NATIONAL BANK OF GREECE

Turning Greece into an Education hub

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➢ Leveraging on the booming global trend of students' mobility and its traditional strength in the production of educators – albeit many living abroad, Greece could be transformed into a regional education hub.

➢ The global environment is favorable, as there has been an impressive increase in students' global mobility over the past four decades (with the number of young people traveling to another country in pursuit of higher education quintupling, to 4.5 million students in 2014 from about 1.8 million in 1995 and 0.8 million in 1975).

➢ Countries have benefited from this trend to different degrees. NBG Research has constructed an Education Index to measure the global competitiveness of universities. Our estimates suggest that the key determining factors are: the degree of university independence, the quality of its professors, the level of R&D expenditure and the country's language.

➢ Greece ranks low in the Education Index, mainly due to the limited independence of its universities. Weak competitiveness is reflected in Greece's low share in the global market (0.7 per cent) – with the majority of foreign students enrolling either through bilateral agreements (e.g. with Cyprus) or are children of immigrants (mainly from Albania).

➢ Based on our estimates, a convergence to international standards could increase inbound students in Greece to about 110,000 from 27,600 in 2015, comprising (i) significant improvements in university independence and (ii) benefits from the large pool of Greek academic diaspora (as 60 per cent of Greek professors are currently employed abroad, compared with an EU average of 11 per cent). In particular, the following steps could be considered:
- ✓ Establish a coherent national strategy for higher education in order to foster independence, results-based funding and international collaborations.
- ✓ Introduce policies and incentives to attract the academic diaspora.
- ✓ Foster the creation of Centers-of-Excellence around Greek universities (while increasing R&D expenditure in higher education).

➢ Combined with the curtailment of the current outflow of Greek students, the aforementioned increase in international students could result in an annual inflow to the Greek economy of about €1.8 bn, mainly due to higher exports and lower imports of education services.

➢ Apart from the direct effect of turning Greece into an education hub, such reforms could transform the Greek growth model by improving its level of human capital, and according to our estimates from the NBG Long-term Education-adjusted Growth Model, could boost annual GDP growth by 1.1 percentage points in the first decade of the reform (adding, *ceteris paribus*, more than €20 bn annually to the Greek GDP by the end of the decade) and by 0.4 percentage points in the next three decades.

➢ Importantly, the gradual improvement of the country's business sophistication, in conjunction with the improved education system, would produce synergies, and double the growth generating effects. Also note that these calculations underestimate the total benefit, as this transformation would probably attract investment – thus boosting growth further.

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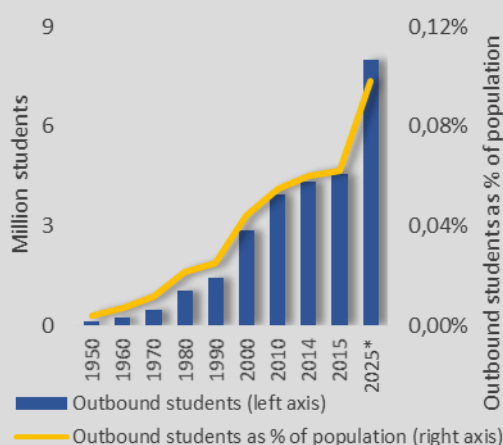
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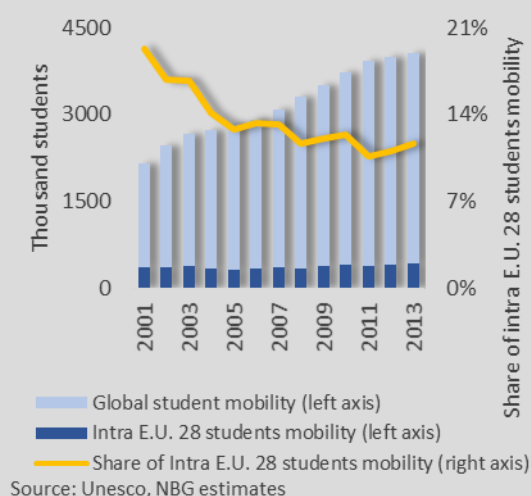

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Students' mobility and population

Outbound students (left axis)

Outbound students as % of population (right axis)

* projection
Source: Unesco, NBG estimates

Students' mobility and population

Global student mobility (left axis)

Intra E.U. 28 students mobility (left axis)

Share of Intra E.U. 28 students mobility (right axis)

Source: Unesco, NBG estimates

In the midst of a prolonged recession, Greece urgently needs new drivers for its economy. Moreover, recent international research has identified that the negative impact of globalization on income distribution in advanced economies can be offset through increases in total factor productivity (TFP), which in turn requires, inter alia, investment in education. Leveraging on the booming global trend of students' mobility and capitalizing on the academic excellence of Greek diaspora, Greece could become a regional education hub. Supported by a powerful reputation (dating back to ancient Greece) for producing educators, Greece could attract from abroad academic professors and university students - boosting its exports of services as well as its medium-term potential growth (through its transformation to a knowledge-intensive economy).

In the following analysis, we examine the global framework for higher education as well as Greece's relative position. We focus on the key factors that determine the attractiveness of universities on a global scale, and derive estimates for the potential long-term boost to the Greek economy in the event Greece enacts the necessary reforms for becoming a regional education hub.
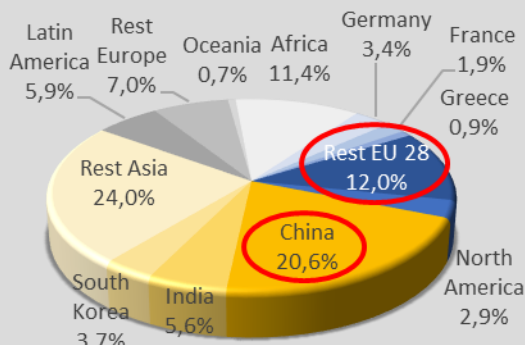
A. GLOBAL MARKET

Over the past four decades, there has been an astonishing increase in students' global mobility, as the number of young people traveling to another country in pursuit of higher education has quintupled, to 4.5 million students in 2015 from about 1.8 million in 1995 and 0.8 million in 1975 (corresponding to 0.06 per cent of the global population in 2015 versus 0.02 per cent in 1975). According to the Institute of International Education[1], this trend is expected to strengthen in the future, with the number of international students projected to reach 8 million by 2025.

Asia has been a key driving force of student mobility, as it currently provides ½ of the international students (compared with 40 per cent in 2000), contributing 60 per cent of the increase during past two decades (with ½ of this increase stemming from China).
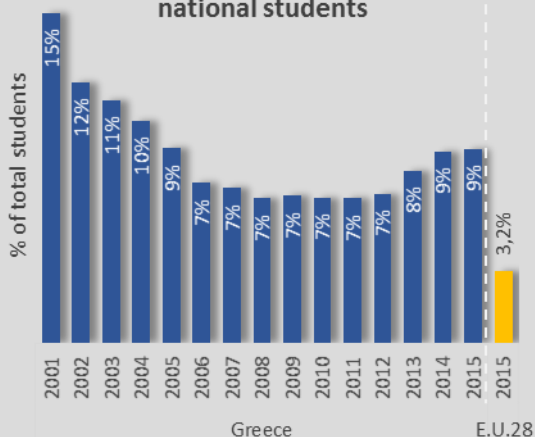
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[1] "Project Atlas: A quick look at global mobility trends" (2015), Institute of International Education.

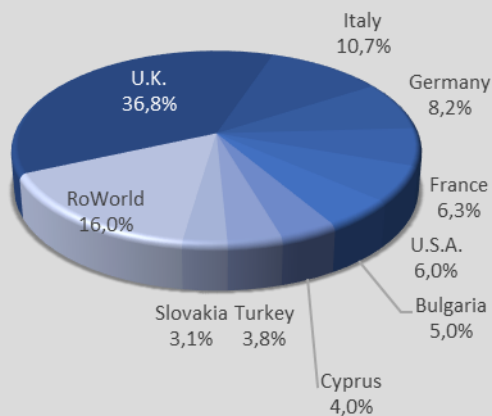## Disaggregation of global students per region of origin
(past 5 years)

Latin America 5,9%
Rest Europe 7,0%
Oceania 0,7%
Africa 11,4%
Germany 3,4%
France 1,9%
Greece 0,9%
Rest EU 28 12,0%
North America 2,9%
China 20,6%
India 5,6%
South Korea 3,7%
Rest Asia 24,0%

Source: UNESCO, NBG Estimates

Outbound students as percentage of the total number of active national students

% of total students

2001 15%
2002 12%
2003 11%
2004 10%
2005 9%
2006 7%
2007 7%
2008 7%
2009 7%
2010 7%
2011 7%
2012 7%
2013 8%
2014 9%
2015 9%

Greece

2015 3,2%
E.U.28

Sources: UNESCO, Eurostat, NBG Estimates

Destination of Greek students
(past 5 years)

Italy 10,7%
U.K. 36,8%
Germany 8,2%
France 6,3%
U.S.A. 6,0%
Bulgaria 5,0%
Cyprus 4,0%
Turkey 3,8%
Slovakia 3,1%
RoWorld 16,0%

Source: UNESCO, NBG Estimates

Turning to the major host countries, the most advanced economies appear to attract the majority of international students. In particular, the US and the UK remain the leaders in the global market, absorbing 22 per cent and 12 per cent, respectively, of the global market. Other popular host-countries are Australia (7 per cent), France (6.5 per cent), Germany (5.5 per cent), and Russia (5 per cent). It is worth nothing that several new host countries have emerged as regional education hubs, such as The Netherlands, Turkey, Canada and China, posting high growth rates in inbound students over the past 5 years (about 10-30 per cent annually) and having a not insubstantial share in the global market (more than 1 per cent).
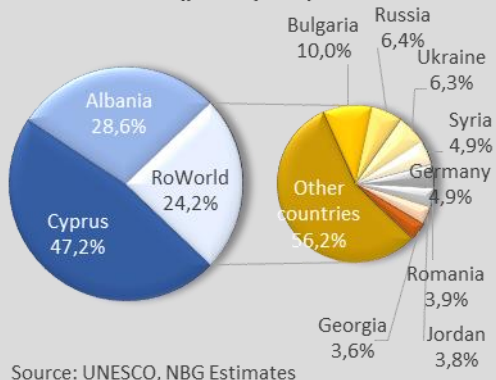
Especially for European countries, we note that intra-region mobility (students travelling to study from one member state to another) currently covers almost ⅓ of the total student mobility in the EU and 12 per cent of global student mobility (down from 19 per cent in 2000).

