

**The Effect of Internal Rate of Return to Education on  
International Mobility of Students**  
An OECD Case in Tertiary Education

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Abstract

This paper investigates the hypothesis that internationally mobile students chose their destination country pursuing better potential of returns for investment, regarding the internationalization of education market. By examining data of mobile students among 10 OECD countries, the gap of internal rate of return to tertiary education in each country and the relation of common languages with gravity model, we proved that the hypothesis can explain the mobility of students and their decision making.

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## 1. Introduction

In recent decades, education has become considered as an important sector for developing human capital. This idea, contrasted to physical capital, is firstly established by Theodore Schultz and established by Gary S. Becker. In his paper, Becker explains human capital as follows:

Schooling, a computer training course, expenditures on medical care, and lectures on the virtues of punctuality and honesty are capital too in the sense that they improve health, raise earnings, or add to a person's appreciation of literature over much of his or her lifetime. (Becker 1993, pp.15-16)

His idea had aroused much argument about education and humanity, and became one of the core ideas of investment in human resources nowadays. Human capital formation is getting an important position today, not only in national policies in many countries but in international activities combating poverties, such as Education for All by UNESCO. These actions are mainly targeting to increase the enrollment rate in primary education and reduce illiteracy, especially in developing countries.

The situation differs in the developed countries; governments offer firm compulsory education systems, and equal (to some degree) opportunity to enter tertiary education<sup>1</sup> is granted for the citizens. Universities and advanced research programs offer students knowledge and high-level skills, and that results to boost its economies. With the globalized labor market, tertiary education has also been more open in recent years. Worldly famous universities are eager to gather promising students from all over the world, and making great efforts to improve their curriculums and facilities. At the same time, students willing to study in more high-levelled program are positive to leave their own country, and comparing universities according to their own conditions. Therefore, for universities today, competitors in attracting excellent students are not only inside a country but in the whole world.

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<sup>1</sup> Includes shorter and vocational programs.

The fact that there are lots of world rankings of universities, such as “The Times Higher Education - Thomson Reuters (THE-TR)” and “QS World University Rankings”, should explain the globalization of tertiary education. Frequent changes of order on rankings reflect high level of interest among not only students but universities and governments. For instance, Korean government has been pushing internationalization of Korean universities to be well evaluated on world rankings and taking better position year by year. These universities on the rise are escalating globalization of tertiary education by its considerable influence on student’s decision making about their destination country. Considering that tertiary education have an important role to educate people as skilled labor force, less attractive universities and their countries should lose their future economic power. Therefore, assuming the impact of education system on international students is highly important for both education and politics of a country.

This paper aims to investigate the relation between the international mobility of students and the international competitiveness of tertiary education of ten OECD countries. To measure the competence, internal rate of return (IRR) to tertiary education is used as an indicator. In this paper, five-step approaches are taken; first, current trends on tertiary education, especially the effect of internationalization are reviewed referring to previous studies in this section. At the same time, the method for estimating impacts on the number of internationally mobile students is proposed in section 1. Then, approach method and the data are explained in section 2 and 3. The results and analysis are shown in section 4, and finally, section 5 describes concluding remarks and policy proposals.

### **1.1. Current trends on tertiary education**

This paper focuses on tertiary education from several categories of educational steps. In this section we first check the definition of tertiary education, and then explain its current trends worldwide.

Generally, educational levels can be classified into three categories: primary, secondary, and tertiary education. In this paper, however, they are explained in more detail and with specific categories, according to the International Standard Classification of Education (ISCED 1997). This classification is also introduced in OECD papers, and we follow it to set information. Based on ISCED classification, tertiary education basically means education at college or university divided into two subcategories, and does not contain advanced research programs<sup>2</sup>.

According to OECD (2013), about 60% of young adults in OECD countries are expected to enter tertiary education over their lifetimes, however, only 3% enter in the advanced research programs<sup>3</sup>. The former entry rate has been increasing by more than 20% in the latest decades. OECD points out three reasons; the structural change in the education systems to meet labor market needs, the shortened programs implemented in the Bologna Process, and the expansion of the source of applicants including international and older students. Considering the fact entry rates to vocational programs are stable, we can say that total entry rates of students to tertiary level education are also increasing.

