University Choice and Students' Migration: An Application of the Heckman Model*

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Abstract: This study attempts to elucidate the migration patterns of Korean high school students choosing a university. Estimating a migration equation without considering sample-selection bias would yield incorrect results. Thus, this study used the Heckman model. We found that the sample selection bias would be serious in the case of students living in Seoul. We also found that students living in small towns had a 13.1 percent higher probability of migrating than those residing in Seoul, and an 8.2 percent higher probability than those living in other big cities. The differences in the migration probabilities can be interpreted as a preference for metropolitan areas. A simple policy that provides physical and financial resources to the universities would not be successful. A higher-education policy is likely to be effective only when it is implemented in coordination with the cultural and economic policies of the region.

Keywords: university choice, migration, preference for metropolitan areas, Heckman model

INTRODUCTION

Most of the empirical studies on Korean educational issues have concentrated on the determinants of students' test scores and enrollment in university. When high

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school students choose a university, they also need to decide whether to stay in their hometown or move to another location. So far, Korean socioeconomic resources have been heavily concentrated in metropolitan areas. The migration of high school students makes this social problem more serious and is thus a meaningful research topic.

This study focused on the migration of Korean high school students from their hometowns to places where universities are located. Among the various determinants of the migration choice, special attention was paid to the apparent preference for metropolitan areas. Empirical questions concerning the extent of this preference and how it affects students' choices were investigated.

Table 1 shows the distribution of the hometowns of students enrolled in Seoul National University and in two other national universities—Kyungpook National University at Daegu and Hanbat National University at Daejeon.[1]

Table 1. Distribution of Students' Hometowns

	Seoul National University		Kyungpook National University		Hanbat National University	
	Number	Percentage	Number	Percentage	Number	Percentage
Capital						
Seoul	1,206	38.3%	28	0.7%	3	0.3%
Big cities						
Busan	239	7.6%	141	3.4%		
Daegu	199	6.3%	2,592	62.6%		
Incheon	138	4.4%	12	0.3%		
Gwangju	122	3.9%	4	0.1%	1	0.1%
Daejeon	127	4.0%	23	0.6%	739	80.2%
Small towns						
Gyeonggi-Do	464	14.7%	43	1.0%	5	0.5%
Gangwon-Do	63	2.0%	21	0.5%	1	0.1%
Chungcheong-Do	144	4.6%	45	1.1%	153	16.6%
Jeolla-Do	164	5.2%	19	0.5%	7	0.8%
Gyeongsang-Do	286	9.1%	1,213	29.3%	12	1.3%
Total	3,152	100.0%	4,141	100.0%	921	100.0%

Source: Downloaded from individual homepage.

Notes: Ulsan and Jeju-Do are integrated into Gyeongsang-Do and Jeolla-Do, respectively. Southern and northern districts are not separated.

1. Almost no other Korean universities formally report this information.

As table 1 shows, in the case of Seoul National University, 38.3 percent of the students are originally from Seoul, 26.2 percent are from the five big cities in Korea, and the remaining students come from small towns. The situation is quite different at both Kyungpook National University and Hanbat National University. Although Kyungpook National University is one of the top 20 universities in Korea, 62.6 percent of its students are from Daegu itself. This percentage increases to 95.3 percent if neighboring regions such as Busan and Gyeongsang-Do are considered part of the same region. Only 0.7 percent of the students at Kyungpook National University are from Seoul. Hanbat National University shows a similar distribution, with a higher proportion of students, 96.8 percent, coming from Daejeon and neighboring Chungcheng-Do.

Some argue that a difference in quality between Seoul National University and the other two institutions is probably the reason behind the difference in distribution patterns. However, there is more than one reason. As shown in table 2, 13 of the top 20 universities are located in Seoul. Thus there are a significant number of high-quality universities in non-Seoul regions. There are also 38 unranked universities in Seoul. This suggests that high school students living in Seoul are not likely to enroll in universities located outside of Seoul.