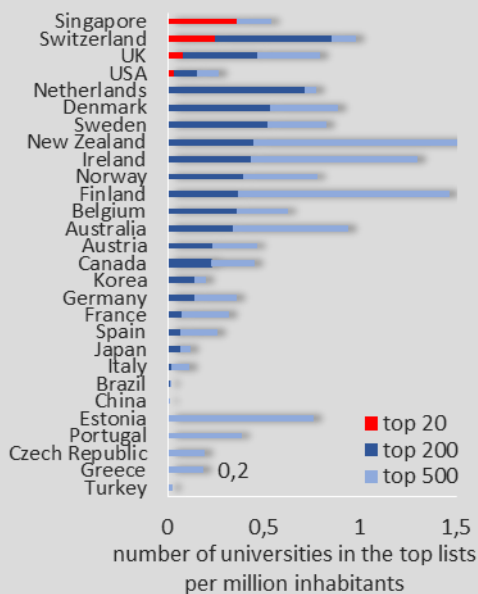## B. GREECE IN THE GLOBAL MARKET
Greek students abroad

Despite the fact that Greece is a small country (covering 0.15 per cent of world population), it has a significant contribution in international student mobility (0.8 per cent of the global market in 2015). The extroversion of Greek students is reflected in a high ratio of outbound to national students (10 per cent in 2015 versus a European average of 3.5 per cent). However, it is important to note that during the past 15 years, the number of Greek students (either undergraduate or postgraduate) opting to continue their tertiary studies abroad almost halved (to 35,000 students per year in 2015 from 60,000 in 2000), as a result of the increased capacity in both undergraduate and postgraduate programs in Greek universities (with undergraduate annual enrollments increasing to 47,000 in 2015 from 40,000 in 2000, while total postgraduates increased to 66,000 in 2015 from 13,000 in 2000). Thus, Greece's market share in the global market has actually shrunk considerably (to 0.8 per cent in 2015 from about 3 per cent in 2000).

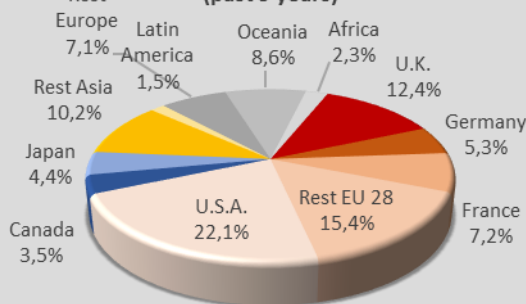## Foreign students in Greek universities by country of origin
(past 5 years)

Russia 6,4%
Bulgaria 10,0%
Ukraine 6,3%
Albania 28,6%
RoWorld 24,2%
Cyprus 47,2%
Syria 4,9%
Germany 4,9%
Other countries 56,2%
Romania 3,9%
Georgia 3,6%
Jordan 3,8%

Source: UNESCO, NBG Estimates

Global University Rankings

Singapore
Switzerland
UK
USA
Netherlands
Denmark
Sweden
New Zealand
Ireland
Norway
Finland
Belgium
Australia
Austria
Canada
Korea
Germany
France
Spain
Japan
Italy
Brazil
China
Estonia
Portugal
Czech Republic
Greece   0,2
Turkey

■ top 20
■ top 200
■ top 500

0   0,5   1   1,5

number of universities in the top lists per million inhabitants

Source: QS Rankings, UNESCO, NBG estimates

Disaggregation of global students per region of destination
(past 5 years)

Rest Europe 7,1%
Latin America 1,5%
Oceania 8,6%
Africa 2,3%
U.K. 12,4%
Rest Asia 10,2%
Germany 5,3%
Japan 4,4%
France 7,2%
Canada 3,5%
U.S.A. 22,1%
Rest EU 28 15,4%

Source: UNESCO, NBG Estimates

EU countries host more than 85 per cent of Greek outbound students, with the UK absorbing over ⅓ of Greek students abroad, followed by Italy, Germany and France (with shares of 11 per cent, 8 per cent and 6 per cent, respectively).

Internationalization of tertiary education in Greece

Greek universities host a minor share of international students globally (0.7 per cent, i.e. approximately 30,000 students). Moreover, the majority of foreign students in Greece are enrolled in the tuition-free undergraduate programs either through bilateral country agreements (mainly with Cyprus) or are children of immigrants (mainly from Albania) and Greek diaspora youths (mainly from Germany). This fact reflects the low attractiveness of Greek universities, which is further confirmed by:
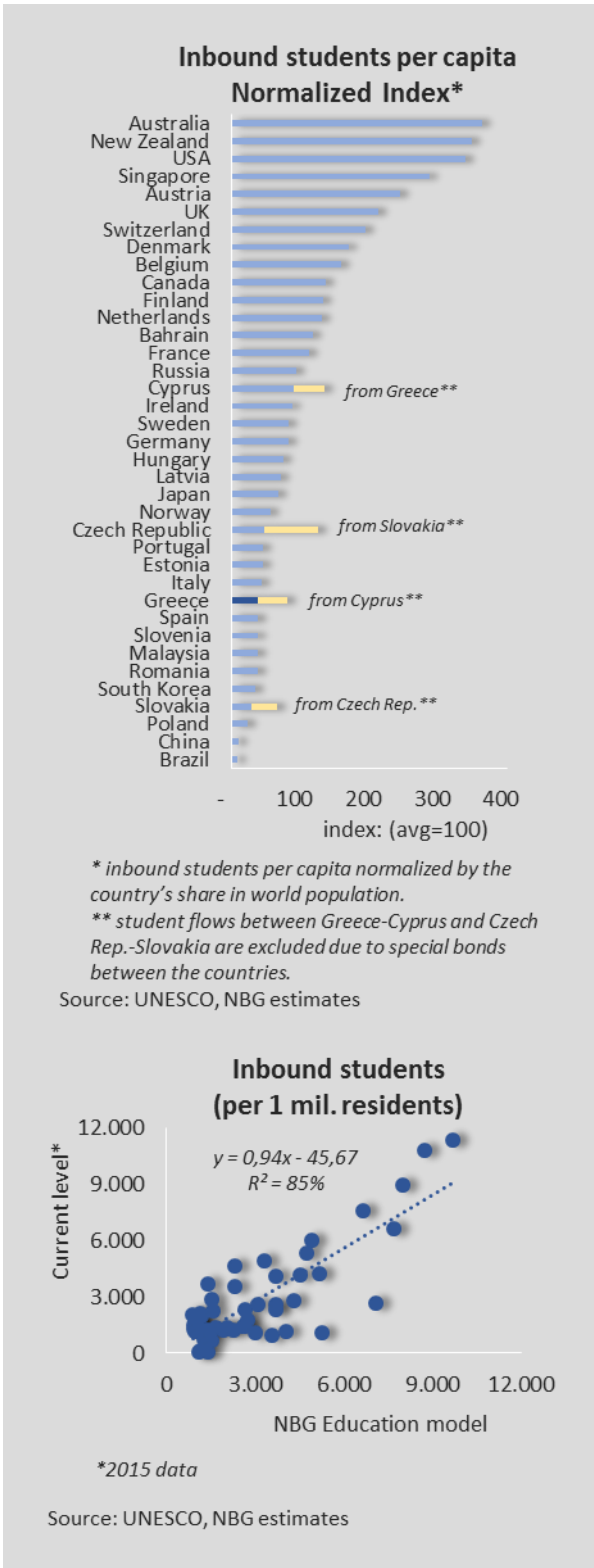
✓ the Global Universities Rankings (see BOX1), such as the QS World University Ranking[2] (QS) where Greece has an average ranking of 590 in 2016, in a total of 900 universities worldwide (with six Greek universities participating in the QS lists and only two in the top 500, or 0.2 universities per million residents in the top 500, compared with 0.4 on average in the EU), as well as

✓ the relevant component of the Global Competitiveness Index (WEF) according to which the quality of Greek education and management schools is rated as 30 per cent lower than the EU average.

C. THE COMPETITIVENESS OF GREEK UNIVERSITIES

The NBG model for universities' global attractiveness

Data suggest that individual countries have benefited from the global trend of rising students' mobility depending on the attractiveness of their universities. In fact, 50 countries appear to attract 86 per cent of total international students (with the top 5 attracting 46 per cent). Standouts, with more than 10,000 foreign students per 1 million residents are Australia and New Zealand. By

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[2] Other Global University Rankings such as the Times Higher Education World Ranking, the Shanghai Academic Ranking of World Universities and the Center of World University Rankings (headquartered in the United Arab Emirates) show similar results, with 2 or 3 Greek universities in the top 500 lists.

**Inbound students per capita
Normalized Index***

Australia
New Zealand
USA
Singapore
Austria
UK
Switzerland
Denmark
Belgium
Canada
Finland
Netherlands
Bahrain
France
Russia
Cyprus — *from Greece***
Ireland
Sweden
Germany
Hungary
Latvia
Japan
Norway
Czech Republic — *from Slovakia***
Portugal
Estonia
Italy
Greece — *from Cyprus***
Spain
Slovenia
Malaysia
Romania
South Korea
Slovakia — *from Czech Rep. ***
Poland
China
Brazil

-    100   200   300   400
index: (avg=100)

* inbound students per capita normalized by the country's share in world population.
** student flows between Greece-Cyprus and Czech Rep.-Slovakia are excluded due to special bonds between the countries.
Source: UNESCO, NBG estimates

**Inbound students
(per 1 mil. residents)**

$y = 0,94x - 45,67$
$R^2 = 85\%$

Current level*

12.000
9.000
6.000
3.000
0

0   3.000   6.000   9.000   12.000
NBG Education model

*2015 data

Source: UNESCO, NBG estimates

taking into account the size of each country, the US and Singapore also stand out as notable host countries. On the other end of the spectrum, with less than 100 foreign students per 1 million residents are Brazil and China. In this context, Greece attracts approximately 1,300 foreign students per 1 million residents (excluding the special case of students from Cyprus[3]) – a ratio significantly lower than the European average of 3,200 foreign students per 1 million residents.

With a view to quantifying the determinants of universities' global attractiveness, we have constructed a cross-sectional model based on a worldwide sample of 50 countries (attracting, as mentioned above, 86 per cent of international students). Based on the literature for education hubs[4], we develop an econometric model to estimate the level of inbound students per capita, based on three factors defining the level of academic excellence of each country's universities:

✓ The degree of university independence, as measured by the degree of flexibility in key issues such as student selection, staffing policy, budget autonomy, course content as well as setting objectives and performance evaluation.

✓ High quality teaching in universities, as measured by the number of highly cited professors relative to the population.

✓ R&D in higher education (as a share of GDP).

Moreover, we have included a "language variable" since the language in which courses are delivered is important, with English, German and – to a lesser extent – French, being more attractive to international students.

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[3] Students from Cyprus are not included in the model due to the strong link between Greece and Cyprus (along with the common language), which is not often seen in other countries in the sample.

[4] De Wit, H. (2013), "An introduction to higher education internationalization", Center for Higher Education Internationalization, Italy.

De Wit, H., Egron-Polak, E., Howard, L., and Hunter F. (2015), "Internationalization of higher education", European Parliament.

Atbach, P. G., and Knight, J. (2007), "The internationalization of higher education: Motivations and realities", Journal of Studies in International Education, 11 (3-4), 290-305.

Horta, H. (2009), "Global and national prominent universities: Internationalization, competitiveness and the role of the state", Higher Education, 58, 387-405.