The structural change of society is also reflected to lower unemployment rates of young people neither employed nor in education or training (NEET) in higher education. In 2011, average 6.5% of 25-29 year-olds NEETs who had completed tertiary education were unemployed: on the other hand, 14% of those who had not completed upper secondary education were unemployed across OECD countries. Same things happened in long-term unemployment: average 3.7% of 25-29 year-olds NEETs were unemployed more than six months, on the centrally, 9.3% of those who have not completed upper secondary education were unemployed<sup>4</sup>.

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<sup>2</sup> See more details at Table 1 in appendix.

<sup>3</sup> OECD (2013), pp.290

<sup>4</sup> OECD (2013), pp.327-332

## **1.2. Mobile students and Gravity models**

Students study abroad, i.e. internationally mobile students, are increasing year by year as is mentioned in the previous section. To look over the situation and a method for impact estimation, this section is divided to two subcategories. The first subsection examines the definition and the trends of International mobility of students. Consequently, the latter one introduces gravity models as a mean of analysis with a review of previous studies.

### **1.2.1 International mobility of students and Current Situations**

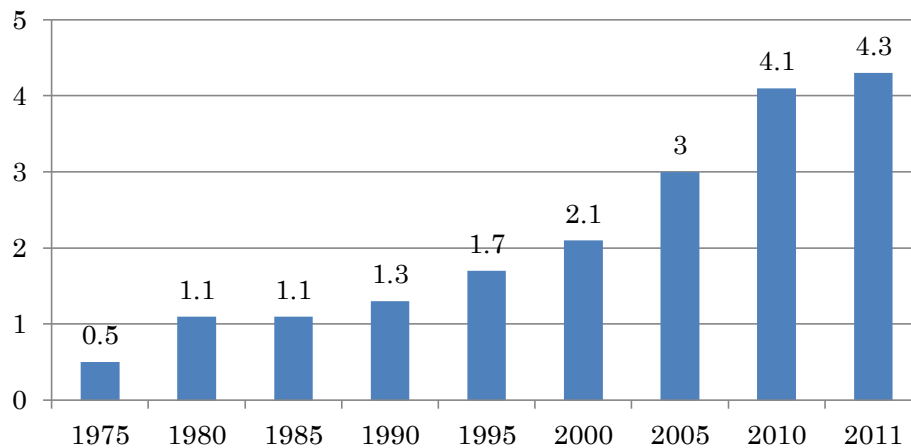
UNESCO Institute for Statistics (UIS) has been accumulating the number of students who move to other country from their own for studying abroad since 1980s<sup>5</sup>. According to UNESCO, internationally mobile students (mobile students) are defined as “students who have crossed a national border and moved to another country with the objective of studying”. This contains two categories of students: students who are not usual residents of the country of study, and students who received prior qualifying education in another country. They are distinguished from foreign students, who do not have citizenship in the destination (host) country. Since immigrant legislation policy is different in each country, the idea of internationally mobile students is used to track student mobility. OECD takes the same stance as UNESCO’s on classification, and has been using UIS data for non-OECD countries in OECD’s annual reports “*Education at a Glance*” series.

According to OECD (2013), nearly 4.3 million students were enrolled in tertiary education outside their country of citizenship in 2011. Compared with that in 1975, the number increased dramatically more than five times (Graph 1). Main reasons for the increase are explained in the report: growing interest in strengthen regional ties among countries like EU, increasing global access to tertiary education, reduced transportation costs, and globalization of labor markets for highly skilled people. These causes of increase of students study abroad should reflect the global change of Education and

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<sup>5</sup> According to UIS website, currently UIS covers the tertiary education level only.

**Graph 1**  
**Long-term growth in the number of students enrolled  
outside their country of citizenship (in millions)**

