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## KNOWLEDGE EXPORT IN HIGHER EDUCATION A Hierarchic Approach

***Abstract:** The purpose of the paper is to lay the possible methodological foundations for the quantification of higher education export, and more specifically of the export of knowledge. In the introductory part of the paper the author emphasizes the need for basic and applied research that provides reliable data and information relating not only to foreign students in higher education but also to the export performance and capacity of the sector and its institutions. The author sees this issue as a topic of greater interest to economic policymakers and university managements. The core of the paper is the author's holistic model of knowledge export constructed from the bottom up, which consists from hierarchic horizontal and vertical levels. Theoretical and practical tasks involved in further development of this model are discussed in the Summary. The author concludes that to answer the questions concerning comparative advantages in this field, not only the product but the entire functioning of the higher education market requires analysis from the economic, management, business, marketing, and other aspects.*

***Keywords:** categories of publications, exchange students, export capacity of higher education, higher education, knowledge export, model of knowledge export, ranking of universities, research results, scientific research, teacher mobility, student mobility*

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### 1 Introduction

In the global competition a small country that is able to export a relatively large proportion of its own products (like Finland, Sweden and Switzerland) is more competitive than one that can sell its national products only at home. Starting from this basic premise, we shall attempt in this study to outline how higher education, as an increasingly decisive segment of the modern economy, features in export. Statistical bureaus generally do not keep separate records of the proportion of higher education services that was exported in any given year. There are two reasons for this.

*On the one hand*, the higher education sector began only in recent decades to assume the nature of an industry. As a result of this, compared with that of other branches the value of the export turnover of higher education in market conditions was not significant. *On the other hand*, it is typical of a service of a mainly public service character that it operates in isolation from external markets and is financed predominantly from the public purse. By the beginning of the 21st century the conditions were ripe for the export capacity of higher education to become a global issue. Entering the information century, a marked divergence is beginning to appear in terms of the export-generating ability of scholarship and teaching.

Leading countries like the USA, Australia and others already describe these fields numerically. Thus, for instance, *at national economy level the USA earned an income of \$14.4bn from higher education students* in the academic year 2006/2007. (Tuition fees and living expenses.) After five years the number of foreign students rose again by 3.2 per cent, reaching a total of 582,984. It is also significant that the increase was greater from the top three sending countries, India (10%), China (8%) and South Korea (6%), indicating growing concentration as well [9]. According to the trade ministry report, this income ranks fifth in the export ratings of the service sectors.

According to the latest statistics, there are about 12,000 foreign students studying in Hungary, and 8000 Hungarian students studying abroad (Education Ministry statement). Whereas the number of foreign students studying here shows a declining tendency, or at least seems to be stagnating, more and more Hungarian students are going abroad. Despite the diversity of the statistical sources and their unreliability, the general opinion is that *the competitiveness of Hungarian higher education in general, and its export capacity in particular*, is tending to decrease. The question is, apart from student mobility, what is the situation in the field of scholarship and of services supplementary to teaching and research? How are we to assess export in the latter fields? Is it possible to express in a single statistic the export performance of a university, or a department, or other entities?

These questions can be raised at the level of universities, faculties and training programmes. At Hungary's leading medical school, *Semmelweis University*, every second student is foreign, and the university earns an annual income of 3bn forints from its foreign students. (Statement made on Hír TV by the rector, Tivadar Tulassay.) Unlike the situation in the USA, however, here it is not known how much of the export income of the national economy derives from university teaching, research and other higher education activities.

There is a need for basic and applied research that provides reliable data and information relating not only to foreign students in higher education but also to the export performance and capacity of the sector and its institutions, a topic of greater interest to economic policymakers and university managements.

Because of the general nature of the problem, the methodological basis must be dealt with first. *The purpose of this study is to lay the possible methodological foundations for the quantification of higher education export, and more specifically*

*of the export of knowledge.* Further studies, analyses and case studies are needed to enable us to evaluate the overall export activity of a country, or a university (such as Hungary, or the Corvinus University of Budapest).