Mapping the global market of international students	1. Traditional education hubs	2. New leaders	3. Emerging - R&D	4. Emerging - independence	5. Newcomers
Country Group characteristics					
Higher education R&D (% GDP)	0,5%	0,7%	0,6%	0,3%	0,2%
Highly cited researchers (per 1 mil. residents)	372	268	62	60	7
Independence index (scale 1-7)	7,0	6,7	6,1	6,7	5,1
Language (scale 0-4)	3,7	1,0	0,8	0,3	0,0
NBG Education Index**	**87**	**73**	**59**	**58**	**24**
Country Group performance					
Inbound students (per 1 mil. residents)	6.086	4.134	1.842	1.215	614
% of global market	*49%*	*8%*	*9%*	*6%*	*9%*
10-year growth	*58%*	*103%*	*150%*	*194%*	*431%*
Inbound students normalized index***	224	133	68	39	32

* Country Groups:
 (1): US, UK, Canada, Australia, New Zealand, Ireland, Austria, Germany, Switzerland
 (2): Belgium, Czech Republic, Denmark, Finland, Netherlands, Norway, Portugal, Singapore, Sweden
 (3): France, Japan, Lithuania, Estonia
 (4): Italy, Spain, Malaysia, South Korea
 (5): China, Brazil, Turkey, Russia, Poland
 ** NBG Education Index: Scale from 1 (worst) to 100 (best)
*** Inbound students normalized Index (avg=100): Inbound students per capita normalized by country's share in world population
Sources: UNESCO, OECD, World Bank, WEF, NBG Estimates

Relative attractiveness of Greek universities

EDUCATION INDEX	28
Highly cited researchers	60
Higher education R&D	48
Independence	4
Language	2

Rank (inverse) from 1 to 100 (best in the sample)
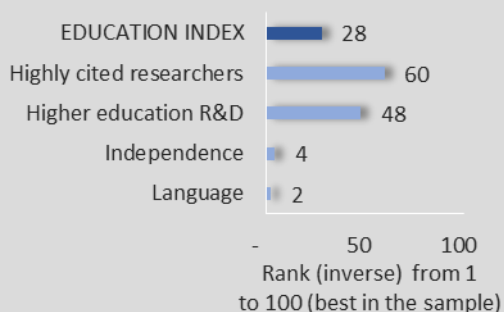
Source: World bank, Thomson Reuters, Eurostat, OECD, NBG estimates

The explanatory power of this model in determining the level of inbound students per capita is estimated to be approximately 85 per cent. In a second step, by using the above factors and the estimated coefficients, we have constructed an NBG Education Index to measure the quality of tertiary education in each country and is the main determinant of the internationalization potential for each country's universities.

Based on the NBG Education Index, we have ranked the countries (with 100 being the best in the sample and 0 the worst), and are able to identify some broad categories of successful cases based on (i) their performance and (ii) the type of their internationalization strategy:

✓ Traditional education hubs (with an average NBG Education Index of 87/100): Countries in this category are already well positioned in the market, attracting on average about 6,000 inbound students per million residents and covering about ½ of the world market of mobile students. These countries combine a high share of R&D (0.55 per cent of GDP on average) and a high degree of institutional independence, which also helps attract a large concentration of highly cited professors in their universities (3.7 per million residents). Another attribute these countries have in common is that they are either English-speaking (the US, UK, Australia) or German-speaking (Germany, Austria, Switzerland), which gives them an additional competitive advantage, as they are more accessible by non-national students.

✓ New leaders (with an average NBG Education Index of 73/100): Countries such as Singapore, The Netherlands and the Nordic countries have managed in a decade to double their inbound students, by allocating to their universities a high share of R&D (0.65 per cent of GDP on average) and allowing a fairly high degree of independence.

✓ Emerging hubs (with an average NBG Education Index of around 60/100): Although countries in this category rank lower, currently attracting about 1,500 inbound students per million residents, the number of foreign students
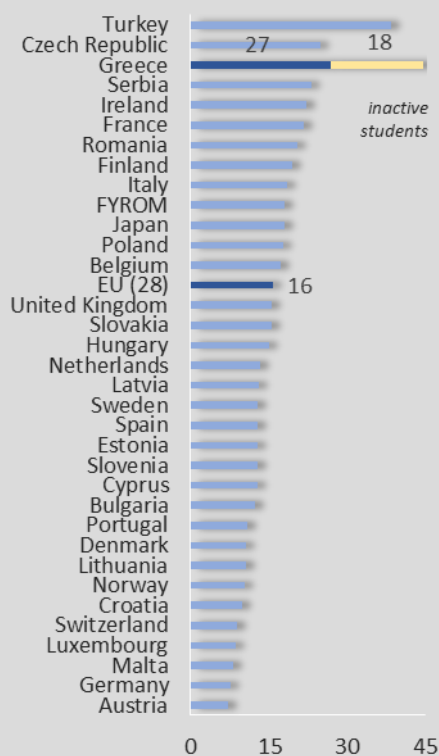
Inbound students and teaching conditions
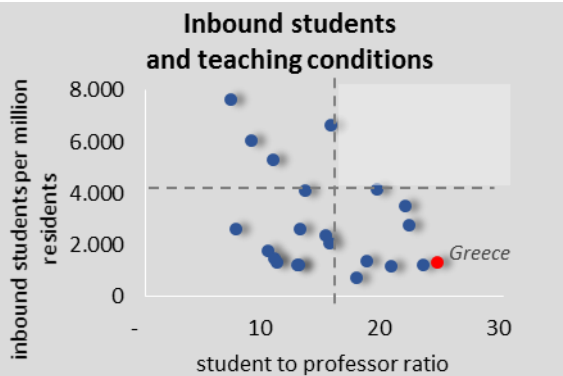
* we consider countries in the Bologna Agreement, to achieve uniformity in the definition of tertiary education

Share of inactive students in Greek higher education

— Universities   — Technological institutions
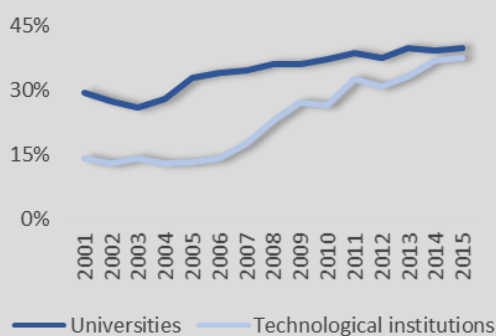
Source: El.Stat., NBG Estimates

Student to Professor* Ratio

27   18

inactive students

16

* all academic ranks in tertiary education
Source: Eurostat, NBG estimates

increased by 150 per cent on average during the past decade (compared with 60 per cent for the traditional education hubs). They have no extraordinary advantages in terms of language or highly cited professors, however, they appear to follow more targeted strategies, focusing either on: i) R&D, such as Japan, France and Estonia or ii) institutional independence, such as Italy, Spain and South Korea.

✓ Newcomers (with an average NBG Education Index of 24/100): Finally, countries such as China, Russia and Turkey have recently gained market share, with significant average growth of about 430 per cent during the past decade. However, they are still relatively weak in terms of R&D, professors and independence. They currently attract just 600 inbound students per million residents on average.

In this global environment, Greece ranks low – exhibiting an NBG Education Index of 28/100 and a weak – compared with the newcomers – growth rate during the past decade (of 120 per cent versus 430 per cent for the newcomers). The main weakness in Greek universities appears to be their low independence (one of the lowest in the examined sample). Greek universities rank higher in terms of R&D in higher education and quality of professors (exhibiting a median performance).

Moreover, another factor that appears to be a necessary but not sufficient condition for the attraction of international students is the teaching environment – proxied by the relative number of students per professor – as small-sized classes allow for higher attention to each student's individual needs. Specifically, above a certain level (of about 16 students per professor), it is difficult to attract more than 4,000 inbound students per resident (see graph). On the other hand, a low student-to-professor ratio does not guarantee a high level of inbound students per resident, as is the case in countries like Slovenia and Ukraine.

In this respect, Greek universities are also at a disadvantage, combining both many students and few professors as a share of the Greek population. The large share of students (6.2 per cent of the population compared with 3.9 per cent on average in the EU)

Students in the country (% population)
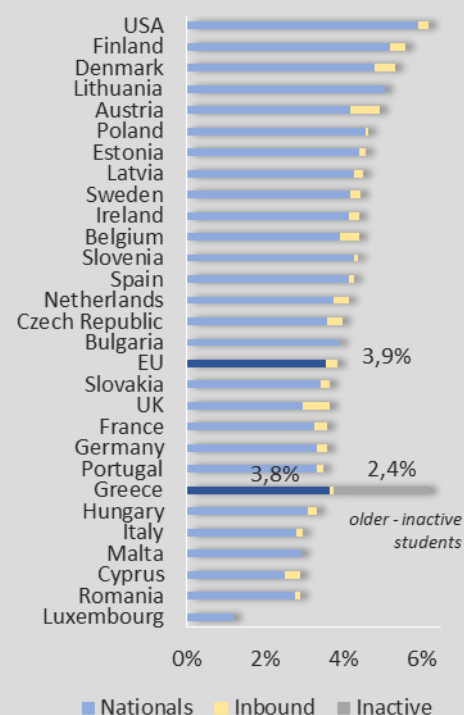
Source: Eurostat, EL.Stat., NBG estimates

Outbound students as percentage of the total number of active students
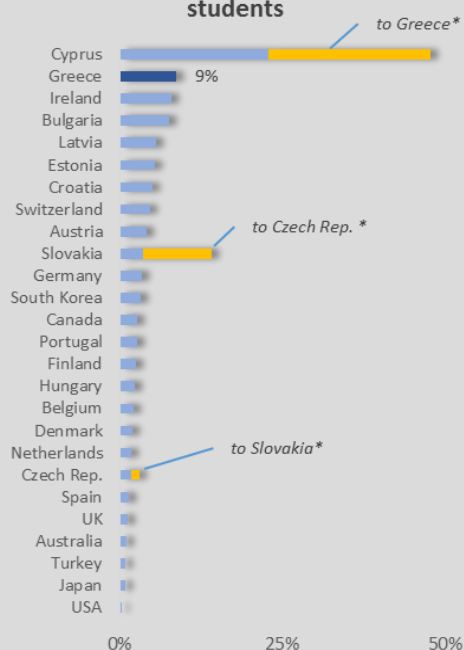
* student flows between Greece-Cypros and Czech Rep.-Slovakia are excluded due to special bonds and common language between the countries.

Sources: UNESCO, OECD, Eurostat, NBG Estimates

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is mainly attributed to the high share of Greek students exceeding the normal duration of studies by more than 2 years, with more than 2/3 of them never obtaining a degree. This share of mostly inactive students is estimated to cover about 40 per cent of tertiary students (as proxied by students over 25 years old, which, to a large extent, matches those exceeding the normal duration of studies by more than 2 years, see BOX2). Combined with the low share of professors in Greek universities (0.14 per cent of the population compared with 0.25 per cent on average in the EU), this leads to about 45 students of tertiary education being attributed to each professor in Greek universities, compared with 16 students on average in the EU, and about 8 in countries like Germany and Austria.