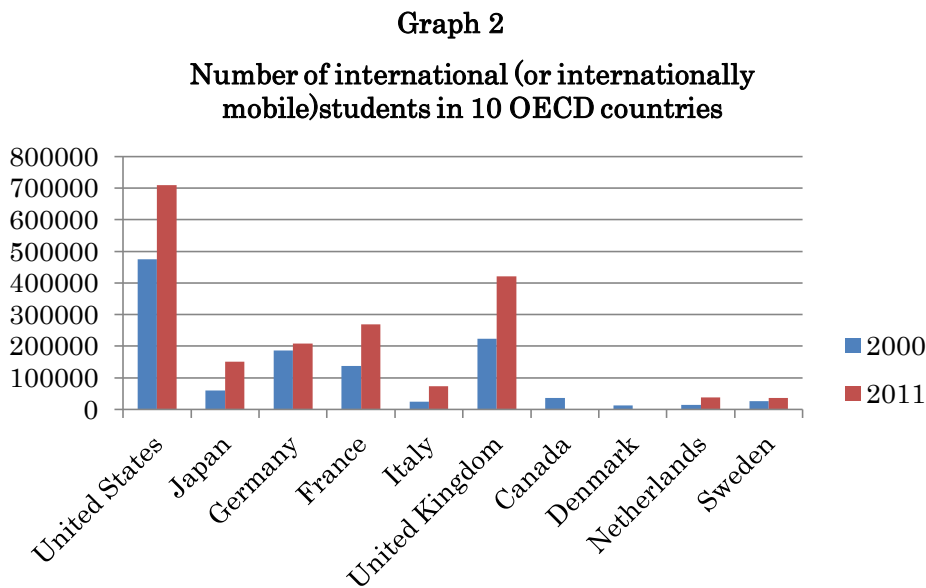


Source: OECD (2013), Education at a Glance 2013, pp.306

surrounding environment.

Australia, the United Kingdom, Switzerland, New Zealand and Austria have the highest percentages of international students among their tertiary enrolment (in descending order). At the same time, Australia, Canada, France, Germany, the United Kingdom and the United States are top destination countries in total receiving more than 50% of all foreign students worldwide. Europe is the top destination hosting 48% of foreign students worldwide followed by North America which hosts 21% of those students. Oceania countries, though hosting less than 10% of all students study abroad, have tripled since 2000. Since well performing foreign students have higher possibility to accomplish better result even after graduation, each country cannot miss any chance competing others. Regarding the regions of origin, Asian students represent 53% of foreign students enrolled worldwide, largely from China (18.5%), India (5.5%), and Korea (3.6%). Europe is the second region sharing 23.1% of those students, followed by students from Africa (11.6%).

Additionally, we would like to check the data regarding target countries and the reference year in this paper<sup>6</sup>. As OECD data showed above, the number of internationally mobile students in tertiary education in 2000 was 2.1 million. Concentrating on the enrolment in tertiary education (ISCED 5 & 6), the number of international students in 2000 and 2011 are shown in Graph 4. Since all the country which data is available indicates significant increase of number, we can say that target countries also follow global trend: increasing size of foreign students.



Note: Data in 2011 of Canada and Denmark are not available

Source: UNESCO Institute for Statistics

### 1.2.2. Determinants of Students' Choice of Destination Country

OECD (2013) mentions to underlying factors of destination choice of students pointing three main causes: language of instruction, quality of program, and tuition fees. The language used in programs can be an important determinant for students. Widely spoken and read languages, such as English, French, German, Russian and Spanish, are used in leading destinations for study. On average across all OECD countries, around one in four foreign students came from a country with the same official or widely

<sup>6</sup> Internal rate of return to tertiary education is the standard in both reference year and target countries in this paper. Details and reasons are described in section 1.3.

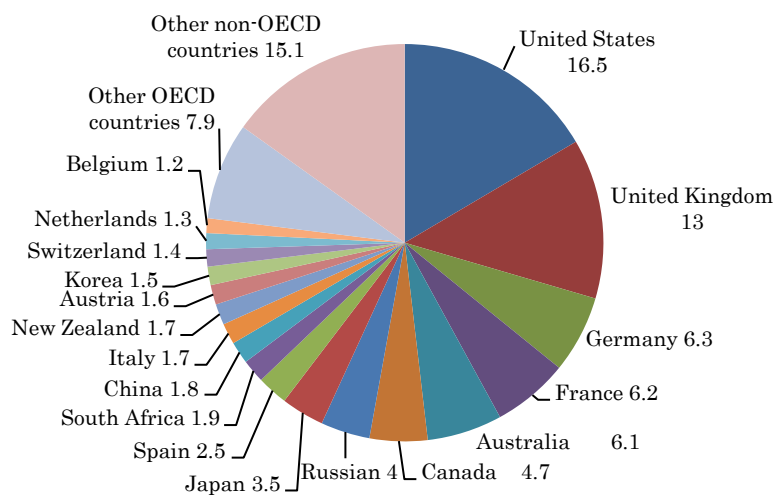


spoken language as the country of destination. Since English is becoming a lingua franca today, English-speaking countries such as Australia, Canada, New Zealand, the United Kingdom, and the United States receive more than 40% of foreign students in 2011. These countries also attract students who wish to improve their English skills. The trend is reflected to the fact that between one in five and one in three foreign tertiary students in all English speaking OECD countries come from other English speaking countries.

