国際大学
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Home advantage:
The causal effect of attending a local college on future job location

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A research report submitted in partial fulfillment of the requirements of the degree of

MASTER OF ARTS IN
INTERNATIONAL PUBLIC POLICY

at the
INTERNATIONAL UNIVERSITY OF JAPAN
2023

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2023

ABSTRACT OF THE RESEARCH REPORT

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The effect of attending a local college on future job location is often discussed by policymakers but it is difficult to examine the causal relationship. Since location information is highly private, relevant surveys and data are usually unavailable. Hence, there is no sufficient previous research discussing this topic. This research is unique because we use individual data, including past moving experiences, to estimate the causal effect. We used cross-sectional data from the Academia Sinica in Taiwan, which contains information on the birthplace, college, and job locations. By using the instrumental variable model, we found that attending local colleges increases the probability of working in the hometown by forty percentage points. This result corresponds with previous research which uses aggregate data. This finding is essential in academics because our research is the first attempt at using individual data to estimate the causal effect of attending local college on future job locations. For robustness checks, we acknowledge that the above home advantage is more significant in rural than urban areas. It reveals that colleges can play a vital role in providing human capitals in small prefectures. For policy recommendations, since the population is highly concentrated in urban areas in Taiwan, local governments can enhance local college education and advertising to gain efficient human capitals within the prefectures.

Keywords: Mobility, job decision, instrumental variable, location, regional inequality, Taiwan.

ACKNOWLEDGMENT

First of all, I wish to extend my sincere gratitude to my supervisor, Professor Yusuke Jinnai, for his experienced guidance, great kindness and enthusiasm toward education. I am very honored to be his supervisée. Professor Jinnai provides solid support for econometrics, Latex, Beamer, and Stata. All teaching materials are extremely well-organized and connected. Having Professor Jinnai as my supervisor is the best thing at the International University of Japan.

Second, special thanks to Professor Hiroshi Kato, one of the Vice President of the IUJ, for inviting the Taiwanese government to attend the International Public Policy Program. It is my pleasure to be the first member from Taiwan. The curriculum and activities of IPPP enriched my college life and gave me so many memorable moments. I am also very delighted to be the speaker at the IUJ Musubiba-college, discussing Taiwanese Politics with Niigata citizens.

Third, I would like to express my sincere gratitude to my Director-general in the Ministry of Foreign Affairs of Taiwan, Mr. Shyue-yow Chou, who currently works as the Deputy Representative of the Taipei Economic and Cultural Representative Office in Japan. Deputy Representative Chou is the person whom I am most pleased to work with. His selflessness has changed my destiny, allowing me to experience all the wonderful things at IUJ.

Finally, I appreciate my family, fiancée and friends at IUJ for supporting me during the past year. Thank you for accompanying me through some tough times. I would like to share this honor with all of you.

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1 INTRODUCTION

In recent years, rural areas in Taiwan have been facing the problem of population decline. In one of the rural areas, Miaoli, the population has decreased by nearly ten percent. Rural prefectures such as Taitung, Hualien, and Chiayi face the same problem. Since this decrease is concentrated on young people, it seems logical to suggest that the low birth rate is the main reason for the population decline. However, we can find that in large prefectures such as Taipei, Kaohsiung, and Taichung, the population is still growing yearly. This indicates that population overconcentration in cities better explains the decline in rural areas. Therefore, balancing the population outflow in rural areas is a key issue for local governments to retain sufficient labor supply in Taiwan. If one prefecture finds a solid resolution, it can also be applied to other rural prefectures.

From an international point of view, population overconcentration is also a significant issue. Compared to other major developed countries, Taiwan is one of the countries where the population is mostly concentrated in the capital city. According to Capital Cities by Total Population by Country (2023)[1], Taiwan's capital city, Taipei City, comprises 2.7 million people, which constitutes nearly twelve percent of the total population of twenty-three million people. If we follow the definition of the Taipei metropolitan area (including New Taipei City and Keelung City), it accounts for nearly 30% of the total population. Compared to other major developed countries, Japan (30%), France (16%), the United Kingdom (14%), Germany (4%), and the United

[1] Global Firepower. (2023). Capital cities by total population by country. Retrieved July 12, 2023, from GFP: https://www.globalfirepower.com/capital-cities-by-total-population.php

States (2%), Taiwan has the highest level of overconcentration alongside Japan. This explains why population overconcentration is a popular issue in Taiwan and Japan.