At this point, it should be noted that if we exclude the older – mostly inactive - students, the share of Greek students to the population is similar to the EU average (3.8 per cent versus 3.9 per cent). However, even excluding inactive students, the student-to-professor ratio is still one of the highest in the EU (27 students per professor versus an EU average of 16 students).
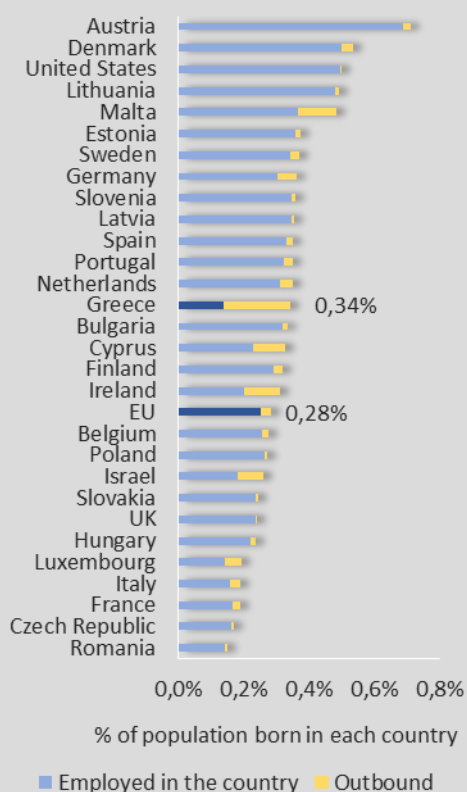
In the following sections, we will focus on the three factors of the NBG Education Index and try to determine the reasons that hold back Greek higher education. Specifically, we will explore:

C1. Greek professors and their share of working abroad

C2. The independence of Greek universities

C3. R&D in tertiary education and the degree of collaboration with the business sector

C1. Greek professors

A positive externality of the Greek students' outflow is the creation of a large number of Greek professors working abroad (about 22 thousand) – covering 0.2 per cent of the Greek population compared with 0.03 per cent on average in the EU. Therefore, although there is a high share of professors who are Greek nationals (20 per cent higher than the EU average, i.e. 0.34 per cent versus 0.28 per cent), the majority is employed abroad (60 per cent versus 11 per cent on average for the EU countries). Specifically, countries with a high share of their students educated in the US and UK universities (mainly Greece, Cyprus and Ireland),
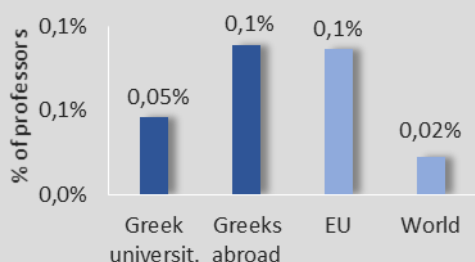
Professors* (% population)

Greece — 0,34%
EU — 0,28%

0,0% 0,2% 0,4% 0,6% 0,8%

% of population born in each country

■ Employed in the country ■ Outbound

* all academic ranks in tertiary education

Source: Eurostat, NBG estimates

Highly Cited Professors

% of professors

Greek universit.	Greeks abroad	EU	World
0,05%	0,1%	0,1%	0,02%

Source: Thomson Reuters/Highly Cilted Researchers 2016, World bank, NBG estimates

also exhibit a high share of their country's professors working abroad.

This development is further reinforced by (i) the historically high Greek immigration rate (see BOX 3), as well as (ii) the recent increase of international academic mobility. In particular, based on several surveys[5], the main reasons for the increased academic mobility appear to be the research environment, proximity to other top professors, quality of teaching, as well as the level and flexibility of research funding. The main beneficiary of this development is the US - hosting 66 per cent of highly cited professors, of which only 43 per cent were born there, while the remainder (23 per cent) is a net academic inflow to the country. European countries that are considered competitive in this respect are Switzerland, Germany, Denmark and parts of the UK.
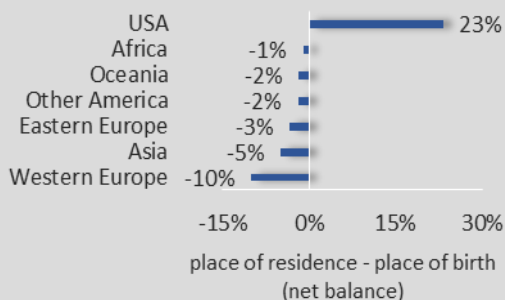
At this point, it is important to point out that, as the majority of Greek professors abroad have been educated abroad in prestigious universities, their academic quality is high. In fact, about 0.1 per cent of Greek professors working abroad are highly cited (based on the relevant annual list[6] of Highly Cited Researchers by Clarivate Analytics – formerly by Thomson Reuters) – a share that is equivalent to the EU average and double the share of professors working in Greek universities (0.05 per cent).

Looking at the other side of the coin, the professors in Greek universities are relatively few (15 thousand), as they cover just 0.14 per cent of the population compared with 0.25 per cent on average in the EU (and about 0.19 per cent globally). Moreover, the existing pool of professors in Greek universities has lower resources to support their research, with about only 0.05 per cent being highly cited, compared with 0.09 per cent on average in the EU. On the same note, professors have less incentive to be employed in Greek universities as the average gross professor wage in Greece is about 35 per cent lower than the EU average

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[5] Source: DG for Internal Policies – Policy department A: Economic and scientific policy, "The attractiveness of the EU for top scientists", June 2012
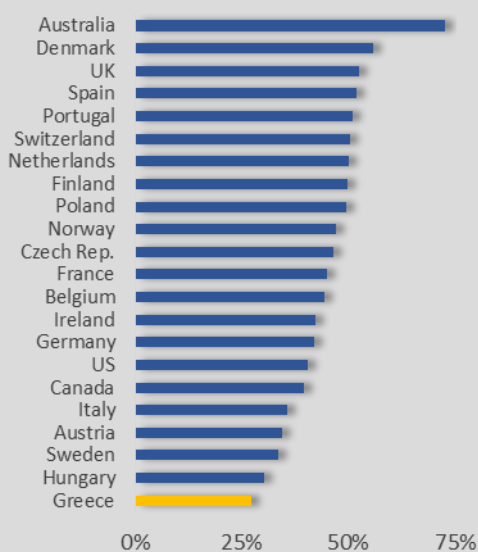
[6] This is an annual list recognizing leading researchers from around the world, based on articles and citations derived from a pool of about 11,855 science and social sciences journals (grouped in 22 research fields) indexed in the Web of Science Core Collection (Essential Science Indicators (ESI) database of Clarivate Analytics - formerly the IP&S business of Thomson Reuters). The list of about 3,000 Highly Cited Researchers in 2016 is based on the number of Highly Cited Papers produced during 2004-2014 (focusing on recent research achievement), meaning papers ranking in the top 1% of citations for each field and publication year. There are about 27 Greeks on the list of Highly Cited Researchers with just 6 of them affiliated with a Greek university.

Highly cited professors' mobility

Region	Value
USA	23%
Africa	-1%
Oceania	-2%
Other America	-2%
Eastern Europe	-3%
Asia	-5%
Western Europe	-10%

place of residence - place of birth
(net balance)

Source: DG for Internal Policies "The attractiveness of the EU for top scientists", June 2012, NBG estimates.

Graduation rates*

Australia, Denmark, UK, Spain, Portugal, Switzerland, Netherlands, Finland, Poland, Norway, Czech Rep., France, Belgium, Ireland, Germany, US, Canada, Italy, Austria, Sweden, Hungary, Greece

* Number of graduates regardless of age in a given level or programme, expressed as a percentage of the population at the theoretical graduation age for that level or programme.
Sources: UNESCO

(and 50 per cent lower than countries like the US and the UK), mainly reflecting the lower level of average wage in the country (as professors are paid double the average employee in Greece, compared with 2.2 times higher in the EU).
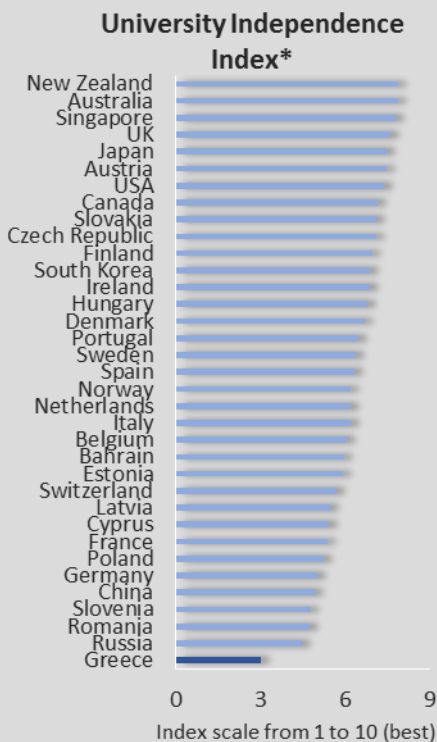
C2. Greek universities' independence

According to the Greek Constitution, higher education is considered a public good – i.e. the state has the exclusive right to establish institutions as well as the obligation to cover their financial needs via the government's budget. Specifically, while higher education institutions are self-governed private law entities, they experience the strict control of the government, as the Ministry of Education is responsible for many aspects of the universities' operation (e.g. hiring and payroll of the academic and the administrative staff, funding).

As access to higher education has been used as a political issue, currently almost all students that take part in the Pan-Hellenic entrance exams succeed in enrolling in tertiary education (although usually not in the field study of their first choice). This development is reflected in low graduation rates[7] (27 per cent in Greece, versus an OECD average of 42 per cent) and it reinforces the stock of older mostly inactive students exceeding the normal duration of studies (about 40 per cent of total students as mentioned earlier). Under the combination of these forces, Greece exhibits a high ratio of students per capita (6.2 per cent of population vs a European average of 3.9 per cent).

Meanwhile, the political system for reasons of regional economic development created numerous small departments in small municipalities all over the country. Specifically, the Greek tertiary education system currently consists of 24 Universities and 16 Technological Institutions, which include about 500 departments.

With the scattering of educational institutions not based on academic criteria, the current system is characterized by:

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[7] Defined as the number of graduates as a percentage of the population at the theoretical graduation age (Source: UNESCO).

University Independence Index*

New Zealand
Australia
Singapore
UK
Japan
Austria
USA
Canada
Slovakia
Czech Republic
Finland
South Korea
Ireland
Hungary
Denmark
Portugal
Sweden
Spain
Norway
Netherlands
Italy
Belgium
Bahrain
Estonia
Switzerland
Latvia
Cyprus
France
Poland
Germany
China
Slovenia
Romania
Russia
Greece

0   3   6   9

Index scale from 1 to 10 (best)

based on an OECD survey (2009)

Source: Martins et al, "The policy determinants of investment in tertiary education", OECD 2009, NBG estimates

Higher education expenditure: Greece vs EU
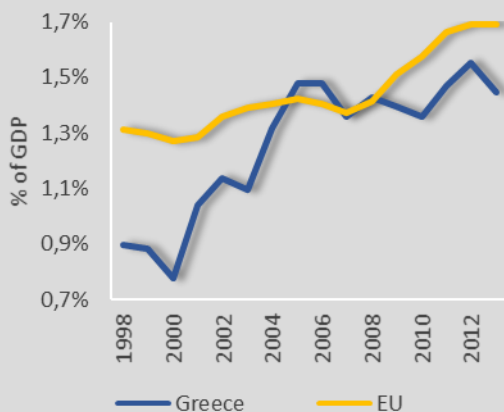
Sources: OECD, Eurostat, NBG estimates

- ✓ high inefficiency in terms of allocation of human and financial resources (e.g. many small departments located in municipalities separated from the main campus), overlapping of curricula), and most importantly,
- ✓ low independence of universities in decisions regarding students and faculty selection, funding and organizational matters.

As a result, Greek universities rank at the bottom of international competition in terms of institutional independence, showing inflexibility in key issues such as student selection, staffing policy, budget autonomy (including sources of funding and allocation of expenditure), course content as well as setting objectives and performance evaluation. In particular, the low autonomy of Greek universities is focused on four areas: i) funding, ii) organizational issues, iii) student selection and iv) faculty selection and remuneration.
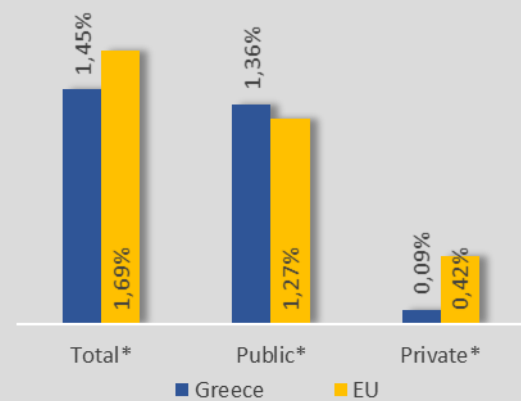
1. Funding

The effectiveness of the tertiary education system is greatly influenced by its available budget, which has two main sources: external funding (from government and private sector) and tuition fees.