Table 2. Locations of the Top Twenty Universities

Ranking	Name	Location	Ranking	Name	Location
1	KAIST	Not Seoul	11	Inha	Not Seoul
2	Seoul National	Seoul	12	Ewha Women's	Seoul
3	POSTEC	Not Seoul	13	Chung-Ang	Seoul
4	Korea	Seoul	14	Konkuk	Seoul
5	Yonsei	Seoul	15	Pusan National	Not Seoul
6	Sungkyunkwan	Seoul	16	Kyungpook National	Not Seoul
7	Hanyang	Seoul	17	The Univ.of Seoul	Seoul
8	Kyunghee	Seoul	18	Ajou	Not Seoul
9	Sogang	Seoul	19	Chonnam National	One of the five big cities
10	HUFS	Seoul	20*	Hongik	Not Seoul

Source: Joong-Ang Ilbo 2009.

* Chonnam National University and Hongik University are tied in rank.

After a review of the existing literature on students' migration, this article will describe the model, methodology, and data used in the study, present estimation results, and suggest some conclusions that can be drawn from them.

LITERATURE REVIEW

Empirical studies on students' migration to attend university can be grouped into two categories: those that use state- or university-level data and those that use individual-level data.

According to Tuckman (1970), in the United States, students from states with a high per capita income or high tuition fees are more open to migration. Further, students from states with many public schools tend to be less mobile. State-sponsored financial aid seemed to have no significant effect on student migration.

Kyung (1996), who analyzed students moving to New York, found that the farther the hometown was located from New York, the less likely it was that students would move. On the other hand, the higher the per capita income of the students' hometown, the more likely they were to migrate. Nixon and Hsing (1994) conducted a similar study and showed that the quality of educational services and factors such as whether the universities are private or public became critical variables for students' decision to migrate. Further, Baryla and Dotterweich (2001) showed that universities that provide high-quality educational services have a relatively larger number of nonresidential students, and there is a positive correlation between the economic conditions in the state where the university is located and the net migration of students to that university.

In summary, the quality of educational services, tuition fees, and the economic conditions in the area surrounding the university are deterministic variables in choosing among universities in different regions of the United States. The above-mentioned studies only took into account the characteristics of the states and universities as factors determining students' migration; the characteristics of the students and their households were ignored. The one exception was Fenske (1974), who found that students with higher ACT scores are more likely to move between states when choosing a university.

The unique contribution of our study is the use of the student- and household-level data in exploring the decision-making process related to choice of university. This made it possible to study these choices at the micro level rather than the macro level. For example, variables such as test scores, household income, and parents' educational level were considered.

MODEL, METHODOLOGY, AND DATA

Model

In the simple model, the dependent variable is represented by whether or not a student migrates in order to attend university.[2] The migration choice may be determined by the student's characteristics, the quality of the university, and the economic conditions of the region where the university is located.[3]

The model was expressed in the form of Equation (1):