Brueckner and Lall (2015) demonstrates that people tend to move from rural areas to pursue their dreams in cities, especially in developing countries. However, even compared to other major developing countries, Taiwan's population overconcentration is still the highest. Egypt (20%), Mexico (18%), Bangladesh (13%), China (2%), and India (2%) face a different level of population overconcentration than Taiwan. This finding demonstrates that the population overconcentration is significantly severe in Taiwan, which is worth further research.

The Taiwanese Government has worked on investigate the reason for population overconcentration. Education and job opportunities are considered to be the two main reasons people move from their hometown to Taipei. A lack of high-quality education and job opportunities can explain why young people are leaving rural areas.

In the case of Taiwan, creating more universities has been seen as a suitable policy to ensure human capital resource. Local governments claim that more universities in local areas can prevent high school students from moving outside, increasing the possibility of local people working in their hometowns after graduation. However, there is no sufficient prior studies examining the causal relationship between attending local college and labor market entry. Most of the studies only demonstrate a correlation between these two choices. Therefore, this research attempts to examine the said causal effect. In particular, it will focus on the relationship between college location and future job location. If this research successfully shows that local college

education can affect future entry into the labor market in Taiwan's context, it will be a solid evidence for the Taiwanese Government to strengthen college education in rural areas. If that is the case, the problem of population decline in rural areas can be eased.

The outline of this paper is as follows. Session 2 discusses the previous studies on the relationship between college education and the labor market. In Session 3, an econometric model was adapted to examine the effect of attending a local college on future job location based on cross-sectional data from the Survey Research Data Archive, Academia Sinica in Taiwan. Regression results and robustness checks will be shown in Session 4. Finally, Session 5 concludes the main points of this paper and offers some policy suggestions for the Taiwanese Government.

2 LITERATURE REVIEW

Previous studies have focused on the relationship between college location and job location. Groen (2004) showed the correlation that students attending college in a home state are more likely to work in the same state. Jin (2014) indicated that Texas A&M University graduates prefer jobs in Texas because of the natural amenities and shorter commute time. Therefore, graduates tend to work in a place near their university. Other subsidy policies are needed if local governments want to compensate for this kind of hometown preference.

Salary is the most direct attribute to encourage moving. Previous studies have examined the relationship between salary and job location. For example, Moretti (2013) illustrated that cities in the United States which experienced large increases in the proportion of college graduates also have large increases in average wages. This

finding can explain why college graduates want to work in cities. Wang (2016) also found that the location of a young worker's entry into the labor force affects his future wage growth. The speed of wage growth was faster if a worker entered the labor force in a large city. These studies revealed that graduates emigrate to cities because of the higher salary levels.

However, some studies found no significant difference between cities and rural areas as regards earning and mobility. For instance, Suhonen (2013) demonstrated no positive average earnings premium for metro area graduates after considering students' family characteristics. Krabel and Flöther (2014) also found that graduates from urban and rural regions were both likely to leave the university region. These studies showed that the results highly depend on different countries' policies or cultural factors. Therefore, examining if the results suit the local context is necessary. This research has significant meaning in regional studies because previous research seldom mentions the mobility issue in Taiwan.

The above studies explained why graduates want to work in cities. However, why young students want to study in cities must still be determined. One possible reason is the need for more educational opportunities in rural areas. Ballarino et al. (2022) found that after the Higher Education Institute (HEI) policy was implemented in the 1980s in Italy to increase universities across the country, students' mobility decreased to a shorter distance, less than one hundred kilometers. This study suggests that creating more universities encourages students to remain in local areas, whereas Ballarino stated that this finding only reflects college enrollment decisions. That is, their mobility after graduation is still unclear and needs to be examined.

Another possible reason students want to study in cities is that they can have better job opportunities if they attend universities in cities. Ehrenfried (2022) showed that moving regionally for university shapes later job mobility. If students move to high school or university at an early stage, it will increase their mobility in the job market after graduation. This finding can explain why students move to study in cities at an early age. It implies that moving for college originated from moving for a job. Hence, the relationship between the college and job locations is worth further research.