Total spending on tertiary education in Greece increased significantly during the period 1998–2006, from 0.9 per cent of GDP to 1.43 per cent – and then remained almost stable as a share of GDP during 2006-2016. However, due to the crisis that has hit the Greek economy for the past 8 years, the level of expenditure for tertiary education has decreased by 26 per cent in absolute terms between 2008 and 2016. Regarding capital expenditure on higher education, the drop is focused on expenditure for equipment (73 per cent during 2013-2016, vs 7 per cent for the expenditure for buildings[8]) – thus exerting further downward pressure on the competitiveness of Greek universities.

Moreover, Greece is one of the few countries that continues to allocate public funding in the form of a line-item budget (i.e.

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[8] Note that the data for capital expenditure are derived from the Ministry of Education. While capital expenditures might also be included in other broader types of government expenditure, it is expected that they will share similar trends.
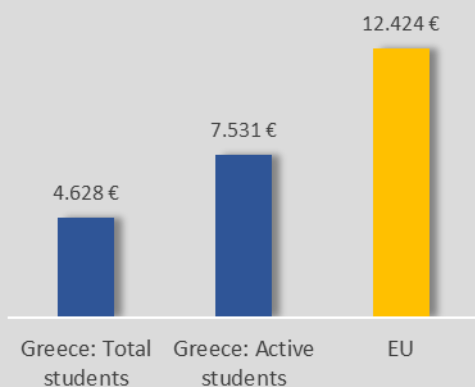
Higher education expenditure: Public and Private

Total*: Greece 1,45% | EU 1,69%
Public*: Greece 1,36% | EU 1,27%
Private*: Greece 0,09% | EU 0,42%

■ Greece ■ EU

* as percentage of GDP
Sources: OECD, Eurostat, NBG estimates

Expenditure* per university student

Greece: Total students 4.628 €
Greece: Active students 7.531 €
EU 12.424 €

* In PPP terms
Sources: OECD, Eurostat, NBG estimates

explicitly outlining the exact items on which money will be spent, instead of block grants which can be freely managed and allocated by the universities), introducing extensive micromanagement of the universities by external bodies. In addition, highly bureaucratic procedures hold back the absorption of available funds, especially for investment purposes.

We note that while government spending remains above the EU average (1.36 per cent on average during 2006-2014 compared with 1.2 per cent in the EU), the participation of the private sector in university funding in Greece is still significantly lower than the EU average (0.09 per cent of GDP against 0.45 per cent in the EU). In fact, tuition fees have a small contribution in higher education funding in Greece, since they only concern post-graduate studies, while undergraduate studies are tuition-free (while in most EU undergraduate programs there are – usually low – tuition fees). Therefore, the total expenditure in Greece remains slightly lower than the EU average (1.5 per cent of GDP versus 1.7 per cent in EU) and its level has decreased by 24 per cent during 2008-2013 (compared with an increase of 25 cent in the EU).

The relatively low total expenditure in higher education, combined with the large number of students (with almost 40 per cent being practically inactive), result in per student expenditure much less than the EU average (€4,628 in PPP terms per student versus €12,424 in EU). In fact, even if we exclude inactive students, the expenditure per student remains considerably lower than the EU average (€7,531 per student – remaining around its pre-crisis level as the decrease in expenditure was counterbalanced by a decrease of active students)[9]. The narrowing of this gap requires a combination of measures in the direction of increasing the available budget and lowering the number of students (mainly by restricting the maximum duration of the studies and restricting the entrance rate).

While the share of active students per capita in Greece is similar to the EU (38 students per 1,000 residents compared with 39 in

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[9] During 2008-2014, the expenditure for tertiary education decreased by 6.7 per cent, while in the same period the number of active students has shrunk by 6.0 per cent (as the students that exceeded the normal duration of their studies by less than 2 years – and thus are considered active – decreased by 30 per cent, while the first-time enrollments in each semester remained broadly stable).

Expenditure per university student: Alternative scenarios for convergence to the EU average
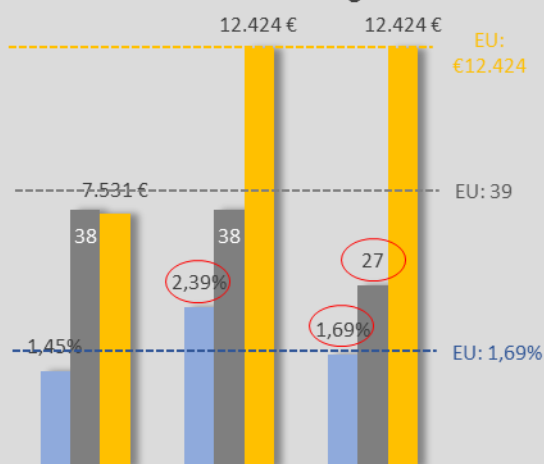
Alternative 1: Increase expenditure and determine maximum duration of studies
Alternative 2: Increase expenditure, decrease enrollments and determine maximum duration of studies
* In PPP terms
**Refers to active students (i.e. excluding eternal)
Sources: OECD, Eurostat, El.Stat., NBG estimates

the EU), the fact that Greece has a lower GDP per capita compared with the EU average creates constraints. A raise in higher education funding to the EU level (1.69 per cent of the GDP) would not be enough to close the gap of the expenditure per student. Therefore, the Government would have to increase the total funding to 2.39 per cent of GDP, so as to avoid reducing the number of active students (by almost 30 per cent, to 27 per 1,000 residents from 38 currently) to reach the same level of per student expenditure.

Alternatively, in the event there is no possibility of additional government spending, higher education funding could increase by allowing some scheme of needs-based tuition fees for undergraduate studies which are now tuition-free, as well as increasing business sector funding. Turning to international practices in terms of tuition fees, we could classify countries into two general categories.

✓ In the first category, we classify countries such as the US, UK and Australia, where students pay tuition fees for both undergraduate and postgraduate programs. For social reasons, the State provides a series of measures, such as extended scholarship programs and bank loans on favorable terms to financially support students. Tuitions in public universities is subsidized and significantly lower than for private universities, and even lower based on residence criteria.

✓ In most EU countries, there is a small private contribution for attending undergraduate programs. Indicatively, students in France and Portugal pay a small registration fee. Some other European countries (Czech Republic, Spain, Hungary, Austria, Poland and Slovakia) have introduced tuition fees which are linked to the academic performance of the students. In these countries, students who do not achieve a certain goal (i.e. successful completion of a minimum number of courses each year) must pay tuition fees.

Quality assesment of tertiary education

Source: WEF/ Global competitiveness Index, NBG estimates

Inbound professors by country*

based on the top 3 universities in the QS Rankings list. All academic ranks of tertiary education are included.
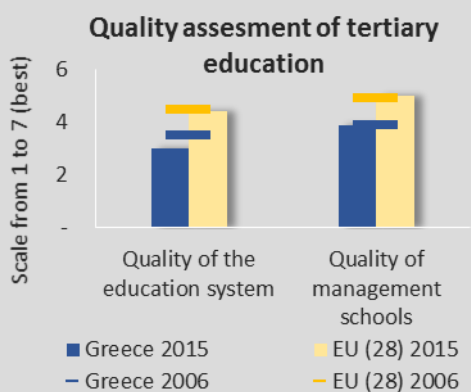
Source: QS Top Universities, NBG estimates

2. Organizational issues

Organizational matters are heavily regulated by the Ministry of Education which approves the rules of operation of each university concerning matters such as i) a university's ability to decide on its executive head (who must already hold an academic position within the university), ii) the structure and composition of decision-making bodies (Greece is one of few countries with no non-university representative in the governing body), iii) the ability to form legal entities (only non-profit in Greece) and iv) decisions for internal academic structures and the establishment, merging or cancellation of academic departments.
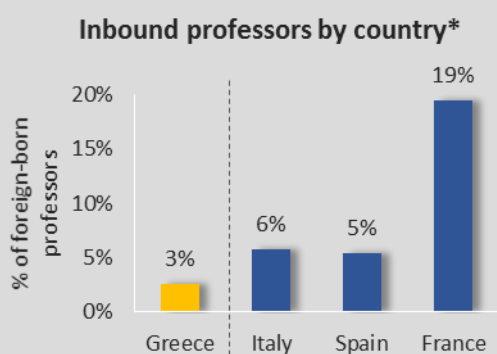
Moreover, students have exerted a large influence on academic issues and decision making processes (mainly stemming from the historically high politicization of Greek universities largely due to the central role that they had during the movement against dictatorship and the restoration of democracy in Greece in 1974). For example, students are involved in the decision making process for issues like the election of the rector and the departments' directors, the approval of the annual budget as well as the creation of new teaching positions. The significant power of students on several occasions has created obstacles to the proper functioning and modernization of the university, while it discourages the administrative bodies from protecting efficiently the facilities and the personnel from acts of violence (as they are accused of violating the universities' asylum).

3. Students

The number and selection of students are controlled by the Ministry of Education at the Bachelor level, while at the Masters level there is greater flexibility. In contrast, universities in western countries with well-developed tertiary education systems (e.g. the UK, US) can determine the number of students that will be accepted each year, as well as design and run the procedure for the selection of the students that will be accepted.

**Highly Cited Professors
by university ***
(per 1 million residents)

Country	HC professors per 1 million residents
Switzerland	
Netherlands	
USA	
UK	
Denmark	
Australia	
Finland	
Belgium	
Sweden	
Canada	
Ireland	
Germany	
Austria	
New Zealand	
Norway	
Israel	
Spain	
France	
Italy	
Greece	0,64
Japan	
Portugal	
South Korea	
Czech Republic	
South Africa	
Turkey	
China	
Iran	
Brazil	

HC professors per 1 million residents

* based on primary or secondary affiliation to universities in the country

Source: Thomson Reuters/Highly Cilted Researchers 2016, World bank, NBG estimates

4. *Staffing policies*

Regarding staffing policies, there are countries that are totally independent in identifying the vacancies and running the recruitment procedures and tenure decisions, as well as defining the salary of the academic and research staff of the institution (e.g. the US, UK, Sweden). There are also countries where promotion and dismissal procedures are partly regulated (e.g. Czech Republic, Hungary and France). Turning to Greece, universities have almost no autonomy concerning the number of available professors' positions (both tenured and non-tenured)[10] and the level of salaries (academic and administrative), as their staffing policies are completely restricted by regulations for public-sector employees.

It is important to note that under Act 4009/2011, there were amendments towards higher independence for Greek universities, tackling many of the abovementioned issues (management, funding, staffing etc.). Indicatively, the reform introduced a new governing structure through boards responsible for the strategic planning and the supervision of the institution (consisted of both internal and external members), while reducing the influence of students on university management and setting limits on the duration of studies. Moreover, it provided higher flexibility concerning hiring and promotion procedures, it allowed the parallel employment of academic staff in Greek and foreign universities (for certain periods) and introduced results-based funding (based on academic quality and efficiency indices), which would complement initially distributed funds (based on objective criteria such as number of students, geographical expansion, field etc.). However, subsequent law modifications (combined with poor implementation) have diminished its scope and effectiveness.