## 2 The main areas of knowledge export in higher education

If we examine higher education institutions similarly to businesses, the question can be raised, what can they offer on the export market? The most obvious answer is: their *teaching* activities. This is what these institutions are most concerned with, in connection with the recruitment of foreign students. These numbers can be expressed in natural units of measurement (persons) and also in amounts of money (income from tuition fees). A university, however, also carries on *research* activity, the results of which may also yield export income. At the same time the institution may offer other services to foreign nationals, such as dormitory accommodation, catering, employment agency services, etc., thus providing a sort of *tourist* service as well. These are the three areas where the export activity of universities, in accordance with accounting rules and after the introduction of appropriate statistical calculation procedures, can be tracked and made accessible to the wider public and the owner as well.

Higher education, however, is a special sector in that *those employed in it*, especially the teachers and researchers, *are sort of intellectual free-lancers*. They can make use of their knowledge individually, that is, they can engage in teaching and research at the invitation of foreign institutions, while on the staff of a Hungarian teaching institution. The income from such activity does not appear in the university's formal accounting system, but may be very important from the export point of view in the case of certain internationally renowned academics. As far as the country is concerned, this is export activity, which as a result of globalization plays an increasingly significant role. This can be determined by means of estimates and questionnaires.

In what follows we shall consider these four large areas, because these are the four areas that ought to feature separately in the export balance sheet of every higher education institution. The strengths of each institution may appear in different columns. Thus, for example, the strength of a college engaged in training for the tourism industry may be that its students devote the greater part of the money they spend here to travelling around the country, to catering and to dormitory accommodation, and a smaller proportion is spent on tuition. In the case of a *university with an international reputation*, on the other hand, apart from the high tuition fees there may be laboratory experiments commissioned from abroad. The real question is what proportion of the institution's total income derives from abroad.

## 2.1. Student mobility and export

This is the area in which we have the most data at our disposal, measured in natural units. Universities have to prepare annual reports, generally for October 15, on the foreign students attending their institutions, the numbers who have graduated in the given academic year, etc. We consider it important to take account of the following data:

The number of *foreign students taking part in degree courses*, the tuition fees paid by them and the budget contribution. In financial terms, for every individual student the source of finance can be assigned that covers the cost of his or her studies for the given year. Here at least three student groups can be distinguished. First, *students paying tuition fees and taking part in foreign-language programs*. Secondly, *students who are foreign citizens but of Hungarian nationality*, studying here on the basis of inter-state agreements. Though the budgetary support paid on their behalf is not export income for this country, from the point of view of the sale of university knowledge it counts as knowledge export and ought to be shown in a separate column. Thirdly, there are *foreign students resident in the country in question*, who may have completed their secondary education there but *who have not yet acquired citizenship* (e.g. Chinese students in Hungary, Turkish students in Germany). They may feature in various programs and tuition fee structures.

*Students taking part here in 'study abroad' programs*, who do not come to gain a degree, but pay the market price (the tuition fee) for the service. It is mainly American students who fall into this category, but the proportion of students from other countries outside Europe is likely to grow.

The number of *exchange students*. These students do not feature in the official statistics of the Hungarian ministry of education, because in their place Hungarian students are studying abroad. On the basis of Erasmus and other bilateral agreements, their number is steadily increasing, especially within the European Union. Although here formally export income does not accrue to the institution or the country, from the economic point of view it does, namely in that in the barter exchange of programs with differing market prices, the less developed country *experiences positive external economic effects (externalia)*. To take an example from motoring, this is like when we changed an old socialist Wartburg for a Volkswagen, or when East and West Germany officially exchanged their marks 1-1. Everyone knew that the West German mark was worth more.

So if a student from the University of Economics in Budapest is an exchange student at the London School of Economics, and an LSE student studies in Budapest, no financial transaction takes place, but nominally the Hungarian student gets a product with an exchange value four times greater than his British counterpart gets. (Assuming that the British course costs the state €10,000 per student, while for a Hungarian student it costs €2,500.) The more expensive the institution that students are sent to, the greater the value that accrues to the individual and the sending country as well. Indirect export income calculated in this way can be nominally determined

(constructed from the bottom up) and summarized, or can be roughly calculated on the basis of *purchasing power parity*. We regard the latter method as justified. Thus, for instance, if in the case of Britain in terms of purchasing power parity Hungary's GDP stands at 60 per cent, then instead of €10,000 it is worth calculating on €6,000. Thus the export income gained through the barter deal (because the University of Economics was capable of providing a suitable service for an LSE student) amounts to €3,500 rather than €7,500. This ought to be shown in the export balance.