Previous research has studied the relationship between college education and labor market entry. Some studies (Groen, 2004; Jin, 2014) found that students attending college in a home state are more likely to work in the same state. On the other hand, Ding (2021) indicated that a college education can also increase students' mobility, making them more likely to emigrate from rural areas. Therefore, depending on cultural differences, college education has two opposite effects on students' future job location. It is necessary to examine whether these research findings apply to the Taiwan context.

Due to regional inequality in Taiwan, our research question focuses on how to encourage college graduates to work in their hometown. This research is inspired by Groen's paper (2004), which successfully demonstrated the correlation between attending a local college and working in the same area. Although he suggested that the instrumental variable (IV) model is an adequate method to estimate the causal effect of studying in one’s hometown on working in one’s hometown, he also mentions that a valid IV is difficult to find. Therefore, this research aims to examine the causal effect by applying an IV model.

3 DATA AND EMPIRICAL STRATEGY

3.1 Data

Although previous research (Groen, 2004) has mentioned the importance of estimating the local college effect on future job locations, relevant research is difficult to conduct due to data unavailability. Location is highly individual information, and it seldom appears in most surveys. In order to estimate the local college effect on future job locations, the data should at least contain three pieces of information: hometown, college attended, and current job location, which makes it extremely difficult to collect sufficient materials for this research.

Fortunately, the above three pieces of location information are included in the Panel Study of Family Dynamics: RI2016, collected by the Survey Research Data Archive, Academia Sinica in Taiwan. The survey has been conducted every five years from 1920 to 2020 to add new samples. Among them, only the 2009 and 2016 surveys contain the three key pieces of information. We choose the year 2016 version because it is the newest data and reflects the recent situation in Taiwan.

The data contain postcodes of the individual's birthplace, the place lived the longest before age sixteen, college, and current job locations. Since the analyzing unit of this paper is prefecture level, we transferred the postcodes to the correspondent prefectures. The data also include personal information such as age, gender and family background. The summary statistics are as following.

Table 1: Summary Statistics

	Obs	Mean	S.D.	Min	Max
Age	1060	28.49	2.30	25	32
Male	1060	0.52	0.50	0	1
Married	1060	0.18	0.38	0	1
Siblings	1060	1.66	0.84	0	7
Father's schooling	1060	11.47	3.31	6	21
Work in Hometown	1060	0.69	0.46	0	1
Study in Hometown	1060	0.42	0.49	0	1

Table 2: Variable Description

Variable name	Variable label
Age	Age in years in 2016
Male	=1 if male, =0 if female
Married	=1 if married, =0 if otherwise
Siblings	Number of siblings
Father's schooling	Schooling years of individual *i*'s father
Work in hometown	=1 if work in the hometown, 0 if otherwise
Study in hometown	=1 if attended local college, 0 if otherwise

Table 1 presents the descriptive statistics. Table 2 explains the definition of variables. The original sample size was 1,972, while location information was not answered by every individual in the data. We deleted all individuals if they did not answer all of the 3 key questions: hometown, college, and job location. Moreover,

since this paper examines the effect of attending college, we also eliminated individuals without a college degree. The final sample size became 1,060.

For the individual characteristics, this dataset contains Taiwanese people aged twenty-five to thirty-two years old. Among all individuals, fifty-two percent are male; forty-eight percent are female. Eighteen percent of them are married. These numbers resemble the real distribution of Taiwanese people, so we can infer that this sample reflects reality in Taiwan's context.

We also include control variables such as marital status, siblings and father's schooling years to examine the model. In Taiwanese society, family ties may be strong factors for future job decisions. We use marital status to represent the impact of spouses and siblings for the shared responsibility of taking care of parents and the father's schooling years for the influence of parents' education on local college attendance.

We used three key pieces of information: hometown, college, and job location, to define the independent and dependent variables. First, an individual's hometown is defined as the prefecture he lived in the longest before the age of sixteen. Although the birthplace may also be an alternative way to identify the hometown, it is possible for an individual to be born in one prefecture but spend most of his time in another prefecture. In that case, his identity toward the hometown may change to where he lived the longest until the age sixteen. Therefore, instead of using the birthplace, we used the prefecture where the individual lived the longest before sixteen as the definition of the hometown.

