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THE DETERMINANTS OF STUDENT MOBILITY IN GREECE

Abstract

This study analyzes the determinants of the choice for higher education in Greece. We investigate the relevance of socio-economic factors (income, education, and occupation), the attractiveness of the university and the distance from origin to destination in order to establish a cost function development. A student's decision to migrate depends both upon characteristics of the university and on characteristics of the area such as regional amenities. The stock of students is also an important predictor of student migration.

There are many asymmetries in factors determining migration which cannot capture without the origin and destination data, that is, the total number of student migrants from each origin to all possible destinations. We combine these data with regional and university characteristics in a production-constrained gravity model.

The main finding of the study is that the distance from the area of residence to the destination (university location) doesn't play role as deterrent as considered. We also find that the attractiveness of a university has a positive impact on migration. There is a significant network effect in the migration of students, a result so far undocumented in the literature.

Our results provide new insights into the factors that determine student migration flows and have direct relevance to policy-making in this field.

Key words: student migration, negative binomial regression, higher education

Introduction

Higher Education in Greece is mainly characterized by its public character and the way of accessing to universities. Every year a large number of students in high schools take part in the exams, in order to enter to the university of their choice. The purpose of this paper is to focus on factors that play role in student migration. Studies have found that socio-economic condition of origin, the quality and the size of the university, demographic determinants and distance between home and university location, have significant influence in student mobility. We use a modified gravity model to describe the behavior of potential students in the choice of a university. The model is estimated by applying a negative binomial regression method on Greek student flows data.

Theoretical Background

There is a wide literature on the Spatial Interaction Models (SIM) theory and applications. Spatial interaction flows are estimated using the mass of an origin, the mass of a destination and the distance in geographical regions of interest. Spatial interaction models remain ‘‘some of the most applied geographical techniques’’ (Fotheringham et al. 2000: 214).
Using distance as a predictor of student flow has been referred by several researchers in form of Spatial Interaction Models (Alm and Winters 2009; Dal Bianco et al. 2010; Sá et al. 2004). Studies on student migration have found that the distance between students' homes and universities or colleges is a basic determinant that explains student migration from secondary to higher education (Sa, Florax, & Rietveld, 2006).
Other explanatory factors are socio-economic variables such as family income (Lupi and Ordine 2008; Denzler and Wolter 2011), the cost of renting accommodation or regional per capita income and unemployment rates (Mixon 1992; Kyung 1996; Sà et al. 2004; Faggian et al. 2007).
Other studies assume university characteristics as determinants of student attraction and they find a positive outcome of university quality (Agasisti & Dal Bianco, 2007b). Van Bouwel (2009) presents as one of the measures of quality of education the the rank of countrys' universities within the top 200 of the Shanghai ranking.
The spatial interaction gets the volume of student migration, M, between an origin (i) and a destination (j) as a function of the attributes of the origin, O, the attributes of the destination, D, and attributes identifying the spatial layout of origins and destinations,

$$M_{ij} = f(O_i , D_j , S_{ij})$$

As the flows are counts of students, and there will be zero, low, and few high values, a Poisson regression model is an appropriate functional form for a spatial interaction model (Flowerdew, 1991). Other studies have followed a zero-inflated negative binomial model to examine migration flows (Dotti et al. 2013).

Higher Education in Greece

Higher education in Greece forms the last level of education system and consists of the University and Technological sectors. According to article 16 of the Greek Constitution, higher education is public and provided by Higher Education Institutions. The supervision is carried out by the Minister of Education and Religious Affairs. All students graduating from primary education must attend courses in Junior High Schools. A student may attend the Junior High School which is located in his neighborhood. Most students attend High School, despite of the fact that upper level Secondary Education is not compulsory in Greece. Students who wish to attend studies in Higher Education take Panhellenic exams in a specific number of courses which are related τo one of the following categories: Humanities, Science, Technology. This is considered to be a hard, highly competitive but also fair exam process that students go through in order to ensure education at a higher level.

Data

Our data come from several sources. The main dependent variable is the annual number of students of secondary education in Greece enrolled in higher education institutions–universities coming from a specific Greek administrative region over the year 2015 (our year of interest). The data were provided to us by the Ministry of Education, Research, and Religious Affairs. The number of students that took part in the exams was about 105,000. Our unit of analysis is a combination (i,j) consisting of a administrative region (i) and an university (j).

