of human capital is controlled, the slope difference turns to be not economically large (0.0008) nor statistically significant ($t_{Height} = 0.0008/0.0007 \approx 1$), suggesting that the height premium is indeed not significantly different between female and male, holding all control variables fixed. In short, regression results confirm the presence of height premium for both genders in Chinese job seeking.

5. Conclusions and Discussion

In this paper, we studied how height affects salary expectations in China based on a large-scale dataset summarizing the demographic and expected salary of over 140,000 job seekers. Both graphical analysis and regression models based on the sub-sample suggested the significant height premium in China, where taller people are likely to expect a higher salary when hunting for jobs. The results are robust when controlling for the effects of other co-variables like the level of education, the previous working experience, and the economic status of cities. For both genders, the effects of height premium decrease as the education level increases. Moreover, we noticed the gender differences in height premium: the effects of height are stronger for female than for male. Yet, further regression results based on the pooled sample suggested that the differences in the height premium between female and male are not statistically significant once controlling all other variables, especially the education level.

Accordingly, we suggest three promising ways to help short people get out of the height premium trap. Specifically, short people can increase the previous working experience, for example, one year seniority can make up 3 cm and 7 cm shortness in height for female and male, respectively. Also, short people can try to increase their level of education, for example, short people will eliminate all disadvantages in salary expectations if they get a master degree, comparing to people who are tall but only with a bachelor degree. Moreover, short people can try to find jobs in top ranked regions in economic development, where the average salary expectations is higher across all height cohorts. Even though the length of time is equal for everyone, from an optimistic point of view, ways of extending working experience are diverse, for example, enhancing self-learning abilities and participating in professional training.

Our results provide a cross-culture supportive evidence for the height premium in job market and further suggest some possible ways towards helping short people get rid of it. In a wider perspective, our work makes a step towards intelligent human resource management [78] through analyzing large-scale online data from socioeconomic systems [79]. Considering that the salary expectations are self-reported by job seekers themselves, our results indicate that the relatively low salary of short people is likely due to their low expectations (for example, the inside inferiority) besides the traditional hypothesis of height discrimination (or other outside reasons). To make a step towards filling the height premium trap, on the one hand, short people themselves should be more confident in salary expectation. On the other hand, short people are encouraged to improve themselves through accumulating more working experience and receiving better education to break the constrains of shortness.

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