With the definition of the hometown, we denote the dependent variable Y_i

(working in the hometown) as 1 if an individual's job location is the same as his hometown, and 0 if otherwise. We obtained prefecture information by transferring 368 pieces of postcode information to twenty-two prefectures. There are two main reasons why we used prefecture information to define independent and dependent variables. College education policies are enacted by prefectures rather than towns or villages. Using prefecture information is beneficial for making policy recommendations to local governments. In addition, prefecture information is an adequate unit to analyze. If we use postcodes to define the variables, even attending college or having a job in the next block will be considered as emigrating from their hometown. This definition does not suit experiences in our real lives. Hence, prefecture information is a rational method to examine the research question. Based on the same logic, independent variable C_i is denoted as 1 if an individual's college prefecture is the same as his hometown, 0 otherwise. We regress Y_i on C_i to examine the effect of attending a local college on working in the same prefecture.

Furthermore, to make the results suit the reality of Taiwanese society, we combine three regions to form metropolitan areas. First, we merge Taipei City, New Taipei City, and Keelung City to form Taipei Metropolitan. Second, we combine Hsinchu City and Hsinchu County with Hsinchu Metropolitan. Third, Chiayi City and Chiayi County are merged into Chiayi Metropolitan. The reason we combined the above three areas was because these areas themselves formulate the living zone. It is natural for people in these areas to commute from their houses to colleges or offices, and they do not feel that they are moving to study or work. Therefore, the final number of prefectures became nineteen.

The distribution of our observations is shown in Table 3. There are 330 individuals grew up in Taipei Metropolitan. This number accounts for thirty-one percent of our data. In reality, the population in Taipei Metropolitan occupies 29.36 percent of the total Taiwan population, which matches the proportion in our data. Besides, the data do not have valid samples from Penghu, Kinmen, and Lienchiang, the three small islands in Taiwan. Considering the population in these three prefectures only accounts for less than 0.7 percent, we believe these data reflect the real population distribution.

Table 3: Distribution of Observations

Prefectures	Obs	Percent	Population	Percent
Taipei Metro	330	31.13%	6,841,446	29.36%
Ilan	31	2.92%	449,510	1.93%
Hsinchu Metro	51	4.81%	1,037,990	4.45%
Taoyuan	50	4.72%	2,293,509	9.84%
Miaoli	25	2.36%	535,076	2.30%
Taichung	125	11.79%	2,826,230	12.13%
Changhua	72	6.79%	1,244,148	5.34%
Nantou	35	3.30%	479,244	2.06%
Chiayi Metro	42	3.96%	751,456	3.22%
Yunlin	8	0.75%	664,092	2.85%
Tainan	111	10.47%	1,856,642	7.97%
Kaohsiung	123	11.60%	2,733,964	11.73%
Penghu	0	0%	107,333	0.46%
Pingtung	37	3.49%	798,016	3.42%
Taitung	6	0.57%	212,259	0.91%
Hualien	14	1.32%	318,736	1.37%
Kinmen	0	0%	141,505	0.61%
Lienchiang	0	0%	13,989	0.06%
Total	1060	100%	23,305,145	100%

3.2 Econometric Model

As we discussed in the previous session, previous research (Groen, 2004) has estimated the local college effect on future job location. This research adopted the

same model, which used the econometric model to examine the impact of college location on future job location. The adopted model can be expressed as follows:

$$Y_i = \beta_0 + \beta_1 C_i + \beta_2 X_i + \varepsilon \quad (1)$$

where

Y_i equals 1 if individual *i* is working in his hometown, 0 otherwise;

C_i is 1 if the individual attended college in his hometown, 0 otherwise;

X_i denotes individual and family characteristics as control variables;

ε is the error term;

In this model, we regressed Y_i on C_i to examine the impact of college location on future job location. β_1 shows how much the percentage of graduates changes on working in their hometown if they attended a local college, compared with those who moved to study. X_i is for other control variables, such as gender and age, to examine the model's robustness.

Other than the control variables such as marital status, siblings, father's schooling years, and hometown population we mentioned before, we also used college prefecture and major fixed effects as control variables. Diverse college majors may impact college decisions and future job decisions differently. Using college prefectures and major fixed effects can increase the model's validity.

However, the result is possibly biased if the independent variable *Ci* is correlated with the error term ε. According to previous research (Groen, 2004), hometown preference is considered a strong unobserved factor in the equation. If an individual loves his hometown, he may want to stay there forever. He will choose to

attend a local college and work in his hometown. In this case, the assumption of exogeneity is not satisfied, leading to a biased result.