Employing the same method of calculation for *poorer countries* than ours (e.g. Romania), in the case of student exchanges both the individual and the country suffer a loss. If, for example, the cost of the Romanian training course calculated according to purchasing power parity is €2,000, then with every student exchange the Hungarian institution loses €500, which reduces its export. On the other hand, this can be categorized as state 'charity', such as Britain and every other highly developed country extends to the poorer countries.

## 2.2 Scientific research, publications

Determining the market value of the results of scientific research even in itself involves theoretical and practical difficulties. This is the area in which there is the greatest need for theoretical and practical research. The reasoning that follows here is the first approach to this problem. Basically there are *two ways* in which we can approach the question.

First, constructing from the bottom up, *to every scientific product we assign an amount* that it is worth on the market. If this amount has come from abroad, then it is put in the category of export. Thus, for instance, it can be ascertained that in Hungary the scientific research fund (OTKA) means about 5bn forints annually as research income for institutions. This comes from domestic sources, so it does not count as export activity. But if a certain sum comes to Hungary from EU funds, then it counts as export. Universities can carry out research at the request of foreign companies and write studies, for which they receive money, and such amounts should be listed in the same category. In practice, however, it is a very small amount that results from this procedure, the reason being that *scientific research* is a peculiar kind of good, in which the role of private asset and public good are inextricably mingled, with the latter dominating. This means that payment is not made for publications, though everyone can gain access to them. This is why a different logic is needed.

Secondly, *starting from the working hours of researchers we can estimate* how much time they spend on research, and in particular on export-generating research, and by multiplying this figure by their hourly salary we can arrive at an approximate value. In the case of a university (such as the University of Economics), **in evaluating a university teacher engaged in business training the allocation of working days is as follows: two days of teaching, two days of research and one day of consultation.** If we calculate on the basis of 2000 working hours a year and a gross salary of 5m forints, then out of this the amount spent on research is 2m forints.

After that we ‘only’ have to estimate how much of the research product counts as export activity. This requires very detailed, thorough analysis, at least as rigorous as we are accustomed to in the area of teaching.

Let us suppose that the outcome of research takes the form of just two products: *books and journal articles*. Both may be either *in Hungarian* (domestic products) or *in English* (export goods). In order to express the value of individual products in forints, first we have to make them commensurable by means of some kind of artificial unit of measurement. A points system may be used. Suppose a professor has to accumulate 100 points from his research products to qualify for his annual salary. This means that each point represents 8 hours of work, or 20,000 forints. Depending on what sort of portfolio his employer expects from the researcher, he assigns different weights to various activities. If monograph writing is important, then a 16-page book or chapter of a book is worth more points than a journal article. If publication abroad is what matters, then an article written in English can earn twice as many (export) points as one written in Hungarian. If quality is the main consideration, then an article published in an ‘A’ category journal is worth twice as many points as one published in a ‘B’ category journal. (Or an article with an impact factor of 1 earns twice as many points as one with an impact factor of 0.5.) We could refine the system still further. The main thing is that in a relatively simple way we are able to estimate the indirect export value of the products of research.

### 2.3 Teacher mobility, guest lecturers, employment abroad

Universities place great emphasis on collaboration by their staff in the work of external organizations, either for payment or without it. It raises the institution’s ranking (market value) if the government, the media or major companies consult its staff as experts. Similarly, *it is in the interest of the institution that its staff should do research, teach and engage in other professional activities abroad*. Then the international reputation of both the country and the institution is enhanced. It is not customary, in the conditions prevailing in this country, for institutions to give a numerical form to this value. Precisely for this reason, the expression in figures of export activity of this kind, which can be regarded as more sporadic, may provide methodological assistance in expressing in figures domestic activity as well. (Let us note, merely in parentheses, that the so-called Inter-City professorship, which undertakes assignments in several universities, is a clear manifestation of this within the country, which unfortunately is approached only from the negative aspect by certain politicians in Hungary.)