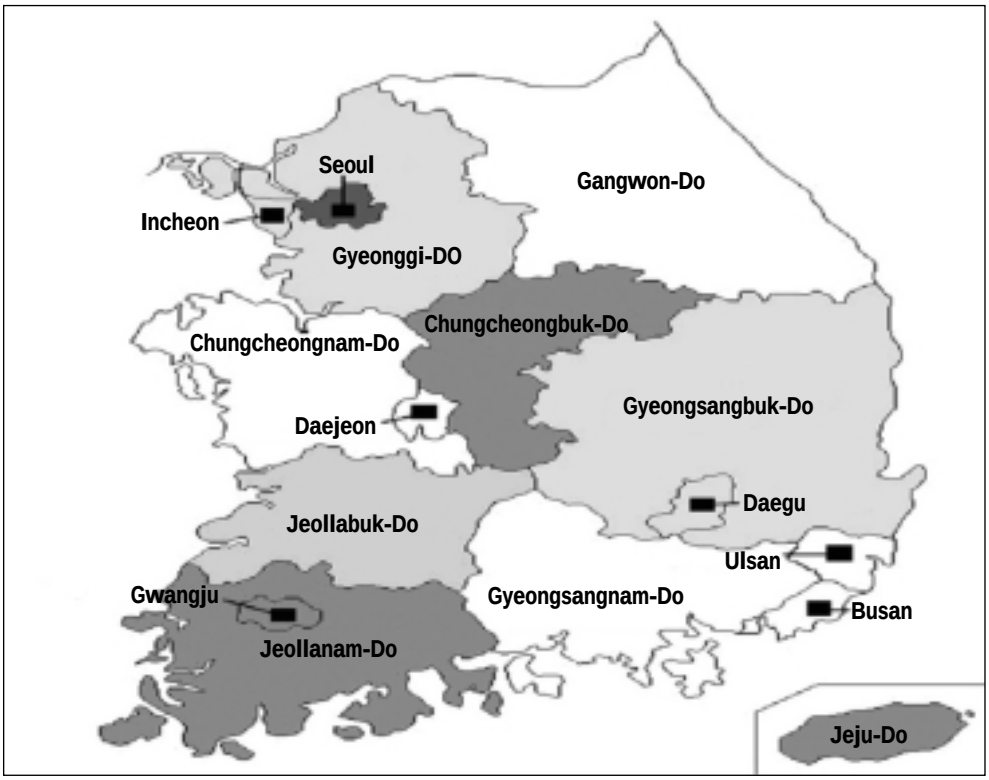
$$Y_{ijk} = \alpha I_i + \beta C_j + \gamma R_k + \delta D_i + \varepsilon_{ijk} \quad (1)$$

where the dependent Y_{ijk} variable is student i's migration to attend university j in region k. Y_{ijk} has a value of 1 if student i migrates and 0 if he or she does not. I_i is a vector of student i's characteristics, C_j is a vector of university j's quality, R_k denotes the economic conditions in the region k where university j is located, and D_i is a vector of the variables that represent the characteristics of student i's hometown.

More explanations of the dependent variable would be helpful to better understand the model. As shown in figure 1, we redefined 10 regions by integrating the six big cities and the nine Dos. It is reasonable to define an area on the basis of its geographical proximity to other regions while investigating students' migration. Moving between two cities within the same region would not be considered migration, and the dependent variable would become zero. For instance, it is not considered migration when a student residing in Jeollanam-Do goes to a university in Gwangju.

2. In addition, the selection equation is estimated in the Heckman model. The enrollment equation is used as a selection equation in this study. A dependent variable in the enrollment equation is whether the student enrolls in a university or not.
3. McHugh and Morgan (1984) argued that the student's migration to attend university can be viewed as a human capital investment. Migration will be worthwhile if the net benefits of the migration exceed its costs. The benefits of moving to a given state would include both the psychic benefits and the potential economic benefits of locating in an area with a healthy economic climate and strong employment opportunities. Their study included vectors of variables relating to economic conditions and to characteristics of the various states' educational institutions, as well as distance measures to capture the effect of the travel cost.

Figure 1. The Ten Regions Defined for this Study



Student characteristics noted for this study were gender, test scores, and household income. It is expected that male students are more likely to leave their hometowns than female students, because parents do not like their daughters to live away from home. Students with higher test scores have a wider choice of universities available to them and therefore a higher probability of migration. And it is more likely that students from higher-income families will move away from their hometowns, since living away from home incurs a considerable expense.

The quality of the university is another important factor that influences a student's choice. The proportions of graduates who find work or advance to graduate programs have been used as proxy variables for the quality of a university.[4]

4. These variables do not perfectly represent the quality of a college. It has been suggested that the reputation of a college or the quality of the employment of graduates would be good indicators of the college's quality. Using more comprehensive data in the future, the effect of the college's quality on the student's choice could be controlled better.

Baryla and Dotterweich (2001) also found that the economic conditions of the region in which the university is located could be a primary determinant of a student's decision regarding migration.[5] The local unemployment rate and the gross regional domestic product (GRDP) per capita were included as explanatory variables in this study.[6] The average regional income or local tax revenues are more directly related to the regional economic level. From the students' perspective, job opportunities are more meaningful. Both unemployment and output level would be better proxy variables for regional economic capacity.