The explanatory variables that are used in the estimation are:

a. The origin population dataset that held by the Hellenic Statistical Authority (EL.STAT.) of Greece. b. The income variable refers to the Per capita gross domestic product by Nuts II, III c. The urban fabric regarding the origin (Pre - Census data of the Agriculture - Livestock Census 1999/2000) d. The total number of the university students' e. a measure of the university quality as reflected in the World University Rankings (WUR) (QS 2015) f. the number of academics coming from the universities. The distance is the key variable. It is calculated between the centroids of the administrative region and the position of the university, using Geographic Information Systems (GIS) via ArcMap, and is measured in kilometers. It is to be proved that this distance measure may not capture the reality of the situation.

Methodology

Spatial interaction models describe and predict spatial flows of people, capital and information. There are many models concerning the determinants of migration such as standard gravity models that based on Newton's gravity law. Gravity equations have a long tradition in the field of spatial interaction modeling. The gravity model's simplest form considers migration as determined by the sizes of the populations of destination and origin and the distance between origin and destination:

$$M_{ij} = k \cdot \frac{P_i P_j}{d_{ij}}, i \neq j$$

Where Mij indicates the number of migrants from origin i to destination j, Pi indicates population of origin i, Pj indicates population of destination j, dij refers to distance between each origin i and destination j, and k indicates a constant.

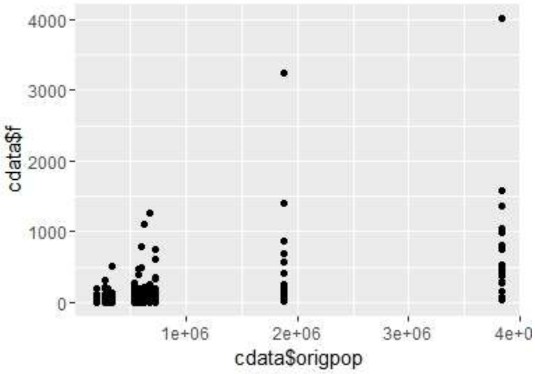
Modeling count variables is a usual study in social sciences. They are one of the oldest and most widely used of all social science models. Spatial Interaction Models (SIM) focus on origin-destination pairs of region and use flow data. The usual estimation strategy of gravity models was to use ordinary least square methods (OLS). In the case that flows are about people who migrate, the dependent variable M_{ij} is a count of migrants and when M_{ij} is zero a practical problem arises in taking logs of both sides. So a Poisson regression framework estimates student flows. The Poisson distribution applies to count data where the variable being examined must take the form of non-negative integers (i.e. zero or a positive whole number). Flowerdew and Aitkin (1982) introduced Poisson regression in the context of migration analysis, and Flowerdew (1991) provided an updated account of Poisson models of migration, including comparisons with other modelling strategies.

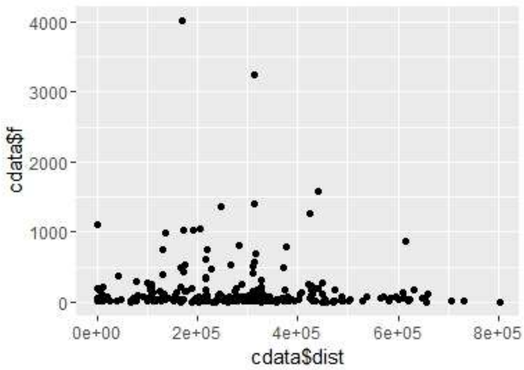
A way of modeling over-dispersed count data, that is the conditional variance exceeds the conditional mean in Poisson regression, is to assume a negative binomial (NB) distribution. The negative binomial distribution, like the Poisson, can only have non-negative integers as its values. The negative binomial model can be considered as a generalized Poisson model (Flowerdew and Lovett, 1989). The form of the model equation for negative binomial regression is the same as that for Poisson regression.

Results

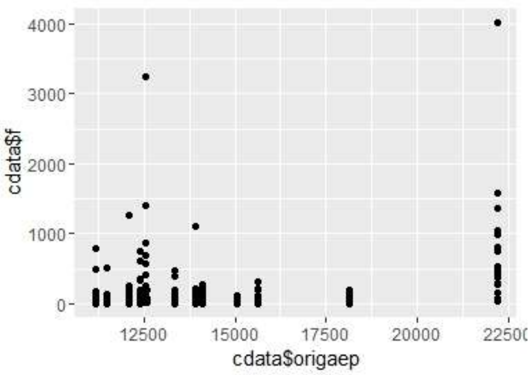
The purpose of this study is to model flows of Greek students from high schools into Greek universities and analyze the role that socio-economic, demographic and other factors hold in the students' migration behavior. Distance is considered as one of the main factors that influence the decision to migrate.

