

A Factorial Model for Studying the Dynamics of International Student Mobility

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Abstract. There are several international institutions interested in monitoring and analysing the dynamics in transnational high education systems. UNESCO and OECD are working with member countries to improve the quality of internationally available data on mobility of students and academics. However, enrolment or country of origin statistics aren't able to explain the student migration phenomenon or to reason why some nations are just "more mobile" than others. Our paper proposes a differing perspective, employing factor analysis methods in order to study the profile of the top ten most active countries of origin in the last five years. Therefore, we will try to identify the factors that determine student migration, focusing on digesting and correlating endogenous and exogenous variables.

Keywords: factorial analysis, international student, international migration.

1. Introduction

What had once constituted an idealistic dream at most, the freedom for students to roam freely from university to university irrespective of country of origin or destination has turned into a present day reality. No longer constrained by geographical or formal barriers, young men and women set out on a quest for knowledge that may well bring them thousands of kilometres away from their homes. Not only is this novel development truly fascinating, but it is also only superficially understood: whilst rather extensive statistical data is available, efforts to use this data as a basis for a comprehensive explanation of student migration peculiarities have been scarce. Moreover, where such analyses have been attempted they have been primarily qualitative ones, since quantitative approaches tend to be often shunned by education researchers, for unclear reasons. This is not to say that purely quantitative analysis is sufficient for understanding this complex phenomenon – indeed, our opinion is that in order for adequate understanding to be gained both quantitative and qualitative aspects need to be organically integrated, so as to constitute a coherent construct rather than a dichotomous joining.

Our paper, the first of a series of publications, aims at setting the basis for an extensive model that leverages qualitative insight as well as quantitative evaluation so as to properly understand the dynamics of international student mobility. To this end, we will survey the current state of knowledge in the field, present our insights and conjectures and finally introduce the general form of our analytical model, as well as justification for its structure and parameters. Therefore, this article will serve as a formal introduction of the general framework we will employ in subsequent iterations.

2. Literature review

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To begin with, a proper definition for the concept of international student mobility is required. We note that the literature on the topic is somewhat scattered, with in-depth studies being scarce, and that there are multiple points of view with regards to what an internationally mobile student is. Student mobility is understood in [11] as the short term commitment abroad, usually academic year of nine to twelve months duration. Students are treated in [7] as a subset of skilled migration, in fact a potential flow of qualified workers. [9] sees the growth of student mobility as a consequence of globalisation, coupled with easier access to higher education. Finally, works such as [3] see experiential goals as the prime drivers of student mobility. Out of the various published interpretations, we have opted for the one presented in [1]: “We define ISM (International Student Mobility) as any form of international mobility which takes place within a student's programme of study in higher education. The length of absence can range from a short trip to the full duration of a course of study”.

What is considerably less equivocal is the general upward trend manifested by international student mobility: according to [15] there were 1.6 million academia level students studying abroad in 1996, with the figure rising to 1.8 million in 2000, and 3.3 million students currently studying outside their own country [4]. Recent estimates like those found in [5] are pointing to a 7.2 million figure for the year 2025. According to published statistics, the four biggest “receivers” (host countries) are, in this order: the United States, the United Kingdom, France and Germany. At the other end, the top ten host countries and, respectively, the top ten countries of origin in different years, according to [8], are synthesized in Table 1 and Table 2.

Table 1. Top ten host countries in different years (Gürüz, 2008: p. 210)

Rank	1968	1980	1985	2002	2004	2006
1.	USA	USA	USA	USA	USA	USA
2.	France	France	France	UK	UK	UK
3.	Germany	Russia	Germany	Germany	Germany	Australia
4.	Lebanon	Germany	UK	Australia	France	France
5.	Canada	UK	Italy	France	Australia	Germany
6.	UK	Lebanon	Canada	Japan	Japan	China
7.	Russia	Canada	Lebanon	China	China	Canada
8.	Egypt	Italy	Belgium	Russia	Russia	Japan
9.	Argentina	Egypt	Saudi Arabia	Canada	Canada	Russia
10.	Italy	Romania	Australia	Spain	South Africa	Singapore

There are several discernible trends in Table 1. First of all, it is obvious that the United States of America has been the favourite destination for international students starting with the second half of the last century. Foreign student enrolment in European countries has increased significantly since the 1980s as a result of the implementation of EU programmes aimed to increase international mobility. China and Japan are newcomers on the global higher education market, both as host countries, and, as presented in the subsequent table, as countries of origin. The Australian policies, much like those in the United Kingdom, are driven by economic rationales. Both Australian and English institutions started to implement recruitment practices in the late 1980s.