The quality of programs is increasingly gathering students' attention today. OECD points out the impact of rankings of higher education programs. Though rankings of institutions differ in the evaluation methods from each other, some rankings introduce the standards of the openness to the world, such as the proportion of foreign instructors and classes in English<sup>7</sup>.

**Graph 3**

**Distribution of foreign students in tertiary education, by country of destination (percentage, 2011)**



Note: Year of reference of data for countries other than OECD and G20 is 2010.  
 1. Data relate to international students defined on the basis of their country of residence  
 2. Year of reference 2010.  
 3. Student stocks are derived from different sources and therefore results are indicative only.  
 Source: OECD (2013), Education at a glance 2013, pp.307

<sup>7</sup> Kuroki (2013) indicates low proportion of foreign instructors, for instance 5.4% in The University of Tokyo compared with 30% or more in top-ranked American universities, as the cause of inferiority of Japanese universities in rankings.

One of the biggest concerns for students is financial issues. The application of tuition fees for international students varies in countries. According to OECD (2013), EU countries, for instance, treat students from another EU country as domestic students, while the United States and Japan apply the same treatment to both foreign and domestic students. Finland, Norway and Iceland have no tuition fees charges. On the other hand in some countries, such as Canada and the United Kingdom<sup>8</sup>, international students have to pay higher tuition fees than domestic students. High costs of tuition fees, however, do not necessarily decrease foreign students, as long as the quality of education is high and its potential returns make the investment worthwhile.

### **1.2.3. Gravity Models**

Dealing and assessing flows of people, gravity models are used mainly in migration and trade study. They estimate flows between two pairs of locations based on the assumption that migrants follow laws similar to gravitational pulls. In gravity models, migration is assumed to move inversely with distance and positively with the size of an economy, often measured by population size<sup>9</sup>. Modified models are also used in recent studies.

This paper use the gravity model developed from Funatsu's paper in 2007. Focusing on regional economic cooperation and its effect on the market of higher education, Funatsu evaluated the relationship between mobile students and regional economical cooperation measuring by the number of mobile students. Since educational services are invisible compared with usual commodity trades, the author considered the number of students study abroad as amounts of educational service trades. He uses a gravity model based on positive analysis of commodity trades in regression equation style inserting regional co-operations, APEC and EU, as dummies. The result showed outstanding relevance of the regional cooperation, especially APEC. Therefore, Funatsu assumed the free trade area promotes not only usual trades but also the transportation

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<sup>8</sup> Except for EU or European Economic Area students.

<sup>9</sup> Rhona (2010), pp.698

of students<sup>10</sup>

Based on Funatsu's theory, this paper intends to estimate the impact of globalization of educational market. Still measuring by the number of mobile students we insert an indicator of globalization and common languages as dummies. Assessing effects of education, however, still has many discussions on the method. Therefore, to simplify the estimation, we use internal rate of return to education as an indicator observing the gap between hosting and sending countries of students. Details of internal rate of return and method of this paper are described in the next part.

### **1.3. Internal Rate of Return to Education**

Based on the idea of human capital, estimation methods of education have increased varieties of theory. In this section, we firstly overview some method for calculating returns of education referring to the difference of approaches. Then, the main method in this paper, internal rate of return, is introduced with previous studies.

#### **1.3.1. Estimating Returns of Education**

Estimation approaches of the impact of education have grown gradually as the concept of human capital became common in economics. Human capital theory is one of the oldest streams in economics of education began by Theodore Schultz and Gary Becker in early 1960s and succeeded by Jacob Mincer. Since Becker's approach, internal rate of return, is detailed in the next part, this section mainly focuses on the Mincer model.

Though the essence of human capital theory goes back to the classic theory of Adam Smith, it is Schultz made a first step to calculating the rate of returns to education in the beginning of 1960s. He advocated the idea of human capital contrasted to physical capital. He also referred to the higher rate of return of human capital compared with

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<sup>10</sup> Funatsu (2007)

that of physical capital<sup>11</sup>. A few years later this idea was established by Becker (explanations are in the next part) and other economists, and Mincer is one them.