A proportion of teachers are engaged continuously, on the basis of individual contracts or longer spells of employment (as guest or associate professors), in teaching and/or research at universities abroad. In this case the salary they receive serves as the basis for evaluating this export activity. Every individual teacher can calculate this on the basis of each concrete assignment. Whether it is a case of research, teaching, expert consultation or any other form of activity, determination

of its export value can take place in two ways.

The simpler way is when the *employer transfers the whole amount of the payment* to the employee's account in a Hungarian bank. For example, for four weeks of teaching an American university pays €5000. Then the teacher has to cover all his or her expenses. The cost of renting accommodation (€1000) and other expenses abroad (food, transport, etc. – let's say €400) reduce the net export. The plane ticket (€600) may be bought from MALÉV or from a foreign airline company. This affects the country's export-import balance. If the latter is chosen, then of the €5000 of gross export income eventually €3000 may come in, as net export.

The other, frequently used method is for *the host partner to directly cover a proportion of the expenses* e.g. by providing a guest professor's flat (at a cost of €600, which is below the market price), with full board (cheaper, at €300) and by sending a plane ticket (also cheaper, at €500). In this case, the employer directly transfers €3000 to the employee's account at the Hungarian bank. For the employee, at market prices the expenses amount to €2000, while for the host university the expenses are just €1400. From their point of view there is a saving of €600 on the import side, since the month's teaching by the foreign professor now costs them €4400.

If a professor has two months a year (20% of his working time) in which he can undertake any kind of work as an expert, then this means that in these circumstances he can earn a maximum of €6,000, that is, 1.5m forints (in the event of two full months' teaching abroad). On an annual level his income thereby increases to 6.5m forints, an increase of 30 per cent. If we reckon on 400 hours of work in those two months, then this opportunity represents an hourly rate of pay of 3750 forints. If we compare this opportunity with what can be earned here at home in 400 hours, if someone undertakes business consultancy or an Inter-City professorship, then it becomes obvious why export does not provide motivation for excellent teachers.

In the preceding paragraphs we have assumed that we are dealing with teachers in full-time employment, who spend only a permitted proportion of their time (or less) on export activity. It would be in the institution's interest, however, precisely on account of the fact that its employees are freelance intellectual workers, to grant them unpaid leave as well for engaging in professional work abroad. The only way to be competitive on the global market is for both the institution and the individual to be able confidently to undertake this. A move towards "*inter-country*" *professorships* is in the interest of the individual, the institution and the country alike. We can regard it as an intermediate stage towards flexible employment, which would not necessarily lead to full-time employment abroad.

#### **2.4. Other services connected with teaching and research, as export activity**

In the 20<sup>th</sup> century the leading universities became institutions providing a comprehensive service, *university towns* (campuses, to use the English expression). In addition to their basic activities of teaching and research they provide countless

other services: dormitories, accommodation, sport, health care, commerce, conference organization, etc. More and more people are employed in the organizations specializing in this. Just one graphic example by way of illustration. One of the top ten universities in the USA is Washington University (Seattle), with an annual income of \$2.2bn, or c.400bn forints. This is as much as is available for the whole of Hungarian higher education. Its 43,000 students are served by a teaching staff of 3,360 and 13,280 other employees. Teachers account for 20 per cent of employees; that is, for every teacher there are four other employees [(12, p.44)]. This indicates what a lot of other activities apart from teaching and research go on within the confines of the campus, a proportion of them involving export activity.

The provision of accommodation for foreign students, teachers, conference participants, etc. is generously *included in the category of tourism*, and can be undertaken by the university or by other institutions. The income of sports facilities, restaurants, etc. visited by foreign citizens is export activity. The extent to which the university takes advantage of these opportunities depends on its entrepreneurial spirit. Trends indicate that these export revenues account for an increasing proportion of the budgets of the leading universities (e.g. Harvard, INSEAD's short residential management training programmes).