Students' hometowns were categorized by two dummy variables—Seoul and the big cities—in order to capture the regional differences in migration probabilities, which are not controlled by other explanatory variables. It can be argued that there exists a preference for universities in the metropolitan areas if the estimates of two dummy variables are negative and statistically significant. The number of universities per thousand high school students was also included as an explanatory variable, because without a sufficient number of universities nearby, students would be forced to migrate. More details on both dependent and explanatory variables are reported in table 3.

Table 3. Variables used in the Study

Variable	Definition
Dependent variables	
Enrollment*	1 if enrolled in a university, 0 otherwise
Migration	1 if migrated, 0 otherwise
Explanatory variables	
Gender	1 if male, 0 if female
Test score	Sum of the KSAT scores for Korean, mathematics, and English
Household income	Monthly household income
Parents' education	1 if the parents together have 24 or more years of education, 0 otherwise
Universities per 1,000 students	Number of local universities per 1,000 high school students
Employed	Proportion of graduates who are employed
Graduate programs	Proportion of graduates who advance to graduate programs
Local unemployment rate	Unemployment rate of the region where the university is located
GRDP per capita	Gross regional domestic product per capita of the region where the university is located
Seoul	1 if graduated from a high school in Seoul, 0 otherwise
Big cities	1 if graduated from a high school in one of the five big cities, 0 otherwise

* The enrollment equation was estimated only in the Heckman model.

5. General theories on migration between the urban and rural sectors within a developing country include the Lewis and the Harris-Todaro models. Harris and Todaro found that

Methodology

An econometric issue is that the estimates derived from the simple model may be biased due to the sample selection. Migration occurs only after students enroll in a university. For example, if students are offered admission to a university located outside of their hometown, they will not enroll in that university if they do not want live apart from their parents.

Using the sample of students who had already enrolled in university in a simple probit regression, students who had chosen not to enroll in university due to a preference for universities in their hometown were ignored. The Heckman model was used to correct this kind of bias. This model is well known as a remedy for sample selection bias. It enabled us to obtain an unbiased estimator using the maximum likelihood estimation method.

Heckman suggested a simple way to get unbiased estimates for Equation (1). In the first stage, whether to enroll in a particular university or not was regressed on the relevant determinants.[7] The rho (ρ), which measures the correlation between two equations, was estimated. In the second stage, we ran the probit regression on a selected sample. The estimated ρ was used as one of the explanatory variables in the migration equation.

Formally, students decide to enroll only if the net utility of the enrollment is greater than zero, that is:

$$E_i = \begin{cases} 1 \text{ if } U(E_i = 1) > 0 \\ 0 \text{ ohterwise} \end{cases} \quad (2)$$

where E_i is a dichotomous variable representing the enrollment decision of student *i*. Also, the dependent variable in Equation (1) has the value of 1 only if the net benefit of the migration is greater than zero. Therefore, the mean value of the dependent variable is given as

$$E(Y_i \mid U(E_i) > 0) = E(\alpha I_i + \beta C_j + \gamma R_k + \delta D_i + \varepsilon_{ijk} \mid E_i = 1) \quad (3)$$

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attempting to lower unemployment by creating jobs would increase urban unemployment. In any case, urban employment itself is not the subject of this study. Unemployment is one of the independent variables that have an effect on students' decisions

6. GRDP per capita is defined as GRDP divided by the economically active population—which yields a larger value than GRDP divided by the total population.
7. The enrollment decision was assumed to be determined by the student's gender, test score, household income, and parents' educational levels, and by the 16 regional dummy variables.

Data

This study used data from the first and second (2004 and 2005) editions of the Korean Education and Employment Panel Survey, compiled by the Korean Research Institute for Vocational Education and Training. Two thousand senior high school students participated in the survey in 2004. The local unemployment rate and GRDP per capita were obtained from the Korea National Statistical Office.

Only those students who had participated in both surveys, conducted in consecutive years, and had taken the English, mathematics, and Korean sections of the KSAT were included in the sample. We also dropped the students with no household income and those whose university provided odd information (for example, some universities reported that more than 100 percent of graduates were employed or had advanced to graduate programs). As a result, the sample size was reduced to 1,019.