The IV model is considered effective in solving the problem of endogeneity. As a valid IV, it should not be correlated with the error term ε. It means that the IV should affect the probability of working in the hometown only through the effect of attending a local college. By using the IV model, we can make a causal inference to explain the relationship between attending local colleges and future job locations.

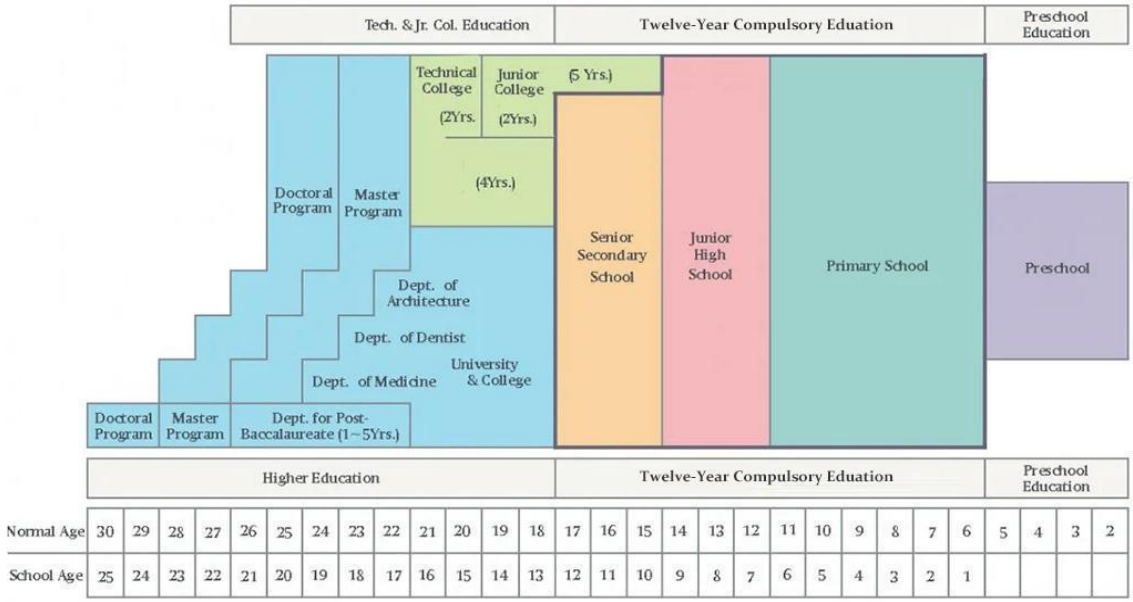
3.3 Instrumental Variable

We used the Stars Recommendation Program as an instrumental variable to solve the problem of endogeneity. There are two main ways colleges recruit high school graduates: the Standardized College Entrance Exam or the Stars Recommendation Program. The Stars Recommendation Program is an educational policy to encourage diversity of college students. It originated from two programs: the Recommendation Program started in 2001 and the Stars Program in 2007. Both of these policies aim to recruit students from diverse regions and family backgrounds instead of only considering the grade. Because of the high similarity, these two programs were combined into the Stars Recommendation Program in 2011.

The educational system in Taiwan is depicted in Figure 1. Compulsory education is nine years, including primary school for six years and junior high school for three years. Twelve-year compulsory education is a long-term goal for increasing the enrollment rate for senior high school. After high school, students are expected to enter college for an additional four-year education. At this stage, students can choose

the Standardized College Entrance Exam or the Stars Recommendation Program, or both, to be enrolled in colleges.

Figure 1: The educational system in Taiwan



Although all senior high school students can take the Standardized College Entrance Exam, not all of them are eligible for the Stars Recommendation Program. Students who want to apply for the Stars Recommendation Program should belong to the top thirty percent of their high school based on grades. Since the competition in high schools significantly varies in each prefecture, the Stars Recommendation Program is often criticized because of its inequality. For example, high schools in Taipei City offer the best education in the country, appealing to many competitive students to enroll in them. Therefore, it is quite difficult for students who have grown up in Taipei City to be in the top thirty percent to apply for the Stars Recommendation Program. On the contrary, students from rural areas may be relatively easy to be in the top thirty percent.