### 3 The hierarchic model of knowledge export

Now that we have surveyed the four main areas of knowledge export in higher education, the next question is in what way the statistical calculations should be done, and who should be included in them. From this point of view it is useful to consider the methods used in the case of *tangible goods* such as cars. Using natural units of measurement, the trade knows precisely how many cars have been manufactured in the world each year, in which regions, in which factories, of what types, and so on. If we look at the market, besides the big commercial companies the individual may also be present, as a seller (on the second-hand market) and as a buyer, on the international market as well. It was in the interest of the trade to evolve a *relatively transparent market information system*, a system where it is to the various participants' advantage to share their knowledge, without giving away any trade secrets.

On the higher education market we are at the beginning of this process. The situation is made more difficult by the *special service nature of the product*, but in theory made easier by the fact that it is a question of a publicly financed activity, in which the law demands greater transparency [14]. On the other hand, because knowledge is a public asset, publication is really 'publicus', that is, accessible to everyone, and 'only' has to be expressed in numbers. Taking all this into account, we recommend a hierarchic model, constructed from the bottom up, for giving a numerical value to knowledge export.

The *most basic level* of knowledge export is that of the *individual*: the teacher, the researcher, the staff member, who takes part in export both as an individual and as a

member of a larger organization. The *most comprehensive level*, on the other hand, is that of the output of all the universities in *the world*. Between these two levels, on the basis of the structural logic of building them upon one another, we consider it useful to distinguish eight further levels. The 10 levels thus created are interesting also from the point of view that development and competition can be traced at every level. There are levels where competition is stronger and others where it is weaker, depending partly on the extent to which we relax market economy rules with regard to the various elements of the system. In what follows, without making any value judgments but adopting the *descriptive scientific approach*, we shall introduce the various levels.

The combination of the four areas of higher education knowledge export and the 10 hierarchic levels to be dealt with in detail in what follows leads to a 4X10 matrix (Table 1). After filling the various cells of the matrix with natural and financial data we can determine the volume of export. Statistical calculation generally has at its disposal predominantly natural indices relating to the *university* (level 4), the *country* (level 6) and the *world* (level 10). In the case of a university with properly-functioning performance indices; however, it is possible to determine export in relation to the *individual* (level 1) as well.

The chief advantage of this holistic system, which extends over the entire range of activity and embraces every hierarchic level, is its ability to influence decision makers at the different levels of management. Thus, for instance, on the basis of comparison of the data for the organizations under their supervision, a dean, a rector or the minister of education can comprehensively assess an institution and evolve a clear-cut system of incentives in order to achieve their aims.

Table 1

## Horizontal and vertical levels of knowledge export

Hierarchic levels	Student mobility	Scientific research	Teacher mobility	Other services	Total export
<b>1. Teachers, researchers</b>					
2. Departments, institutions					
3. Faculties, fields of knowledge					
<b>4. Universities, teaching centres embracing several fields of knowledge</b>					
5. The same field of knowledge throughout a country					
<b>6. All the universities in a country</b>					
7. All faculties in a region dealing with the same field of knowledge					
8. All the universities in a region					
9. All the world's university faculties dealing with the same field of knowledge					
<b>10. All the world's universities</b>					

There are levels where it is not customary to express the activity itself numerically, therefore any evaluation of export runs into greater difficulties. Elsewhere we have precise units of measurement at our disposal relating to certain elements of export (such as publications, or foreign students). Though the higher levels of the hierarchic system are constructed upon the lower levels, because of the differing dimensions of the calculations it is not always possible to make a mechanical summation of the lower level in order to determine the performance of the higher level. In what follows we shall analyse some areas in greater detail and others only briefly.

### 3.1 Teachers, researchers and administrative staff as subjects of export activity

*Every employee* in a higher education institution can be asked the question, to what extent he or she engages in export activity. There are some who do it of their own free will; some do it because it belongs to the nature of their work; and for some it is specified in their job description. Everyone working in the office that deals with foreign students is involved in export activity, as in a travel agency specializing in foreign visitors. Others devote part of their working time to it. In this case, analysis of working time helps to determine the amount of export activity.

Earlier we indicated how teaching abroad can be allocated to the allowance of free consultation time in the case of a *staff member with permanent academic status*. If, as we assumed earlier, we have a *points system relating to teaching tasks, research work and work involving the organizing of teaching and/or research*, then we have to go through every item and determine *what proportion of the points derives from export activity*. If a teacher earns 10 points for teaching one subject in one time-slot (80 minutes), then this all counts as export if the class consists only of foreign students. If it includes just a few foreign students, then their number must be divided by the number in the class, and the product multiplied by the number of points, and the resulting number of points can then be assigned to export activity.