Table 2. Top ten countries of origin in different years (Gürüz, 2008: p. 211)

Rank	1968	1980	1985	2002	2004	2006
1.	China	Iran	China	China	China	China
2.	USA	Malaysia	Malaysia	USA	USA	USA
3.	Canada	Greece	Iran	India	India	India
4.	Syria	China	Greece	Korea	Korea	Korea
5.	UK	Nigeria	Morocco	Japan	Germany	Germany
6.	Germany	Morocco	Korea	Germany	Japan	Japan
7.	Greece	USA	Jordan	Morocco	France	France
8.	Korea	Hong Kong	Hong Kong	Greece	Turkey	Malaysia
9.	Italy	Germany	Germany	France	Morocco	Canada
10.	Malaysia	Jordan	USA	Turkey	Greece	Russia

We can extract significant insight from the table above. What is shown as China, the leader of the world in terms of foreign students abroad in 1968, is actually today's Taiwan, which then represented China in the

internationalization before mainland China joined the UN in 1971 [8]. The presence of Iran as the first country that sends its students abroad might be explained by the regime change which significantly increased the Diaspora. The constant presence of Greece and Morocco in the top ten countries of origin during the analysed period is also noticeable. Furthermore, starting with the 1980s, China, Korea, India and Japan have emerged as major countries of origin of foreign students while the beginning of the 21st century is marked by the growing interest of American students for study-abroad programmes. French mobility, on the other hand, might be explained by the EU initiatives to encourage mobility around Europe.

Whilst the absolute volume of student exchanges is reasonably easy to measure, it is considerably more difficult to identify the primary factors of influence impacting the phenomenon. On one hand, studies like [10] position mobile students as a “migratory elite”, a point which is supported by work such as [12], but contradicted by findings from [6] or [14], with the latter being unable to find any proof of an income/social standing influence. [16] identify the wish to enhance foreign language skills, career prospects, cultural experience and personal development as key factors affecting student propensity for international mobility, whilst [13] and [10] found that prior mobility is another significant favouring factor. On the other hand, deterring factors are also presented by investigations such as [2] or [16], with the four main ones being language problems, financial obstacles, entry restrictions and academic recognition issues, with the latter study also pointing to academic institution prestige having a significant role in influencing international student mobility.

Taking all of the above into account, we can conclude that we are dealing with a complex phenomenon, which is impacted by multiple factors of influence, whilst being incompletely defined or tied to a closed set of determinants. As such, our analysis needs to be a multi-dimensional one.

3. Model description

Traditional factor analysis tends to deal with two simplistic constructs, namely either an additive model of the form:

$$\theta = A + B + \dots (1)$$

or a multiplicative one of the form:

$$\theta = \frac{A}{B} \times \frac{B}{C} \times \dots (2) \text{ (the right - hand side ultimately simplifies to } \theta \text{)}$$

By piece-wise substituting values from an arbitrarily chosen reference period with those from the investigated period, the researcher can measure the impact of the shift of a single factor on the general variance of the aggregate indicator. However, we have found that neither of these embodiments suffices for our case, therefore we have opted for a different approach, which is briefly detailed in the following paragraphs.