Although many people criticize the inequality among regions, increasing the diversity of students is the key idea of the Stars Recommendation Program. If the Standardized College Entrance Exam is the only way to enter universities, students in Taipei City benefit the most from its abundant education resources. Students from rural areas may be unable to attend top universities because local governments cannot provide equivalent educational environments or recruit as many teachers as Taipei City does. Hence, the Stars Recommendation Program is an affirmative action measure to balance regional inequality, protecting students' educational rights in rural areas.

The reason we believe this instrumental variable satisfies the exclusion restriction is that students do not apply for the Stars Recommendation Program based on their hometown preference. Since the Stars Recommendation Program encourages students from other prefectures rather than local students, it is unrelated to an individual's hometown preference. If an individual strongly prefers his hometown, it is reasonable for him to choose the Standardized College Entrance rather than the Stars Recommendation Program. For instance, if a student grew up in Taipei City and wants to attend college in Taipei City, preparing for the Standardized College Entrance is much easier for him rather than being in the top thirty percent. On the other hand, if a rural area student insists on attending a local college, choosing the Standardized College Entrance is also much easier and more reasonable for him.

Therefore, we decide to use $Star_i$ as an instrumental variable to solve the problem of endogeneity. Out of 163 colleges in 2011, seventy-one colleges provided the Stars Recommendation Program.[2] The number was fifty-five in 2001 because there

[2] These numbers were cited from the Department of Statistics, Ministry of Education.

was only the Recommendation Program during that time. The Stars Program was added in 2007, with additional universities joining the program. Since the age range in our data was between twenty-five and thirty-two when participants answered the survey in 2016, their college enrollment should have been between 2002 and 2009. We define $Star_i$ as equal to 1 if an individual *i*'s college provided the Stars Recommendation Program when they entered colleges, 0 otherwise. Moreover, because the Recommendation Program started in 2001, and the Stars Program was added in 2007, we divided our samples into two parts: individuals who had reached eighteen and those who were under eighteen in 2007. Students under eighteen in 2007 benefited from the new policy of the Stars Program, so we use the number seventy-one to denote $Star_i$. In contrast, we applied the number fifty-five to the group aged below eighteen in 2007 because they experienced only the Recommendation Program.

It is natural to consider that individual-level data are ideal for clearly identifying who applied for the Stars Recommendation Program. However, due to data unavailability, we do not have individual data about the Stars Recommendation Program. Besides, Matthias and Fabian (2011) uses the college-level instrumental variable "ERASMUS" to instrument the independent variable "Studying Abroad". They define colleges that provide ERASMUS programs as 1, 0 otherwise. Therefore, using college-level data is still a reasonable choice. The first regression equation is as below:

$$C_i = \alpha_0 + \alpha_1 Star_i + \alpha_3 Z_i + v \quad (2)$$

where

C_i is 1 if the individual attended college in his hometown, 0 otherwise;

$Star_i$ is 1 if individual *i*'s college provides the Stars Program;

Z_i represents individual and family characteristics as control variables;

v is the error term;

Based on the above discussion, we believe that $Star_i$ is not correlated with the error term ε in equation (1), and it is a valid IV. Z_i denotes the same control variables as equation (1) to represent the individual and family characteristics. Regression results will be presented in the next session.

4 EMPIRICAL RESULTS

4.1 First Stage Regression Results

Table 4 shows the first stage regression results. Previous research (Staiger & Stock, 1997) indicates that the F-ratio should reach 10 to be a valid IV. Our resulting 16.6923 F-ratio satisfied the requirement. Hence, $Star_i$ does not have a weak IV problem. The coefficient of $Star_i$ is -0.1365, which is significant at a one percent significance level. The negative number shows that if a college provides the Stars Recommendation Program, the probability of an individual studying in his hometown will decrease. This result corresponds with our expectation in Session 3: the Stars Recommendation Program encourages students to attend college in other prefectures.