Naturally, on the first occasion the cases that are difficult to categorize must be analysed, and a standpoint worked out. Thus, for instance, if *an article in English appearing in a journal published abroad* earns 15 points, this counts entirely as export, since we presume that the great majority of the readers are foreigners. But if the journal is published in Hungary, and only a limited number of copies are sold abroad, then here again an estimate is needed. The basis for it may be the proportion of the copies printed that are sold on foreign markets. If this is 60 per cent, then  $0.6 \times 15 = 9$  points can be added to the export tally.

In the case of points awarded for the *organizing of an international conference*, the above procedure can be followed; thus, for example, the given number of points, say 10, can be adjusted by taking into account the proportion of foreign participants. The organization of a profession's large-scale, annual international congress, however, demands much more time than the  $10 \times 8 = 80$  working hours corresponding to this in the *working time balance*. In such a case the free professional time allowance or the 'individual overtime allowance' is at our disposal, covering a further, say,

100 working hours. The main thing is that in the individual export balance, if we now want to express the activity in forints, then  $(80+100) \times 2500 = 450,000$  Ft appears, instead of 200,000 Ft.

### 3.2 Departments, institutions, research teams

A university's internal regulations determine for what activities financial accounting is done at department, institute and research team level, that is, in individual basic organizational units. Where this does not take place, clearly people are not thinking terms of export. But on the basis of our logic, it is possible in the simplest way to prepare an estimate of the export activity of a department (let us use the name of this organization only), if we *add together the export activities of the people who make up the department, on the basis of the university's points system*. If, for instance, there are three university professors, and according to the points system they earned 15, 45 and 85 points respectively through export activity, then on this basis the department's export income is  $145 \times 20,000 = 2,900,000$  Ft.

The system we recommend enables *decision-makers* at the various hierarchic levels (heads of department, deans, directors, rectors, ministers, etc.) to *take decisions appropriate for achieving their aims*. In the case of external accreditation, a head of department may realise that in the department over five years five Hungarian-language books have been published, but not even one foreign-language article has appeared in an A or B category journal, and he or she will begin thinking about the reasons. If an average book earns 50 points, then a total of  $50 \times 20,000 = 1,000,000$  Ft can be calculated, and if the author received a honorarium of a further 500,000 Ft from the publisher, then writing a book earned the author 1.5m Ft. If an article published in an A or B category foreign journal is worth 15 points and there is no honorarium, then this earns the author 300,000 Ft. It is perfectly obvious that in the absence of other motivation, the department members are going to write books rather than professional articles.

### 3.3 Faculties, fields of knowledge

Faculties are the organizational units where export activity can be comprehensively assessed; that is to say, its presence in *all four higher education knowledge export markets* can be examined. If the faculty grants the degree, the specialized qualification, then it is accountable for everything. Since the nature of the basic activity differs from one faculty to another (mechanical engineering, economics, horticulture, law, to name just a few), the norms also differ, as do the knowledge requirements and therefore the importance of internationality. The faculty can decide what areas of export to expand into, that is, in what areas it needs to excel in teaching, research and other services. It is useful for a faculty to prepare a *matrix* in which the main areas of knowledge export lie on the horizontal axis, while the departments and institutes are shown on the vertical axis.

### 3.4 Universities, teaching centres embracing several fields of knowledge

The new law relating to Hungarian higher education was intended to soften the boundaries of the faculties, which had been becoming increasingly rigid walls. For this reason almost all the provisions of the law apply to universities, but at the same time the university's internal regulations have delegated almost every right to the faculties [1]. But as comprehensive administrative units the universities play a major role in international competitiveness. They are organizations capable of exploiting the advantages deriving not only from *economies of scale* but also from *interdisciplinary cooperation*.

There is an increasingly noticeable tendency among the major Australian, American and German universities to appoint as heads of their international organizations diplomats and businessmen who are able to use to advantage in the higher education sector the experience they have acquired in diplomacy and business life. There is a need for a concentration of resources at university level, to enable a university to target the major foreign regions at strategic level. Everyone can see that in the area of student mobility the Asian market is growing enormously, but only the universities are capable of taking advantage of this, through deliberate policy.