Table 4. Summary Statistics of the Variables used in the Regression

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Migration	1,040	0.24	0.43	0	1
From Seoul or one of the five big cities	449	0.16	0.37	0	1
Enrollment	1,360	0.76	0.42	0	1
Gender	1,520	0.55	0.50	0	1
Test score	1,520	146	67.3	5	297
Household income	1,446	$3,300	$2,000	$130	$18,000
Parents' education	1,463	0.70	0.46	0	1
Universities per 1,000 students	1,520	0.44	0.21	0.10	0.85
Employed	738	66.7%	10.4%	43.5%	98.2%
Graduate programs	738	9.5%	4.8%	0.2%	49.5%
Local unemployment rate	1,040	3.3%	1.0%	1.7%	4.7%
GRDP per capita	1,040	$36,000	$7,780	$22,700	$81,500
Seoul	1,520	0.26	0.44	0	1
Big cities	1,520	0.24	0.42	0	1

Table 4 shows the summary statistics of the variables used in the regression. In our data, 1,520 students provided their gender, test scores, and hometowns. About 55 percent were male, and 26 percent resided in Seoul. Another 24 percent of the sample were from the five big cities. Therefore, 50 percent of the students had graduated from high schools in small towns. Among the students whose related information was

reported, 76 percent enrolled in a university and 24 percent migrated to do so. The migration rate of Seoul and big city students was 16 percent, much lower than that of small-town students. The average employment rate of graduates was 66.7 percent, ranging from 43.5 to 98.2 percent. On average, 9.5 percent of graduates advanced to a graduate program. Appendix 1 indicates that the explanatory variables of the model are not correlated with each other. There is no concern on the multicollinearity problem.

ESTIMATION RESULTS

The estimation results of the simple model presented in table 5 show that male students with high test scores and high household incomes are more likely to migrate to attend university, although the estimates are not statistically significant. The number of universities per thousand students turned out to be an insignificant variable. As expected, good economic conditions in the region neighboring the university is another factor that attracts students. The lower the unemployment rate in a region, the more likely students are to move there.[8] Also, the positive estimates in the "employed" and "grad-

Table 5. Estimation Results

	Simple model			Heckman model					
	Migration equation			First stage: Enrollment equation*			Second stage: Migration equation		
	Estimate	Z	Pr>|z|	Estimate	Z	Pr>|z|	Estimate	Z	Pr>|z|
Gender	0.188	1.70	0.090	-0.121	-1.42	0.156	0.168	1.32	0.187
Test score	0.001	1.40	0.161	0.001	1.08	0.276	0.001	1.47	0.140
Household income	0.0002	0.67	0.504	-0.001	-3.27	0.001	0.0001	0.19	0.851
Parents' education				-0.078	-0.72	0.474			
Universities per 1,000 students	0.385	1.52	0.129				0.376	1.48	0.139
Employed	0.019	3.46	0.001				0.019	3.27	0.001
Graduate programs	0.051	3.79	0.000				0.050	3.55	0.000
Local unemployment rate	-25.830	-3.84	0.000				-25.430	-3.61	0.000
GRDP per capita	0.012	1.60	0.109				0.012	1.58	0.114
Seoul	-0.504	-2.79	0.005				-0.490	-2.64	0.008
Big cities	-0.291	-2.05	0.040				-0.285	-1.98	0.047
(Constant)	-2.463	-4.84	0.000				-2.518	-5.02	0.000
Log-likelihood	-368.90						-977.09		
Sample size	721						1,019		

*: The estimates of the regional dummy variables representing the effect of 16 administrative districts are not reported.

uate programs" categories indicate that students are more likely to enroll in a university providing a high-quality education.

One interesting result is that the estimates of the "Seoul" and "big cities" variables have a negative sign. This finding tells us that students who live in metropolitan areas are less likely to migrate than those who live in small towns. The preference for universities in metropolitan areas encourages high school students residing in the metropolitan areas to stay there, while it encourages students living in small towns to leave their hometowns.