Table 4: First Stage Regression Results

Variables	Coefficients
Star	-0.1365***
	(0.0335)
Age	-0.0036
	(0.0064)
Male	0.0247
	(0.0310)
Married	0.0039
	(0.0388)
Siblings	-0.0229
	(0.0171)
Father's schooling	-0.0063
	(0.0044)
College Prefecture F.E.	YES
Major F.E.	YES
Constant	0.9055***
	(0.2206)
N	1,060
R^2	0.2198
F-ratio	16.6923

*R*obust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 Main Regression Results

Table 5 depicts the main regression results. Columns (1) and (2) are the results of ordinary least squares (OLS) regression. Columns (3) and (4) show the results of IV regression. Column (1) uses individual characteristics, college prefecture, and major fixed effects as control variables. Coefficient 0.3718 is significant at a one percent significance level, demonstrating that attending local college increases the probability of working in their hometown by thirty-seven percentage points. This effect is considered to be reasonable because college is an important period to build social networks related to future occupations. Attending a local college provides more chances to apply for internships in local areas, accumulating more social capital for future job decisions. In contrast, students who leave their hometowns to study may lose these opportunities. At the same time, they may receive other resources by attending colleges in other prefectures. These cases show the importance of a college education for future job decisions.

Table 5: Main Regression Results

	(1) OLS	(2) OLS	(3) IV	(4) IV
Studying in	0.3718***	0.3672***	0.4109*	0.3991*
hometown	(0.0290)	(0.0292)	(0.2144)	(0.2245)
Age	-0.0031	-0.0045	-0.0029	-0.0043
	(0.0058)	(0.0062)	(0.0057)	(0.0061)
Male	0.0605**	0.0566*	0.0594**	0.0557*
	(0.0304)	(0.0306)	(0.0301)	(0.0302)
Married		0.0210		0.0204
		(0.0364)		(0.0358)
Siblings		-0.0365**		-0.0360**
		(0.0175)		(0.0175)
Father's		-0.0064		-0.0061
schooling		(0.0041)		(0.0046)
College	YES	YES	YES	YES
Prefecture F.E.				
Major F.E.	YES	YES	YES	YES
Constant	0.4788**	0.6636***	0.4544*	0.6375**
	(0.1958)	(0.2186)	(0.2334)	(0.2804)
N	1,060	1,060	1,060	1,060
R^2	0.1756	0.1811	0.1742	0.1802

*R*obust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In addition, the effect of being male is statistically significant at a ten percent significance level. The coefficient 0.0605 means that a male is more likely to work in their hometown than a female by 6 percentage points. This figure is also reasonable because a male is still expected to succeed in a family business or heritage in

Taiwanese society. Therefore, the cost of leaving hometown is higher for males than females.

In column (2), after adding family characteristics as control variables, the coefficient of the college effect becomes 0.3672, which is also significant at a one percent significance level. It means that attending a local college increases the probability of working in their hometown by 36.7 percentage points. The downward coefficient change indicates that other factors, such as siblings, also explain the decision about job locations. The effect of siblings is significant at a five percent level. The coefficient of siblings -0.0365 means that if an individual has one more sibling, his probability of working in his hometown will decrease by 3.65 percentage points. This also corresponds with the social reality in Taiwan. Since young people in Taiwan are responsible for taking care of their parents, the more siblings they have, the more possible it is for them to be released from the responsibility. Therefore, there will be a higher probability of leaving their hometown if they have more siblings. In sum, the effect of attending local colleges is a significant force that must be addressed to decide the future job locations.

Column (3) shows the IV result without family characteristics controls. The coefficient of the college effect increases to 0.4109, which is significant at a ten percent significance level. It means that attending a local college can increase the probability of working in their hometown by forty-one percentage points. This result corresponds with previous research (Matthias & Fabian, 2011; Ding, 2021), showing that the IV result is greater than the OLS. Therefore, the real impact of attending local college is larger if we use the IV model to estimate the causal effect.

Column (4) adds family characteristics controls into the IV regression, showing a similar result. The coefficient of studying in one's hometown decreases slightly to 0.3991. This number indicates that attending a local college can increase the probability of working in one's hometown by forty percent. This result corresponds with forty-one percentage points in the previous research (Winters, 2018), which used aggregate data in the United States to examine the effect of birth-state enrollment rates on later-life birth-state residence. This finding is meaningful in academics because we use individual data to examine the validity of aggregate data in previous research.

4.3 Robustness Checks

Since the effect of attending local college can be diverse in urban and rural areas, it is necessary to examine the effect in different regions. We divided our samples into three groups: large, medium, and small prefectures, based on the population of individuals' hometowns. The total population of Taiwan is twenty-three million, distributed in nineteen prefectures as defined in the previous session. Prefectures with a population greater than three million are defined as large prefectures, between two and three million are medium prefectures, and less than two million are small prefectures. The regression results are shown in Table 6 and Table 7.