Similarly, at university level collaboration is needed if they are to win a share of international research programs. Precisely because of this global market, and the formation of the *European Higher Education and Research Area*, organizational units smaller than universities cannot take part in these processes, unless their dimensions (revenues, student and staff numbers, buildings) make it possible. It was mainly multi-faculty, classical, large, historical universities that managed to get into the famous Shanghai ranking. Three Hungarian universities are among them, in the 201-500 band, while the Czech Republic has only one and Poland two such universities [(12, p.358)].

For a university too it is possible to draw up a knowledge export matrix in which the faculties appear in the rows. At university level, export is even more liable to be calculated collectively. This happens in the case of publications and also with foreign students, when central organizations deal with these topics. This is typical in the area of *other services*, where infrastructural investments and teaching, sports, conference, cultural and accommodation facilities are handled by the university, and therefore their use for external market, export purposes can also be measured at university level. This takes place if the university really behaves like an economic unit [5].

### 3.5 A country's university faculties in the same field of knowledge

Market demands, cultural differences, historical traditions and many other factors play a part in determining in which specialized fields people are trained in a particular country. Thus, for example, traditionally *in Germany and Japan the proportion of students attending courses in engineering is higher than in the USA*.

*In the USA in the academic year 2006/2007 the ten most important fields of knowledge where foreign students were enrolled were the following: business and management (jointly, 18%); engineering (15%); physical education and life sciences (9%); social science (8%); mathematics and computer science (8%); fine and applied art (5%); health professions (5%); intensive English (4%); education (3%) and humanities (3%) [9].*

The ranking of universities is mostly done according to faculties and specializations. Hungary has 170 competing faculties. In this competition at present the battle is being waged mainly for students, but also for subsidies based on the state per capita allowance, for development subsidies, tuition fees and export markets. While in the first three areas, because of the limited nature of the Hungarian market, they are competing at one another's expense, on the export markets it is a *win-win* contest. Here, if *Hungarian medical science* has a good reputation, it has a positive effect on the export market performance of all the Hungarian universities, precisely because of the small size of the Hungarian market compared with the world market.

### **3.6 Export from all the universities in a country**

We can most simply obtain the volume of the export activity of all the universities in a country if in the manner already described we add together the export turnover of the individual universities, thus building from below. For this, however, we would first need data that we do not possess. When we have it, it will be possible to prepare the matrix mentioned earlier, in the rows of which the names of the various universities appear. The OECD, for instance, carries out surveys of the flow of labour and students in its member countries. On this basis it can be ascertained that c.8,000 Hungarian students are studying abroad, and 3,000 Hungarians are working abroad as researchers.

Although rankings of countries *on the basis of the number of their publications* do not give a complete picture of their export, these are good approximate values for knowledge export.

### **3.7 Export from all university faculties and institutions in a region dealing with the same field of knowledge**

On the global market there is competition among regions. The regions may be groups of countries, like the Visegrád Four, or the 12 new members of the EU, or the 15 EU member countries prior to the latest enlargements, the 10 countries of South-East Asia, and so on. But they can also be regions that overstep national frontiers and consist of areas embracing regions of certain countries (like Sub-Carpathia, which includes parts of Hungary, Slovakia, Ukraine, Romania and Poland). Such types of cooperation are generally related to particular fields of knowledge.

### 3.8 Export from all universities in a region

The most important for us is the export from the universities of the European Higher Education Area, although we know that the East-Central European region badly spoils these statistics. Here too, basically, the approach mentioned earlier, building from below, adding together the various countries' data, which rely on national statistical calculations, can be applied to only a limited extent. Few countries have as thorough a statistical system as the USA.

On the other hand, as a result of globalization, organizations with responsibilities of this kind are increasingly being formed. The biggest organization dealing with student mobility in relation to the USA and the whole of North America is NAFSA. In Europe there is the European Association of International Education (EAIE), while in Asia there is the Asia Pacific Association of International Education (APAIE). The conferences, student fairs and exhibitions organized by them give a good picture of the region's export capacity.