The Mincer model had been developed in 1974 based on the human capital earnings function. The equation is as follows:

$$\log y_i = a + rS + bX + cX^2 + e$$

where  $y$  are the earnings of individual  $i$ ,  $S$  represents the years of education acquired,  $X$  represents individual's potential experience (usually approximated by  $X = \text{age} - S - 6$ ). The most important characteristics of this framework are the assumption that each additional year of education has the same effect on earnings and the years of schooling measured accurately<sup>12</sup>. This model has been widely used partly because of its handiness for dealing big data sets. At the same time, however, the assumption of equal education effect puts some limit especially in studies regarding different level of educational attainment as the cause of different output.

### 1.3.2. Internal Rate of Return to Education

Compared with the Mincer model, calculation of internal rate of return (IRR) to education has the basis on education level reflecting the wage premium depending on individual's attainment of education. Though the story goes back to front, Becker introduced a method to determine the optimal level of education comparing the IRR and market rate of interest, based on Schultz's theory in 1964<sup>13</sup>. His achievement for establishing human capital theory is the basis of economic approach for education today

Originally, internal rate of return is defined as the discount rate that equalizes the real costs of education during the period of study to the real gains from education thereafter. Sveinbjorn *et al* (2002) calculated the IRR to upper-secondary and tertiary education in ten OECD countries —United States, Japan, Germany, France, Italy,

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<sup>11</sup> Zhang (2002)

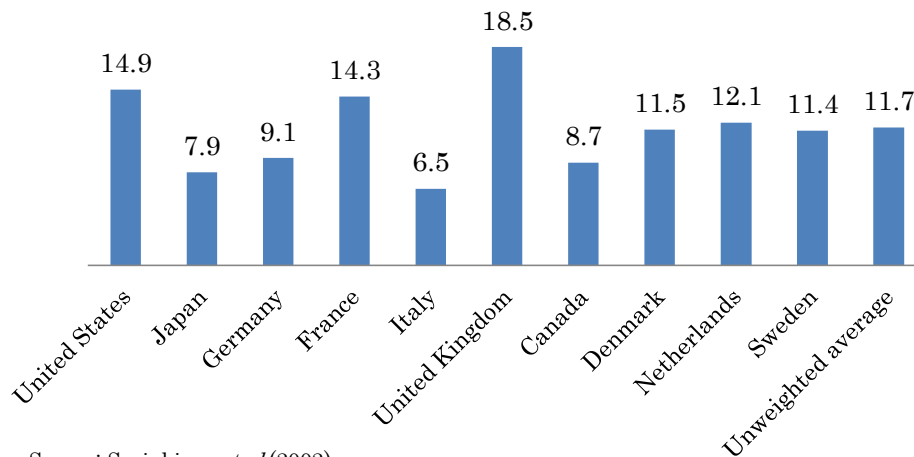
<sup>12</sup> Rhona (2010), pp.516

<sup>13</sup> Rhona (2010), pp.515-516

United Kingdom, Canada, Denmark, Netherlands, and Sweden—targeting 1999-2000. Examining the relative figures such as the structure of earnings and unemployment rate of each country, the estimations of IRR to education basically consists of calculations on costs and benefits of education (Graph 3). The results of private IRR to tertiary education of men are as follows: the top score was 14.9% of the United Kingdom on the other hand Italy resulted in the lowest 6.5% (the average rate was 11.7%). The result of Japan, for example, was second least country with the score 7.9%, and it can be explained by less effective tax system, relatively high tuition fees and shortage of public monetary support for students considering variables<sup>14</sup>.

Graph 4

Private Internal Rate of Return to Tertiary Education,  
1999-2000 (Comprehensive rate of Men, Per cent)



Source: Sveinbjorn *et al* (2002)

Here, let us look back previous sections. The explosive increase of mobile students can be explained by factors such as tuition fees (See 1.2.2. Determinants of Students' Choice of Destination Country). Considering costs of education are calculated from average tax rate, private cost of education, student grants and loans, etc. in Sveinbjorn *et al* (2002), IRR can be regarded as the indicator of whole education system in one country.

Because of complications of the IRR estimation and the huge amount of data for costs and benefits estimation of education, calculation of IRR is resigned in this paper. This

<sup>14</sup> The comprehensive rates of return are estimated including impacts of four relevant variables. See Table 3 for details.

paper quotes the estimation results of IRR to tertiary education, especially comprehensive rate of men, from Sveinbjorn *et al* (2002) Therefore, all the reference year of other data is set to 2000 to fit with the data of IRR.