C3. R&D and collaboration with the business sector

Higher education R&D expenditure in Greece is low, reaching €550 million in 2014 or 0.3 per cent of GDP (compared with 0.5 per cent in the EU). Despite the fact that higher education absorbs a high
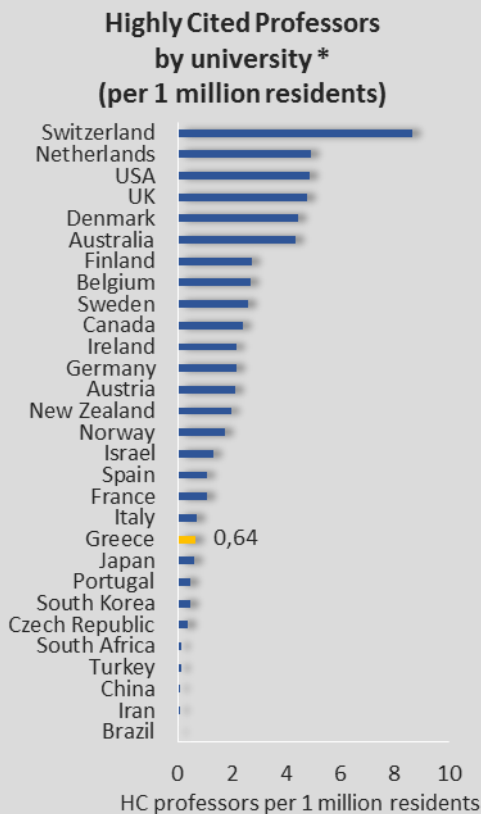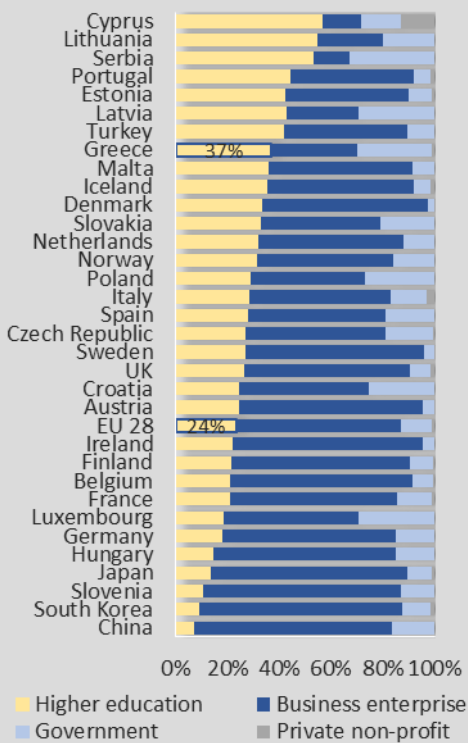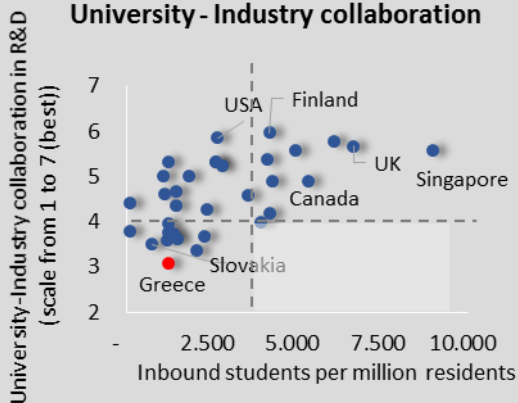
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[10] The choice of the appropriate candidate for each position is decided by a committee comprising by university's professors as well as professors from other universities (or research centers) in Greece or abroad.

Total R&D expenditure

Countries (top to bottom):
Cyprus, Lithuania, Serbia, Portugal, Estonia, Latvia, Turkey, Greece — 37%, Malta, Iceland, Denmark, Slovakia, Netherlands, Norway, Poland, Italy, Spain, Czech Republic, Sweden, UK, Croatia, Austria, EU 28 — 24%, Ireland, Finland, Belgium, France, Luxembourg, Germany, Hungary, Japan, Slovenia, South Korea, China

0% 20% 40% 60% 80% 100%

Legend:
- Higher education
- Government
- Business enterprise
- Private non-profit

Source: Eurostat

Inbound students and University - Industry collaboration

University-Industry collaboration in R&D (scale from 1 to 7 (best))

Labeled points: USA, Finland, UK, Singapore, Canada, Slovakia, Greece

x-axis: Inbound students per million residents
- 2.500 5.000 7.500 10.000

Source: Global Competitiveness Index 2015, UNESCO, NBG estimates

share of total R&D expenditure (37 per cent compared with 24 per cent in the EU), this is not enough to counterbalance the generally weak R&D activity in Greece (covering 0.8 per cent of GDP, compared with 2 per cent in the EU).

Moreover, Greek universities have a very limited collaboration with the business sector, which is partly a result of weak R&D activity of Greek enterprises and low business sophistication. In fact, based on the relevant Global Competitiveness Index component, Greece ranks last among its EU peers in terms of universities collaboration with the business sector (with a value of 3 on a scale of 1 to 7, compared with an EU average of 4.4 and an OECD average of 4.7). We note that collaboration with the business sector is not directly related to more inbound students (it is not an explanatory variable in our model, however, it indirectly enters into our model through the funding variable). However, there appears to be a minimum acceptable level of collaboration between universities and enterprises in order to attract international students, which is estimated around 4 on a scale of 1 to 7 (see graph).

It is important to note that the level of collaboration of universities with the business sector partly depends on the level of business sophistication of the business sector. In fact, sufficiently sophisticated enterprises might be considered a prerequisite for the efficient formation of links with the academia. Greece also lags in this respect. By combining the respective sub-indices from the Global Competiveness Index (i.e. related to variables such as cluster development, value chains, production process and management quality), Greece ends up with a business sophistication index of 3.6 on a scale of 1 to 7, compared with 4.6 on average in the EU.

D. WHAT CAN BE ACCOMPLISHED

From the above analysis, it is evident that the impressive pool of Greek professors working abroad could be used as a potential source of highly skilled professors in Greek universities. However, the low competitiveness of Greek universities (mainly due to low independence and R&D expenditure) makes their permanent

Business Sophistication index

EU (28) 4,6

Greece 3,6

Index (scale from 1 to 7)

Source: Global Competitiveness Index 2015, NBG estimates

The MIT Portugal Program: International Applications

	2007	2008	2009	2010
International	40	139	163	239
Portuguese	219	170	108	149

■ Portuguese   ■ International

Source: S.M. Pfotenhauer, J.S.Jacobs et al, "Seeding change through international university partnerships: The MIT-Portugal Program", International Association of Universities, 2013

return to Greece difficult. In this section, we will first outline specific policies that can be adopted (based on best practices from other countries) and then analyze their effects in the Greek economy both in the short term and in the medium term.

D1. SPECIFIC POLICIES

In order to strategically develop universities that would attract high-quality professors (and subsequently students), we suggest a combination of specific policies that could facilitate this goal:

1. Fostering independence and international collaborations

Countries with high levels of autonomy, that are attractive for professors as well as students (such as the US, Australia, New Zealand, the UK and Japan), follow some common policies:

- ✓ coherent national strategy for higher education
- ✓ universities are considered autonomous institutions, able to form a complete strategy from the selection of students and academic staff, to tuition setting, funding and budget allocation
- ✓ cooperation of universities with relevant ministries (outside that for education) and chambers of commerce, as well as other universities national and international
- ✓ cross-country agreements for student and academic mobility
- ✓ results-based funding of universities as an incentive for efficient operation and specific international strategy, and professors' evaluation as an incentive for academic excellence
- ✓ student support with extensive programs for grants and scholarships, allowing for higher flexibility in terms of tuition fees, without eliminating the social aspect of educational services.

Focusing on university collaborations, the positive effects of such initiatives concerning partnerships between universities, inter-country agreements as well as the participation of the business sector, can be confirmed through international experience. Indicatively:
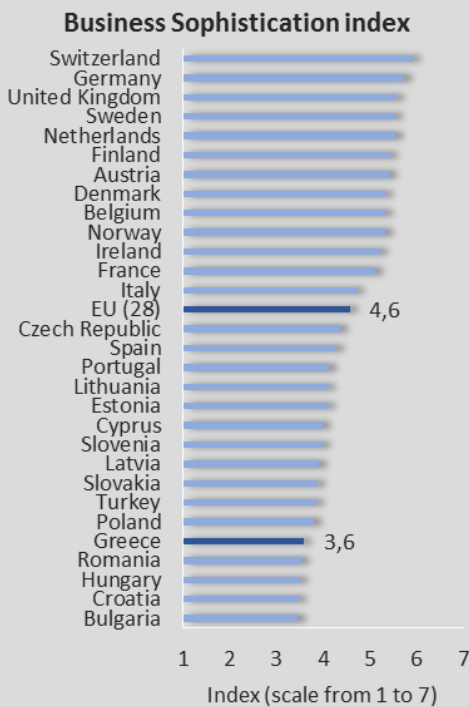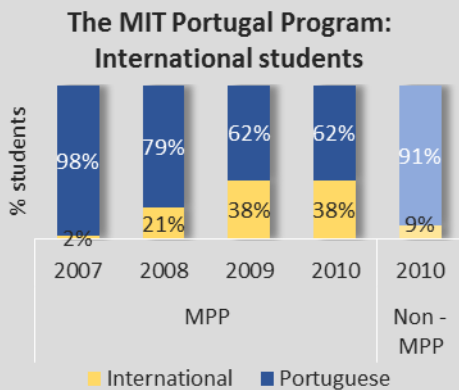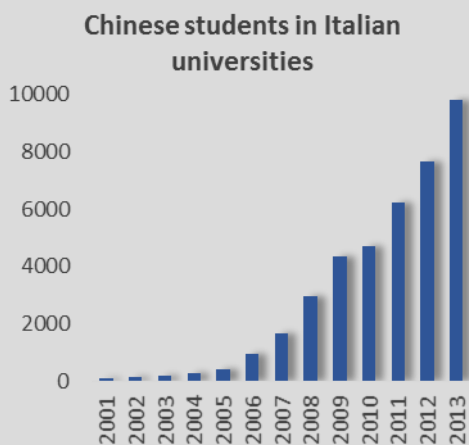
**The MIT Portugal Program:
International students**

Source: S.M. Pfotenhauer, J.S.Jacobs et al, "Seeding change through international university partnerships: The MIT-Portugal Program", International Association of Universities, 2013

Chinese students in Italian universities
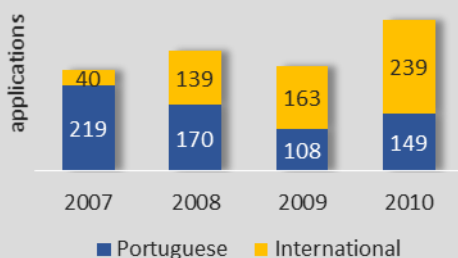
Source: Unesco

- ✓ Partnering with pre-eminent international institutions is a way to gain critical expertise and sufficient legitimacy for changes that would otherwise be hard to carry through. A good example is that of Portugal and the MIT Portugal Program (MPP consortium), connecting the MIT with 8 Portuguese schools of engineering, science, economics, and management, 20 Portuguese research centers and more than 50 industry partners under one umbrella. Collaboration is strongly promoted, with students attending more than one university (thus travelling during their studies) and getting a joint degree (including MIT). International applications are high and so is student selectivity. This partnership has led to higher student mobility in the universities concerned – attracting about 40 per cent foreign students in 2010 compared with 2 per cent in 2006 (when the consortium was formed) and less than 10 per cent in other Portuguese universities. Moreover, based on annual surveys, graduates as well as academic staff appear to be more oriented towards industrial research and innovation and more open to collaborations.