Table 6 indicates the OLS results by population size. Column (5) examines the effect of attending college in large prefectures. Coefficient 0.1145 is statistically significant at a five percent significance level, which means that attending a local college in a large prefecture will increase the probability of working in the same prefecture by 11.45 percentage points. Compared to the result in column (2), the effect in large prefectures is much lower. The abundance of job opportunities in large prefectures can explain this finding. Even if students choose to study in other prefectures, returning to work after graduation is still highly possible. On the contrary, small prefectures have fewer job vacancies than large and medium prefectures. We can see that the coefficient from columns (5) to (7) shows an upward trend when the population declines. It demonstrates a home advantage to enter the local labor job market. Attending local colleges in small prefectures can accumulate more local social capital, being more accessible to job opportunities.

Table 6: Robustness Check by Population Size (OLS Results)

	(5) OLS Large prefectures	(6) OLS Medium prefectures	(7) OLS Small prefectures
Studying in	0.1145**	0.2508***	0.4489***
hometown	(0.0448)	(0.0481)	(0.0467)
Age	-0.0145*	-0.0130	0.0022
	(0.0086)	(0.0122)	(0.0104)
Male	-0.0013	0.0348	0.1187**
	(0.0412)	(0.0580)	(0.0520)
Married	0.0084	0.1496**	-0.0096
	(0.0542)	(0.0629)	(0.0625)
Siblings	-0.0521*	-0.0259	-0.0157
	(0.0287)	(0.0337)	(0.0289)
Father's	-0.0077	-0.0190**	-0.0032
schooling	(0.0052)	(0.0084)	(0.0071)
Major F.E.	YES	YES	YES
Constant	1.2998***	1.1338***	0.4487
	(0.3308)	(0.4115)	(0.3543)
N	330	298	432

*R*obust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We also use the IV model to examine the effects, as shown in Table 7. There is also an upward trend from columns (8) to (10), demonstrating that the smaller a prefecture is, the more important it is for local colleges to provide human capital. The only difference is that the coefficient in large prefectures is not statistically significant in the IV model. This finding corresponds with our expectation that colleges in large prefectures only have a limited effect on labor market entry because sufficient job opportunities in large prefectures substitute for the impact of college locations. To summarize, local colleges are important in providing human capital, especially in small prefectures.

Table 7: Robustness Check by Population Size (IV Results)

	(8) IV Large prefectures	(9) IV Medium prefectures	(10) IV Small prefectures
Studying in hometown	-0.4527	0.6153**	0.8492***
	(0.3642)	(0.2764)	(0.2992)
Age	-0.0127	-0.0068	0.0016
	(0.0096)	(0.0135)	(0.0110)
Male	0.0142	0.0144	0.0990*
	(0.0439)	(0.0615)	(0.0572)
Married	-0.0323	0.1292**	0.0020
	(0.0710)	(0.0693)	(0.0647)
Siblings	-0.0352	-0.0246	-0.0102
	(0.0320)	(0.0330)	(0.0320)
Father's schooling	-0.0096	-0.0104	0.0029
	(0.0059)	(0.0105)	(0.0084)
Major F.E.	YES	YES	YES
Constant	0.9962*	0.8153*	0.3236
	(0.5078)	(0.4901)	(0.3868)
N	330	298	432

*R*obust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 CONCLUSION AND POLICY RECOMMENDATIONS

In conclusion, attending local colleges increases the probability of working in one's hometown by forty percent. This finding is academically important because our research used individual data to estimate the effect of attending local college on future job locations. The accumulation of social capital can explain why attending a local college increases the probability of working in one's hometown. If an individual studies in his hometown, he will have more local connections and internship opportunities than those who left their hometown after graduating from high school.

As we discussed in previous sessions, this paper also encountered some difficulties. First, it used college-level data as the instrumental variable, which can be improved by using individual data. Future studies can try to collect personal information to specify the causal effect. Second, due to the data unavailability, this paper could not identify the information on the Stars Recommendation Program in each year between 2002 and 2009. Future studies can improve this particular part of the research if relevant data are available.

This research indicates the importance of local college education on future job location. Attending a local college can increase the probability of working in one's hometown. For policy recommendations, local governments can enhance local college education to keep human capital inside the prefecture. In particular, college in rural areas should be more active on strengthening its advertising because the effect of attending local college is more significant in rural areas than urban areas.

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