## 2. Model & Method

Based on the regression equation of Funatsu (2007), which used gravity model measuring by the number of international student, this paper established a model with some arranges to examine impacts of IRR between two countries and common languages.

$$FS_{ij} = a_0 + a_1 \log GDP_i + a_2 \log GDP_j + a_3 \log Dist_{ij} + a_4 IRR + a_5 CL + e_{ij}$$

$FS_{ij}$ : the number of students moved to country  $j$  from country  $i$

$GDP_i$ : GDP of country  $i$  (students' own country)

$GDP_j$ : GDP of country  $j$  (host country)

$Dist_{ij}$ : distance between country  $i$  and  $j$

$IRR$ : Gap of Internal Rate of Return to tertiary education between country  $i$  and  $j$  (dummy)

$CL$ : Common languages among country  $i$  and  $j$  (dummy)

Bilateral international mobile students' data among target OECD countries, United States, Japan, Germany, France, Italy, United Kingdom, Canada, Denmark, Netherlands, and Sweden, in 2000 are analyzed. The choice of target year and countries are made based on the data of IRR to tertiary education quoted from Sveinbjorn *et al* (2002).

To examine the hypothesis that international students chose the country of study to gain better return, the dummy take 1 if the IRR to tertiary education of host country is higher than that of the country of origin.

### 3. Data

- ◆ The number of students moved to one country to another for study

- Source: UIS database

Bilateral data of foreign students are taken from UIS data “International flows of mobile students at the tertiary level”. Originally, this data is accumulated since 1980s and only for tertiary education level. From UIS bilateral dataset, matrix data among 10 target countries are compiled in this paper. Year of reference is 2000.

- ◆ GDP

- Source: World Development Indicators

Gross Domestic Product data is used for measuring the size of an economy. Basically in gravity models, it is considered that migration have a trend to move positively to bigger and wealthier economy. All the GDP amount is converted to US\$ in this paper. Year of reference is 2000.

- ◆ Distance

- Source: Online calculation tool (Chotto Benri-chou)

In gravity models, distance has negative impact on migration of people, i.e. the more distant two countries have, the less people move between them. Data is taken by kilo-meters standard in this paper. Since organized dataset of bilateral distance are not available for excel, this paper used a web tool that can calculate distance between two points of location.



◆ Internal Rate of Return to tertiary education

- Source: Sveinbjorn *et al* (2002)

Comprehensive rate of returns to tertiary education is used. Since combined IRR data of men and women are not available in the source, this paper examines men's data only. Year of reference is 2000.

◆ Common languages

- Source: country database of the Ministry of Foreign Affairs of Japan

Common language is determined by the language officially used in two pair of country in this paper. The definition of official language is based on the Ministry of Foreign Affairs of Japan.

#### 4. Result

The adjusted R square is 0.6283612<sup>15</sup>. Only variable x3, distance between two countries has negative coefficient, and other variables have positive coefficient. This result shows typical example of gravity model; the more GDP two countries gain the more people move between them, and the more distance two countries have the less people move between them.

Examining coefficients, we can say x1, GDP of host countries, have more impact than x2, GDP of students' own country. This reflects decision-making process of students who try to go to more wealthy country expecting better return for investment in education. There is little gap of coefficient between GDP of host country and that of the country of origin, since target countries have relatively close size of GDP as OECD countries.

Distance to host country has significant influence. Transportation around the world has greatly developed today, however, the cost and time for transportation are still big obstacles even today, certainly for students who have less economic margin.

Variable x4, IRR to tertiary education proved certain significance, though showing lowest coefficients compared with other variants. It explains that higher IRR of destination country compared with that of their country of origin can be a significant determinant. Hence, the hypothesis that foreign students chose the country of study to gain better return is confirmed.

Interestingly, common language has few coefficients. Considering the variety of target countries, there is a possibility that the categorization based on national languages may underestimate its value.

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<sup>15</sup> See also Table 3

## 5. Concluding Remarks

This paper aimed to examine the effect of internal rate of return to tertiary education on internationally mobile students, regarding IRR as an index of internationalization of education scheme in one country. Measured by the number of students who study abroad with gravity model adding IRR and common languages as variables, the result showed positive effect of IRR and we could proof its impact on students' decision making of destination country.