- ✓ Reinforcing industry-universities collaboration is also significant, as indicated by the Italian project "Marco Polo", which was part of a bilateral agreement between the Italian and Chinese governments (2004) that aimed to attract Chinese students to Italian universities. The program was designed in order to meet the needs of Italian firms which had set up factories or/and offices in China and were seeking executives who understand both the Italian and Chinese language and culture. Towards that goal, (i) Italian industry heavily subsidized a special fund that provided full annual scholarships to eligible Chinese students, (ii) the Italian Government simplified the visa procedures and (iii) Italian universities offered Italian language courses to Chinese students. As a result, Chinese students in Italy reached about 10,000 in 2013 from less than 300 students in 2004.

Outflow and return of Chinese students

Source: Migration Policy Institute, "Emigration trends and policies in China: Movement of the wealthy and high-skilled", Feb. 2016

## 2. *Introducing return programs and incentive schemes for the academic diaspora*

As mentioned earlier, an easily accessible pool of professors is available through the Greek academic diaspora. To determine the set of policies and incentives required to attract those professors, Greek officials could follow the example of other countries that managed to benefit from their immigrants.

✓ One of the largest immigrant bases is that of China, with its diaspora estimated at about 50 million[11], mostly spread across neighboring countries in Southeast Asia. Recognizing the benefits of innovation, knowledge building and technology transfer, the Chinese Government (after 1978 and under the Open Doors policy) has followed a strategy aiming to encourage Chinese immigrants (especially those with technological skills) to return and work in China. For example, skilled Chinese professors were motivated to return – either permanently or temporarily – through a set of policies from the government and local municipalities. Some indicative policies were i) financial incentives to returning immigrants (special research grants, laboratories and assistants, low-interest loans, exemptions on importing certain equipment, subsidies on housing and salaries) ii) simplification of procedures of return and settlement (Returnee Service Center as a single window), iii) overseas recruitment associations for scholars and professionals (Thousand Talents Program) and science and business parks iv) as well as providing special schools for immigrants' children with difficulty in the Chinese language. As a result, many positions in tertiary education in China are covered by experts who graduated abroad (about ¾ of presidents of universities, as well as professors in the field of science and engineering and about 60% of PhD supervisors).

✓ Israel is another country with a significant brain drain issue, with about ¼ of its professors working in
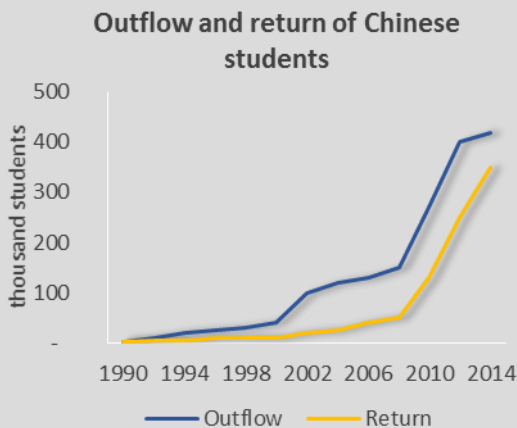
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[11] Based on a study commissioned by the Chinese State Council Office of Overseas Chinese Affairs: Guotu Zhuang, "Distribution and trends of Overseas Chinese", Studies on Overseas Chinese Affairs, 2010.

Israeli professors in US universities
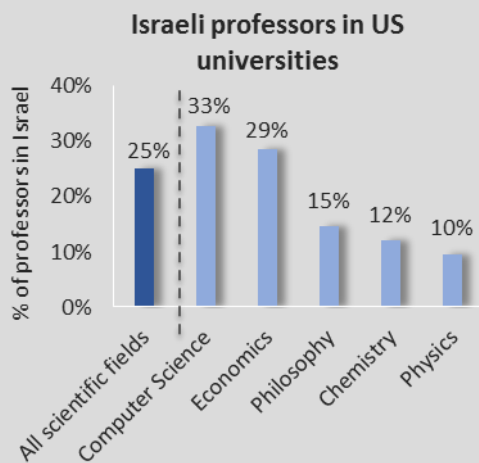
Source: A.Welch, J.Hao (2015) "Global Argonauts: Returnees and diaspora as sources of innovation in China and Israel", Societies and Education
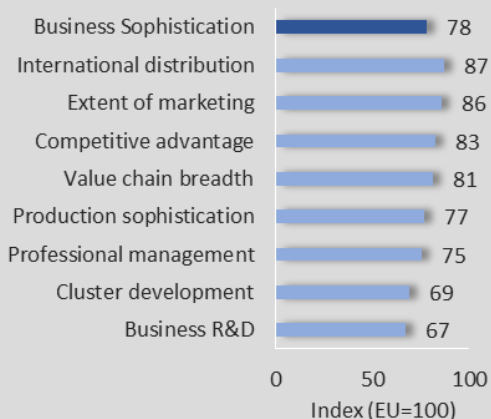
R&D expenditure (%GDP)
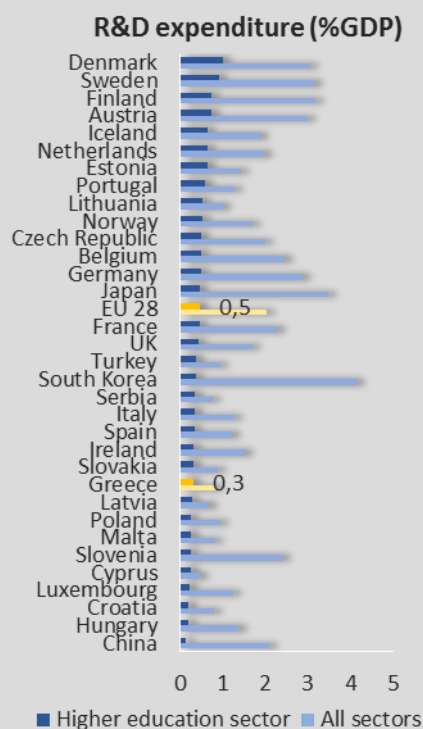
Source: Eurostat

universities abroad (mainly the US) based on the Israeli Council of Higher Education. In an effort to attract those academics back to the country and re-absorb them into university or industry positions, the Israeli National Brain Gain Program was launched in 2013. The program includes i) a database of professors and other Israelis with higher education living abroad (supervised by the Ministries of Economy and Immigrant absorption), combined with ii) the Israeli Academy of Sciences Contact Center, promoting regular contact, with immigrant professors, special workshops and other assistance for their repatriation. According to recent data, there are about 2,600 academics listed in the database and about 500 have already returned in jobs in Israel, with the aid of the contact center.

3. Creating Centers-of-Excellence (CoE)[12]

Apart from the introduction of incentives, professors will also require an overall favorable environment for academic research. In this context, a key initiative is the development of CoEs around Greek universities, which would attract a critical mass of professors, infrastructure and knowledge. If developed efficiently, CoEs can gain international recognition among the academic as well as business community and become a pole of research and training. Successful examples include i) the CoEs of Airbus in Malaysia (for sustainable fuel), Toulouse (for overall design) and other countries worldwide, as well as ii) the GREEN project (GREnoble Excellence in Neurodegeneration) for neurobiology in Grenoble. Another notable project, still under development, is that of Israel, with a recently formulated plan by the government for the establishment of 30 CoEs (i-core program). The project is under the umbrella of the wider Israel National Brain Gain Program aiming to attract Israeli academics back to Israel and strengthen scientific research. During 2011-2013, 16 of those CoEs were launched and managed to attract about 60 researchers from abroad, with a target to reach 80.

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[12] A CoE consists of a network of institutions (universities, research centers, business enterprises, government departments) focusing on a specific field of research (and industrial development) and concentrating available resources to its development.

Business Sophistication index Greece

	Index (EU=100)
Business Sophistication	78
International distribution	87
Extent of marketing	86
Competitive advantage	83
Value chain breadth	81
Production sophistication	77
Professional management	75
Cluster development	69
Business R&D	67

Source: Global Competitiveness Index 2015, NBG estimates

This structure fits well with the characteristics of a small country like Greece, focusing its available resources to niche markets where a competitive advantage can be found (e.g. agriculture, food manufacturing and tourism).

As business sophistication of the Greek enterprises is still low (see p.15) Greek universities (and their Centers of Excellence) might have to look for collaboration abroad. We note that international collaborations among Centers of Excellence is a common practice. Indicatively, the GREEN project in Grenoble, concerning research against neurodegenerative diseases, is integrated in the European and Canadian network of Centers of Excellence in Neurodegeneration (COEN).

4. Creating special regime universities

The additional professors (who would subsequently attract more students, both Greek and non-Greek) could be absorbed by already existing universities in case they manage to reach the above-mentioned requirements – especially in terms of independence. Alternatively, bearing in mind that the Greek tertiary sector could be resistant to change due to political and social concerns, special-regime universities could be created - with greater flexibility especially in terms of tuition fees and other funding possibilities (as well as student selection and other academic issues). It should be noted that such policies are not without precedent. Indicatively:

✓ There is already a case in Greece, concerning the International Hellenic University in Thessaloniki, which was established under a special framework (law 3391/2005), allowing i) tuition for all programs (undergraduate and postgraduate), ii) control over student selection and iii) all courses taught in English.

✓ Another example is that of Singapore where, while most universities are under government control, a reform in 2005 allowed the operation of two autonomous public institutions with significant flexibility, while the Government sets broad education policies and ensures accountability. This could have led to the increase of about 30 per cent (or 15,000 students) of international students choosing to study in Singapore after 2009.

Student Mobility: Assumptions and Estimates		
NBG model	**Current**	**Target**
Higher education R&D (%GDP)	0,3%	0,5%
Highly Cited Professors	7	23
Independence index	3,0	7,9
Language (dummy)	0	1
Inbound foreign students*	**27.600**	**110.000**
Other assumptions	**Current**	**Target**
Outbound greek students (% of total Greek students)	9%	3,2%
Outbound greek students	**40.000**	**14.000**
Student to professor ratio in universities	21	16
Professors in universities	**12.300**	**22.800**

* of which about 13,000 students are from Cyprus

✓ Taking a different path, Turkey has supported the establishment of private non-profit universities (starting in mid-1980s), which almost quadrupled during the past decade (representing now $^1/_3$ of the total number of Turkish universities), while their share in enrollments has doubled (absorbing 14 per cent of the enrolled students, up from 7 per cent ten years ago[13]). Note that the high quality of these universities is verified by their ranking in Global University Rankings (with 3 of them within the top 500 universities according to the QS World University Ranking – surpassing any Turkish public university in the list).

D2. DIRECT EFFECT: ATTRACTING FOREIGN STUDENTS AND BALANCE OF PAYMENTS INFLOWS

The effects from the formation of an education hub in Greece would be twofold; it would increase the country's growth potential in the medium term, while it would also boost net exports in the short term (through higher exports and lower imports of education services).

In particular, based on our analysis, inbound students in Greek universities could increase potentially to about 110,000 from 27,600 in 2015 (including the current flow of about 13,000-15,000 students from Cyprus), provided that the five factors identified in our model as critical for the level of academic excellence improve to the highest international standards; namely:

(i)   raise Greek universities' independence,

(ii)   attract highly-cited professors (about 20 to 25 for the size of Greek universities),

(iii)   increase R&D expenditure in higher education to the EU average (0.5 per cent of GDP (from 0.3 per cent in 2015),

(iv)   introduce several programs in English, and

(v)   lower the student to professor ration (from 21 to 16).