To begin with, we consider the total number of mobile international students as expressible by a real-valued 8D function θ , defined as follows:

$$\theta: \mathbb{R}^8 \rightarrow \mathbb{R}, \theta(\Gamma) \in \mathbb{C}^1 \forall \Gamma \in \mathbb{R}^8 (3)$$

Let $\Gamma \in \mathbb{R}^8$ be the vector:

$$\Gamma = \begin{pmatrix} m \\ n \\ p \\ q \\ x \\ y \\ z \\ w \end{pmatrix} (4)$$

with definitions for its components being provided later. In this context, we consider the differential form of $\theta(\Gamma)$:

$$d\theta = \frac{\partial \theta}{\partial m} dm + \frac{\partial \theta}{\partial n} dn + \frac{\partial \theta}{\partial p} dp + \frac{\partial \theta}{\partial q} dq + \frac{\partial \theta}{\partial x} dx + \frac{\partial \theta}{\partial y} dy + \frac{\partial \theta}{\partial z} dz + \frac{\partial \theta}{\partial w} dw (5)$$

By piecewise substitution into the differential form, we can determine the impact that the variation of one of the eight factors we consider has had on the variation of international mobile student count. We note

that Θ doesn't have to be linear in its variables and indeed it is not (we forego presenting the econometric analysis performed to arrive at the 8D construction, as well as the function's explicit form, given the spatial constraints imposed upon this paper and its introductory nature).

Let the vector Γ be decomposed into two 4D vectors, respectively $A = (mnpq)^T$ and $B = (xyzw)^T$ thus $\Gamma = \begin{pmatrix} A \\ B \end{pmatrix}$. In this case A holds the country of origin specific variables and B holds the international destination-specific variables. For the components of B we use a weighted average at the level of the four most active host countries, with weights being determined by the number of students from the country of origin that are engaged in mobility in the aforementioned group, thus ensuring that the relevance of the analysis is retained. We now briefly define these variables:

Country of origin specific variables:

- m = GDP per capita, as an indicator of the level of development and general welfare;
- n = aggregate international student count for the past four years (this is constructed as a non-linear negative exponent power-series, with year -1 having a 50% weight, year -2 a 25% one year -3 a 15%), in order to include the effect of prior experiences and osmotic influences between students;
- p = total count of students engaged in academic level education;
- q = countrywide access to the Internet.

Host destination specific variables:

- x = GDP per capita delta between the host cluster and the origin country, as an indicator of the differences in level of development and general welfare;
- y = weighed count of universities for the host cluster;
- z = cultural development factor, computed as the weighed sum of culturally oriented facilities (museums, historical sites, expositions etc.) to be found in the receiving cluster;
- w = entertainment factor, computed as the weighed sum of purely entertainment oriented facilities (restaurants, night-clubs, coffee shops etc.) to be found in the host cluster.

In our choice of variables we have focused on three primary aspects, namely their coverage of the spectrum of influence factors identified in prior works on this topic, coupled with the wide availability of the data sets recording their values and the extent and refresh interval for these data sets (e.g. we wanted the series to be long in order to cushion the impact of any non-representative/erroneous values, and we wanted them to be reasonably frequently updated). Whilst we have converged on this particular vector of variables, it is not only possible but also likely that the model's accuracy can be extended, either via the inclusion of different, currently unaccounted for elements, or through using a more granular representation for some of the aggregate indicators we are evaluating.

4. Preliminary observations

In this paper we have introduced the basic framework we will employ in upcoming work focused on analysing the dynamics of international student mobility. Starting from the available literature and insight into traditional factor analysis, we have developed a more extensive model for representing the complex dynamics of international student mobility. In effect, our model amounts to a multi-variable, non-linear function, and we employ differential calculus and factor analysis principles in order to ascertain the effect that parameter variations have on the variation of the aggregate international student flux. Whilst we have foregone engaging in an extensive presentation of the modelling aspects, due to space constraints, we will follow-up with another publication detailing the process of constructing the final functional form, the econometric estimation of the form of the parameters and their coefficients, as well as the model's validation. Early work shows a strong correlation between the variables we have identified and the dynamics we are focusing on.

Given the complex and intricate nature of international student mobility, we believe that going forward only this type of analysis will prove adequate. We will proceed with the presentation of our results in subsequent publications.

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