The estimation results of the Heckman model are also reported in table 5. Household income has been proved to affect students' enrollment decisions. Also, although not reported in table 5, it was found that students from Seoul are less likely to enroll in university than those from non-Seoul regions. Roughly speaking, the estimates of the migration equation are similar to those obtained from the simple model. However, most of the estimates become smaller in absolute value. The estimates for the "employed" and "graduate programs" variables were 0.018 and 0.050, respectively. The effect of living in Seoul and the big cities was also reduced. There was an upward bias in the estimates of the simple model due to the sample selection.[9]

Migration was found to be mainly determined by university quality and regional attractiveness rather than students' individual characteristics. Even though the estimates of gender, test score, and household income were statistically significant in the simple model, they were not meaningful in the Heckman model. Estimating the Heckman model by replacing the "Seoul" and "big cities" variable with the "capital" variable (1 if graduated from a high school in Seoul or in Gyeonggi-Do, 0 otherwise), we were able to figure out the differences in the migration possibilities for the capital and other areas. As shown in appendix 2, the estimate of the capital variable was not statistically significant. This suggests that students living outside the capital area are more likely to move within that area than into the capital area.

The migration probabilities of students living in Seoul and the big cities are reported in table 6. As mentioned above, the main purpose of this study was to understand the migration pattern. While the migration probabilities have been calculated only for the students who enrolled in a university in the simple model, two types of probabilities were calculated in the Heckman model. Those are "intersectional" and "conditional" probabilities. The former represents the likelihood of the occurrence of both enroll-

8. The estimate of the local unemployment rate is high because the measurement unit is a percentage.
9. According to the likelihood ratio test, the hypothesis that rho = 0 was rejected at the 1 percent significance level.

ment and migration. The latter indicates the migration probabilities given the occurrence of enrollment.

Table 6. Migration Probabilities

	Simple model			Heckman model					
	Pr (migration)			Pr (enrollment and migration)			Pr (migration enrollment)		
	Estimate	Z	Pr > | z |	Estimate	Z	Pr > | z |	Estimate	Z	Pr > | z |
Students living in Seoul	-0.132	-3.35	0.001	-0.093	-3.27	0.001	-0.131	-3.28	0.001
Students living in the big cities	-0.084	-2.17	0.030	-0.058	-2.17	0.030	-0.081	-2.17	0.030

Note: The probabilities are relative values compared to those of the students from small towns.

In the simple model, students living in Seoul are 13.2 percent less likely to migrate than those from small towns, while students living in the big cities have an 8.4 percent lower chance of migration. In the Heckman model, the intersectional probabilities are changed to -9.3 percent and -5.8 percent, respectively. Being conditioned on enrollment, the migration probabilities of Seoul and big city students become less than those of small town students by 13.1 percent and 8.2 percent.

Once again, we found that the sample selection bias should not be ignored in estimating the migration equation of high school students. Also, it may be more serious in the case of Seoul students. There are a significant number of students living in Seoul who do not enroll in university due to a preference for universities in their hometowns.

CONCLUDING REMARKS

In theory, various factors such as the number of universities nearby, the quality of a university, a student's individual attributes, and regional economic conditions could affect students' university choices. Based on micro-level data, this study investigated how much those factors affect a student's decision to migrate to another region.

After controlling for the effect of individual, collegial, and regional characteristics, a difference in migration probabilities was found between students in metropolitan areas and those in small towns. This unexplained difference might be caused by a preference for the metropolitan areas. This phenomenon may represent the concentration of economic and social resources in the metropolitan areas. It is known that an imbalance in growth between metropolitan and nonmetropolitan areas is a common feature of developing countries.

If university graduates prefer to find a job in a region with which they are familiar

and companies hire a fair share of local students, then students' migration into the metropolitan areas would be linked to urban concentration. As more economic resources are concentrated in the metropolitan areas, the preference for metropolitan areas becomes stronger. This attracts more students to those areas, creating a vicious circle between students' migration and urban concentration.