Still, some questions remain. Because of the lack of data on mixed gender IRR, we could not analyze the impact of IRR for women and both gender. Examining the gender difference of IRR would be a meaningful study. Especially, percentage of women enrollment in higher education decreases level by level, significant impact is supposed. Also, estimation of the impact of languages needs improvement. Different approaches such as the proportion of classes conducted in the same languages would be another interesting study. One of the big problems is the necessity of update of reference year. Further study with recent data is planned.

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## Appendix

**Table 1**  
**Classification of Levels of Education**

<b>Term used in this paper</b>	<b>ISCED classification (and subcategories)</b>
<p><b>Pre-primary education</b></p> <p>The first stage of organized instruction designed to introduce very young children to the school atmosphere. Minimum entry age of 3.</p>	<b>ISCED 0</b>
<p><b>Primary education</b></p> <p>Designed to provide a sound basic education in reading, writing and mathematics and a basic understanding of some other subjects. Entry age: between 5 and 7. Duration: 6 years.</p>	<b>ISCED 1</b>
<p><b>Lower secondary education</b></p> <p>Completes provision of basic education, usually in a more subject oriented way with more specialist teachers. Entry follows 6 years of primary education; duration is 3 years. In some countries, the end of this level marks the end of compulsory education.</p>	<b>ISCED 2</b> (subcategories: 2A prepares students for continuing academic education, leading to 3A; 2B has stronger vocational focus, leading to 3B; 2C offers preparation of entering workforce)
<p><b>Upper secondary education</b></p> <p>Stronger subject specialization than at lower secondary level, with teachers usually more qualified. Students typically expected to have completed 9 years of education or lower secondary schooling before and are generally 15 or 16 years old.</p>	<b>ISCED 3</b> (subcategories: 3A prepares students for university-level education at level 5A; 3B for entry to vocationally oriented tertiary education at level 5B; 3C prepares students for workforce of for post-secondary non-tertiary education at level ISCED 4)
<p><b>Post-secondary non-tertiary education</b></p> <p>Internationally, this level straddles the boundary between upper secondary and post-secondary education, even though it might be considered upper secondary or post-secondary in a national context. Program content may not be significantly more advanced than that in upper secondary, but is not as advanced as that in tertiary programs. Duration usually the equivalent of between 6 months and 2 years of full-time study. Students tend to be older than those enrolled in upper secondary education.</p>	<b>ISCED 4</b> (subcategories: 4A may prepare students for entry to tertiary education, both university level and vocationally oriented; 4B typically prepares students to enter the workforce)
<b>Tertiary education</b>	<b>ISCED 5</b> (subcategories are below)

<p><b>Tertiary-type A education</b></p> <p>Largely theory-based programs designed to provide sufficient qualifications for entry to advanced research programs and professions with high skill requirements, such as medicine, dentistry or architecture. Duration at least 3 years full-time, though usually 4 or more years. These programs are not exclusively offered at universities; and not all programs nationally recognized as university programs fulfill the criteria to be classified as tertiary-type A. Tertiary-type A programs include second-degree programs, such as the American master's degree.</p>	<p><b>ISCED 5A</b></p>
<p><b>Tertiary-type B education</b></p> <p>Programs are typically shorter than those of tertiary-type A and focus on practical, technical or occupational skills for direct entry into the labor market, although some theoretical foundations may be covered in the respective programs. They have a minimum duration of two years full-time equivalent at the tertiary level.</p>	<p><b>ISCED 5B</b></p>
<p><b>Advanced research programs</b></p> <p>Programs that led directly to the award of an advanced research qualification, e.g. Ph.D. The theoretical duration of these programs is 3 years, full-time, in most countries (for a cumulative total of at least 7 years full-time equivalent at the tertiary level), although the actual enrolment time is typically longer. Programs are devoted to advanced study and original research.</p>	<p><b>ISCED 6</b></p>

Source: OECD (2013), Education at a Glance 2013, pp.22-23

Table 2

**Calculation of Private Internal Rate of Return**

The internal rate of return (in real terms) is the discount rate ( $\delta$ ) that equalizes the future flows of real benefits (B) and real costs (C) associated with investments in upper-secondary (*s*) or tertiary (*u*) education, *i.e.*

$$\sum_{t=a}^{a+l} (1 + \delta)^{-(t-a)} \times C^u(t) = \sum_{t=a+l+1}^{64} (1 + \delta)^{-(t-a)} \times B^u(t)$$

where *t* is age, *a* is the typical age at the start of tertiary education and *l* is the standard length of tertiary education. The benefits are assumed to last until the age of 64.