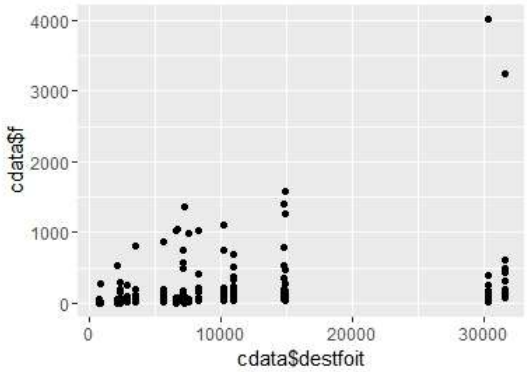
We plot the student flow against origin population and distance



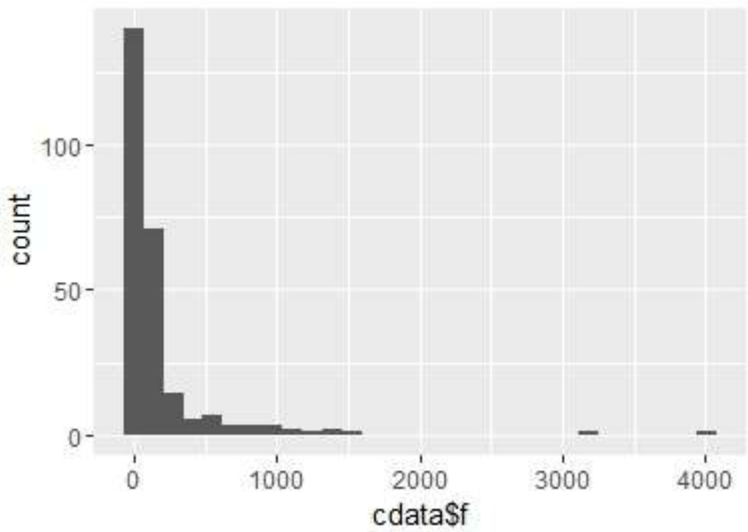


We also plot the student flow against GDP and number of students





The distrbution of student flows looks like Poisson distribution



We run a Poisson regression model in R using the glm (Generalised Linear Models) function.

Table 1. Parameters estimates of Poisson model

Variables	Estimate	Pr(>|z|)
(Intercept)	4.463e+00	< 2e-16 ***
GDP (origin)	-7.376e-05	< 2e-16 ***
Population(origin)	5.904e-07	< 2e-16 ***
Urban fabric (origin)	2.615e-03	< 2e-16 ***
University rank (destination)	-3.082e-04	< 2e-16 ***
Academics (destination)	-1.965e-03	< 2e-16 ***
Total number of students (destination)	1.811e-04	< 2e-16 ***
Distance	-1.298e-07	0.000238 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Null deviance: 96695 on 253 degrees of freedom
Residual deviance: 34621 on 246 degrees of freedom
AIC: 36132
Number of Fisher Scoring iterations: 5

The GOF test indicates that the Poisson model does not fit the data (1 – pchisq=0)
It gives results very similar to the over-dispersed Poisson model. We now fit a negative binomial model with the same predictors.

Table 2. Parameters estimates of Negative Binomial Poisson model

Variables	Estimate	Pr(>|z|)
(Intercept)	4.064e+00	< 9.49e-11 ***
GDP (origin)	-5.593e-05	0.1493
Population (origin)	5.413e-07	0.0513
Urban fabric (origin)	3.250e-03	0.0955
University rank (destination)	-3.104e-04	5.14e-07 ***
Academics (destination)	-2.943e-03	8.01e-07 ***
Total number of students (destination)	2.502e-04	1.49e-09 ***

Distance	-5.365e-07	0.2335

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Null deviance: 753.39 on 253 degrees of freedom
Residual deviance: 279.04 on 246 degrees of freedom
AIC: 2785.8
Number of Fisher Scoring iterations: 7

The GOF test indicates that the Negative Binomial model marginally fits the data
(1 – pchisq = 0.07605704 > 0.05)

Conclusions

The definition of the determinants of student migration is central to design efficient policies aimed at allocating student flows. Those determinants regard both to origin and destination countries. The main findings of our estimations are the following ones. The factors that play significant role in students flow are those who are related with the university (destination). To explain in detail, the attractiveness of university influences the choice of students to migrate. Not only has the rank of the university, but also the total number of students and academic staff prescribed student mobility. Contrary to what was indicated, distance doesn’t discourage students to migrate. It is important to note that additional factors should be implemented in order to calibrate better the model. Finally, we hope that our findings will provide a useful starting point for further research into the internal migration patterns of students who migrate from home to university.

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