This study does not provide an answer to the question of why the preference for metropolitan areas exists. Nevertheless, if high school students prefer universities in metropolitan areas due to the social, cultural, and economic merits of the region, the policy implication is simple. A simple policy that provides physical and financial resources to the universities would not be successful. A higher-education policy is more likely to be effective when it is implemented in coordination with the social, cultural, and economic policies of the specific region.

REFERENCES

Baryla, E. A., and D. Dotterweich. 2001. Student migration: Do significant factors vary by region? *Education Economics* 9(3):269-80.

Fenske, R. H. 1974. Recent trends in studies of student migration. *Journal of Higher Education* 45(1):61-74.

Gribble, C. 2008. Policy options for managing international student migration: The sending country's perspective. *Journal of Higher Education Policy and Management* 30(1):25-39.

Henderson, J. V. 2000. *The effects of urban concentration on economic growth*. NBER Working Paper 7503. Cambridge, MA: National Bureau of Economic Research.

Jang, S., and N. Kim. 2004. Transition from high school to higher education and work in Korea, from the competency-based education perspective. *International Journal of Educational Development* 24(6):691-703.

Joon-Ang Ilbo. 2009. University rankings 2009. http://univ.joins.com/portal.

King, R., and E. Ruiz-Gelices. 2003. International student migration and the European "year abroad": Effects on European identity and subsequent migration behaviour. *International Journal of Population Geography* 9(3):229-52.

McHugh, R., and J. N. Morgan. 1984. The determinants of interstate student migration: A place-to-place analysis. *Economics of Education Review* 3(4):269-78.

Nixon, F. G., and Y. Hsing. 1994. The determinants of out-of-state enrollments in higher education: A Tobit analysis. *Economics of Education Review* 13(4):329-35.

OECD (Organisation for Economic Co-operation and Development). 2008. *Education at a glance*. Paris: OECD.

Papatsiba, V. 2005. Student mobility in Europe: An academic, cultural, and mental journey? Some conceptual reflections and empirical findings. In *International perspectives on higher education research*, vol. 3, ed. M. Tight, 29-65. Emerald Group Publishing.

Tuckman, H. P. 1970. Determinants of college student migration. *Southern Economics Journal* 37(2):184-89.

Appendix 1. Correlation of the Explanatory Variables

	Gender	Test score	Household income	Employed	Graduate programs	Local unemployment	GRDP	Colleges per 1,000 students	Seoul	Big cities
Gender	1.00									
Test score	-0.13	1.00								
Household income	-0.01	0.15	1.00							
Employed	0.06	-0.04	0.11	1.00						
Graduate programs	0.04	0.50	0.12	-0.08	1.00					
Local unemployment rate	-0.08	0.39	0.19	0.14	0.34	1.00				
GRDP per capita	0.00	-0.10	-0.03	0.19	-0.09	-0.41	1.00			
Colleges per 1,000 students	0.01	-0.07	-0.13	-0.11	-0.01	-0.25	0.07	1.00		
Seoul	-0.12	0.13	0.19	0.12	0.11	0.28	0.03	-0.12	1.00	
Big cities	0.08	0.09	0.05	-0.06	-0.01	0.13	-0.23	-0.34	-0.26	1.00

Appendix 2. Estimation Results with Capital Area Dummy

	Heckman model					
	First stage: enrollment equation			Second stage: migration equation		
	Estimate	Z	Pr > | z |	Estimate	Z	Pr > | z |
Gender	-0.121	-1.42	0.155	0.155	1.24	0.216
Test score	0.001	1.10	0.273	0.001	1.44	0.150
Household income	-0.001	-3.31	0.001	-0.0001	-0.18	0.855
Parents' education	-0.081	-0.77	0.442			
Colleges per 1,000 students				0.592	2.29	0.022
Employed				0.018	3.11	0.002
Graduate programs				0.050	3.45	0.001
Local unemployment rate				-24.886	-2.94	0.003
GRDP per capita				0.013	1.70	0.089
Capital				-0.100	-0.61	0.545
(Constant)				-2.750	-4.99	0.000
Log-likelihood				-981.70		
Sample size				1,019		