The costs of tertiary education are defined as:

$$C^u(t) = [1 - \tau(E^s(t))] \times [1 - ur^s(t)] \times E^s(t) \times (1 + g)^{(t-a)} + F^u(t) \times (1 + g)^{(t-a)} - S(t)$$

where  $\tau$  is the average tax rate for base-year earnings of a single person with upper-secondary education at age *t* [ $E^s(t)$ ],  $ur^s(t)$  is the unemployment rate for people with upper-secondary education at age *t*, *g* is the growth rate of labor productivity in the economy as a whole,  $F^u(t)$  is the annual private cost of tertiary education, and  $S(t)$  is student grants and loans at age *t*. The scaling factor at the end of the first term of the right-hand side of the equation is there to project future earnings by the scaling up of base-year earnings in line with the productivity growth rate for the economy as a whole.

The benefits of tertiary education are defined as:

$$B(t) = (1 - \tau(E^u(t))) \times (1 - ur^u) \times E^u(t) \times (1 + g)^{(t-a)} - (1 - \tau(E^s(t))) \times (1 - ur^s) \times E^s(t) \times (1 + g)^{(t-a)} - R(t)$$

Where  $R(t)$  is the repayment of loans, if any. According to this equation, the benefits are equal to the difference between post-tax earnings adjusted for the unemployment risk for tertiary and upper-secondary educated persons minus the repayment of student support.

Source: Sveinbjorn et al (2002)



Table 3  
Private internal rates of return to tertiary education (Men, per cent), 1999–2000

	United States	Japan	Germany	France	Italy <sup>1</sup>	United Kingdom	Canada	Denmark	Netherlands <sup>2</sup>	Sweden	Unweighted average
Return based on pre-tax earnings and the length of studies (narrow rate)	18.9	8.0	7.1	13.3	6.7 <sup>3</sup>	18.1	8.4	7.9	11.7	9.4	11.4 <sup>4</sup>
Impact of (in percentage points)											
Taxes	-2.3	-0.3	-1.5	-1.6	..	-2.1	-0.5	-2.1	-2.0	-1.5	-1.5 <sup>4</sup>
unemployment risk	0.9	0.9	1.1	2.4	0.5	1.6	1.3	1	0	1.2	1.1
tuition fees	-4.7	-2	-0.3	-1.1	-0.7	-2.7	-2.3	-0.2	-0.6	-0.7	-1.5
public student support	2.1	1.3	2.7	1.3	0	3.6	1.8	4.8	2.9	3	2.4
<b>Comprehensive rate</b>	<b>14.9</b>	<b>7.9</b>	<b>9.1</b>	<b>14.3</b>	<b>6.5</b>	<b>18.5</b>	<b>8.7</b>	<b>11.5</b>	<b>12.1</b>	<b>11.4</b>	<b>11.7</b>

Note: The rates of return to tertiary education are calculated by comparing the benefits and costs with those of upper-secondary education. In Sweden, the theoretical length of standard tertiary course is used in the calculation rather than the average theoretical length of different programmes.

1. 1998

2. 1997

3. Post-tax earnings.

4. Excluding Italy.

Table 4

Result on 10 OECD countries

Regression Statistics		y: Number of mobile students				
Multiple R	0.8057542	x1: GDP of host country				
R Square	0.6492398	x2: GDP of students' own country				
Adjusted R Square	0.6283612	x3: Distance (based on capital cities)				
Standard Error	0.4721045	x4: Internal Rate of Return (dummy)				
Observations	90	x5: Common language (dummy)				
ANOVA						
	df	SS	MS	F	Significance F	
Regression	5	34.65375819	6.930752	31.09597	8.86185E-18	
Residual	84	18.7221431	0.222883			
Total	89	53.37590129				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
intercept	-14.17925	1.850995311	-7.66034	2.89E-11	-17.8601593	-10.498345
x1	0.8698895	0.105418507	8.251772	1.9E-12	0.660253193	1.07952571
x2	0.7874059	0.105418507	7.469333	6.92E-11	0.57776964	0.99704216
x3	-0.956837	0.116301331	-8.22722	2.13E-12	-1.18811516	-0.7255593
x4	0.4707997	0.099766898	4.718997	9.36E-06	0.272402241	0.66919707
x5	0.514626	0.178468238	2.883572	0.004993	0.159722342	0.86952965