### 3.9 Export from all the world's university faculties and institutions dealing with the same field of knowledge

The world rankings of universities drawn up by the Financial Times and other organs provide a good opportunity, as far as the leading universities are concerned, to judge whether, for instance, medical science and engineering sciences are the most export-oriented fields. The various export fields reveal great differences. While in the natural sciences the export of publications (see the role of the impact factor) seems more widespread, in the business sciences the student mobility component of export is stronger. The degree of this, however, may differ in the case of poorer and richer countries, or countries in different phases of development. This is what makes it exciting to analyse these statistics and use them for forecasting and decision making. Among academic publications we have so far mentioned mostly professional articles. There are many who contest this, claiming that *books* and *monographs* are at least as important components of academic output and export. The market for these is undoubtedly a part of export.

### 3.10 Export from all the world's universities

For many centuries the knowledge market, and within it the higher education market, was global, since everyone learned Latin and a relatively small number of universities served a large area, as in Europe. The majority of students studied not in their homeland, in their mother tongue, but abroad. At the universities of Bologna, Paris, Vienna, Cracow, Prague, etc. most of the students were foreign. In the 19<sup>th</sup> century national languages and in the 20<sup>th</sup> century higher education for the masses caused what had formerly been an export-oriented market to become a domestic one. Today, of the 120 million students in higher education only 2.5 million are foreign

citizens. It is this ratio that is going to change dramatically in the present century. At least the trends and the life curve of higher education indicate this.

The same applies to the research activities and the catering and service activities connected with higher education. They account for an increasing slice of GDP. More and more people are employed in this sector. By 2025 some estimates put the number of students at 250 million. This implies the growth of the industry and commerce that serve them.

#### 4 Summary; conclusions

As we said in the introduction, our purpose was to outline a theoretical framework that can be used in practice to illustrate the role of higher education, as a branch of industry, on export markets. Though the proportion of higher education export in GDP terms is insignificant, because of its strategic importance the time has come for us to begin measuring it. In what follows we shall touch upon the theoretical and practical tasks involved in further development of the holistic model we have outlined.

In the development of the *system of higher education financing*, a decisive part is played by the extent to which a higher education product is a *public asset or a private asset*. Supporters of higher education that is free as far as students are concerned have argued, and continue to argue, in favour of the former every time the question crops up. Those who emphasize that the student, in acquiring a degree which has a high market value, gains a private asset, justifiably argue that the community should share in this profit, even retrospectively. Ideas like tuition fees, repayment of costs, student loans, or deferred repayment of costs all derive from this. Analysis of it is particularly exciting in the case of international student mobility.

The highly developed countries of Western Europe can afford to accept foreign students *free of charge*, like their own citizens, or *for minimal repayment of costs*. But if the ratio of foreign students rises above a certain level (5-10%), then the economic consequences are not negligible. In Europe courses taught in English are generally fee-paying in the less developed countries. In the Scandinavian countries they are provided free, on conditions similar to those for native students. In this case the *positive externalia* have to be examined, which may compensate for the tuition fees not charged.

One of the explanatory theories of international trade is that of *comparative advantage*, the application of which to higher education knowledge export requires basic research. Why is it worth while for a student from a rich country to study in a poor country? Why do such exchanges take place? Why may a poor country be able to export? To answer these questions, not only the product but the entire functioning of the higher education market requires analysis from the *economic, management, business, marketing* and other aspects.

The calculation of knowledge export in the university sector comes up against countless theoretical, accounting and recording difficulties. Only concrete practical

research can alter this. For example, in the USA there is a relatively good database relating to *student mobility*.

In relation to certain categories of *publications and professional articles* it is possible to construct a very good hierarchic system, starting from the individual. The various institutional rankings generally do this. Thus, for example, one aspect that the Financial Times, in compiling the MBA rankings, examines is how many articles researchers from a particular institution have had published in any of the 40 leading professional journals it has selected. Every year institutions in Hungary as well report on their research results (the number of books, book chapters, specialized articles, conference lectures, etc.) but these do not become decisive indicators for management. They could be supplemented by successful *case studies* describing the situation. Everyone could do with a reliable, consistently measured export performance index.

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