It is important to note that this convergence of Greek universities to the international standards would also limit the current outflow

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[13] Note that these estimates exclude students undertaking their studies via distance education (mostly in Open Education Faculties).

Special regime universities: Assumptions	
Students and professors assumptions	
Additional students	108.400
more inbound EU	*41.200*
more inbound non EU	*41.200*
less outbound Greeks	*26.000*
Master degree or higher (% of students)	50%
Additional professors	6.770
Revenues and expenditures assumptions	
Annual tuition for GR-EU students:	
bachelor degree	*2.500 €*
master degree or higher	*5.000 €*
Annual tuition for non-EU student	
bachelor degree	*5.000 €*
master degree or higher	*10.000 €*
Annual living expenses/ student	10.000 €
Annual living expenses/ professor	20.000 €
Annual salary/ Highly Cited Professor	150.000 €
Annual salary/ other teacher	50.000 €
Annual salary/ administrative staff	25.000 €
Annual needs in fixed capital / student	680 €

Special regime universities	
Revenue	**715 €**
Tuition fees	560 €
Business R&D	55 €
EU funds	100 €
Costs	**565 €**
Salaries	340 €
R&D	150 €
Fixed capital needs	75 €
Net balance	**150 €**
in million €	

of Greek students, who would now find high quality education services in their own country. Specifically, in case the share of outbound students converged to the EU average of 3.5 per cent (from about 10 per cent currently), there could be about 25,600 more Greek students in Greek universities. Therefore, along with the increase of 82,400 inbound international students, the total increase in demand for tertiary education in Greece would amount to 108,000 additional students.

In practice, the special regime universities (assuming that these are set up for foreign students and the extra Greek students would be placed) should satisfy the above-mentioned five conditions and, under a baseline scenario, could operate under the following assumptions:

✓ Regarding tuition, we assume that students attending special-regime universities would pay tuition for both bachelor and master degrees. By (i) setting tuition to levels similar to global competition (with Greek and EU students being charged about 50% lower than non-EU students), and (ii) assuming that ½ of inbound students would seek a master's degree (which is the OECD average) with ½ of them originating from non-EU countries, the special regime universities would receive tuition fees of €0.56 bn annually from approximately 108,000 students (non-Greek and Greek who do not study abroad).

✓ Additional revenues could be attracted from EU funding programs linked to the international mobility of students and academic staff as well as business R&D programs. Based on the experience of other EU countries in the absorption of similar funds, we estimate the potential benefit at about €0.16 billion per year.

Turning to costs for the operation of special regime universities, we assume that:

✓ Aiming at the EU average student-to-professor ratio (16), the special regime universities would require 6,800 professors. Considering average academic salary levels for most of them and special compensation schemes for professors with high levels of citations, we estimate

Direct inflows to the Greek economy	
Net exports of education services	1.660 €
Tuition fees: Greek students *(26,000 less outbound students)*	*100 €*
Tuition fees: Foreign students *(82,400 more inbound students)*	*460 €*
Living expenses of students	*1.100 €*
Business R&D	55 €
EU funds	100 €
Total inflows	**1.815 €**

*in million €

Tax Revenue	
Income tax of additional professors	100 €
Taxes on living expenses:	330 €
additional professors	*55 €*
additional students	*275 €*
Total taxes (direct effect)	**430 €**

*in million €

** 30% income tax, 25% taxes on living expenses (VAT and taxes on rents and business profits)

annual salaries for the special regime universities in the order of €0.34 bn.

✓ In order to attract and accommodate the additional students, there needs to be an increase in annual R&D expenditure of about €0.15 billion (based on the NBG Education Model, as described above) as well as an annual capital investment of about €75 million (based on past fixed capital needs per student).

Under this scenario, the special regime universities' revenues of tuition fees and other funds (from EU programs or the business sector) would exceed the costs of salaries and expenditure (R&D and fixed capital) and therefore would not exert a negative effect on the public budget.

More importantly, the aforementioned increase in tertiary students could result in annual net export of education services of about €1.7 billion from tuition fees and living expenses of foreign students (as well as Greek students that would otherwise study abroad), which combined with the EU funds and the business R&D would attract more than €1.8 bn per year in the Greek economy.

Note that these higher expenditures correspond to higher tax revenues. According to our estimates, resources of approximately € 0.4 bn per year[14] would be raised from (i) the tax revenues from the living expenses of the additional students and professors (both VAT as well as taxes on rents and profits), and (ii) the income taxes of the additional professors' salaries. These extra funds would be enough to cover for the improvements in terms of higher education quality (higher independence, higher R&D expenditure and lower professor–to-student ratio) to spread and benefit all Greek universities (and not just the special-regime ones).

D3. LONG-RUN IMPACT: TRANSFORMING THE GREEK GROWTH MODEL AND BOOSTING ITS LONG-TERM POTENTIAL

Apart from the aforementioned direct impact, higher education benefits the economy through multiple externalities – mainly through (i) its contribution to skills development and (ii) its research activities that develop productivity-enhancing

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[14] These estimates refer to the direct effect. The total tax revenue boost would in fact be even higher due to multiplier effects.

Growth differences between countries

$y = 0{,}91x + 0{,}005$
$R^2 = 93\%$

Greece

Realized value*

NBG Long-term Education-adjusted Growth Model
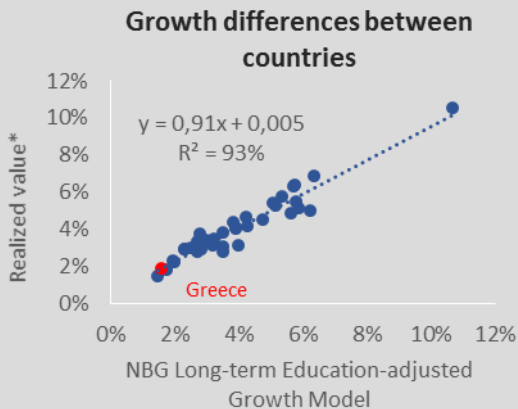
* average annual growth rate of GDP per employee (during 1995-2015)

Source: UNCTAD, NBG Estimates

Scenario 1: Assumpions		
	First decade*	**Next 25 years***
Human capital	9,2%	4,5%
quantity	*0,0%*	*0,0%*
quality	*9,2%*	*4,5%*
Academic human capital	27%	0,0%
quantity	*6%*	*0,0%*
quality	*21%*	*0,0%*
Business sophistication	0,0%	0,0%

*average annual growth rate

Source: NBG Estimates

technologies. In fact, a substantial literature has emerged during the past decades that highlights how education can create long-term sustainable growth[15]. Drawing on this large literature that analyzes the effect of higher education on economic growth, NBG Research has constructed a model based on the augmented Solow growth model[16] which provides the fundamental level of production per employee by considering physical and human capital as its main determinants.

Our analysis introduces three novelties:

✓ We correct the well-documented deficiency of not taking into account the quality of higher education. Note that previous attempts to consider the quality effect of education have focused on earlier stages of education (mainly secondary-school education)[17].

✓ We study separately the effect of academic human capital on growth. Apart from increasing the human capital inherent in the labor force and thus boosting its productivity, academic human capital can affect economic growth through a second channel: by supporting the innovative base of the economy and facilitating the diffusion of new technologies. Therefore, academic human capital can also exert a separate direct influence on the economy.

✓ We encompass the idea that the impact of academic human capital on growth depends on the level of the country's business sophistication.

With a view to quantifying this analysis, we have used a dynamic panel model, based on the Pooled Mean Group estimator approach[18] which allows us to test for a long-term relationship with

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[15] Sianesi, B., and Van Reenen, J. (2003), "The returns to education: Macroeconomics", Journal of Economic Surveys, 17, 2, 157-200.
Gemell N., (1996), "Evaluating the impacts of human capital stocks and accumulation on economic growth: Some new evidence", Oxford Bulletin of Economics and Statistics, 58, 1.
Keller, K., (2006), "Investments in primary, secondary and higher education and the effects on economic growth", Contemporary Economic Policy, 24, 1, 18-34.

[16] Mankiw, G., D. Romer, and D. Weil (1992), "A contribution to the empirics of economic growth", Quarterly Journal of Economics, 107, 407-437.

[17] Hanushek, E.A., and Kimko, D.D., (2000), "Schooling, labor force quality and the growth of nations", American Economic Review, 90, 5, 1184-1208.

[18] Pesaran, H., Yongcheol, S., and Smith, R., (1999), "Pooled mean group estimation of dynamic heterogeneous panels", Journal of the American Statistical Association, 94, 621-634.
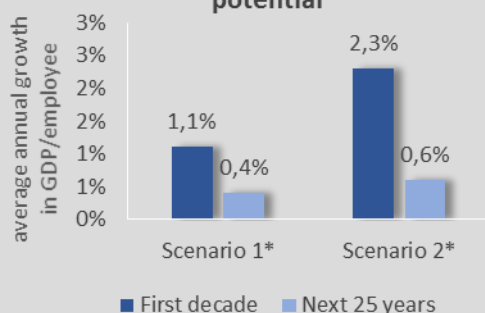
Scenario 2: Assumpions		
	First decade*	**Next 25 years***
Human capital	9,9%	5,2%
quantity	*0,6%*	*0,6%*
quality	*9,3%*	*4,6%*
Academic human capital	27%	0,0%
quantity	*6%*	*0,0%*
quality	*21%*	*0,0%*
Business sophistication	4,7%	0,0%
average annual growth rate		

Source: NBG Estimates

Greece as an Education Hub: Long-term boost on growth potential

* Scenario 1: Higher Education Hub
* Scenario 2: Higher Education Hub + Business sophistication initiatives

Source: UNCTAD, NBG Estimates

unique per country short-term dynamics. Our estimates are derived from a worldwide sample of 38 countries (attracting about 80 per cent of international students) for the period 1995-2015. With the scope of finding the drivers of GDP per employee, we have included four main parameters:

- ✓ Physical capital, as proxied by the FDI-to-GDP ratio.
- ✓ Quality-adjusted human capital, as proxied by the tertiary education employment shares adjusted by the country's NBG education index (of the previous 35 years on average, so as to capture the quality of the current employees).
- ✓ Quality-adjusted academic human capital, as proxied by the number of university professors per capita adjusted by the country's NBG education index.
- ✓ Business sophistication, as proxied by an average of respective sub-indices of the WEF Global Competiveness Index (taking into account variables such as cluster development, value chains, production process and management quality).

This model – the NBG Long-term Education-adjusted Growth Model - explains 93 per cent of the growth differentials between countries during the past 20 years.

Therefore, according to our model estimates, in the event Greece converges gradually during the next decade to the international high standards of tertiary education (as described in the previous section), annual GDP growth could be boosted by 1.1 percentage point in the first decade (i.e. the adjustment period; where the upgrade of the academic human capital, according to our scenario, will take place) and by 0.4 percentage points during the next 25 years (i.e. the long-term effect; where the upgrade of the human capital will gradually feed into the real economy).

More importantly, a gradual improvement in the business sophistication of the country's corporate environment during the next decade to achieve similar levels with leading EU countries (e.g. through initiatives supporting clusters, value chains and branding) would

- ✓ strengthen the effect of the superior academic human capital, as well as

**Greece as an Education hub:
Long-run boost on GDP**

Sources: NBG estimates
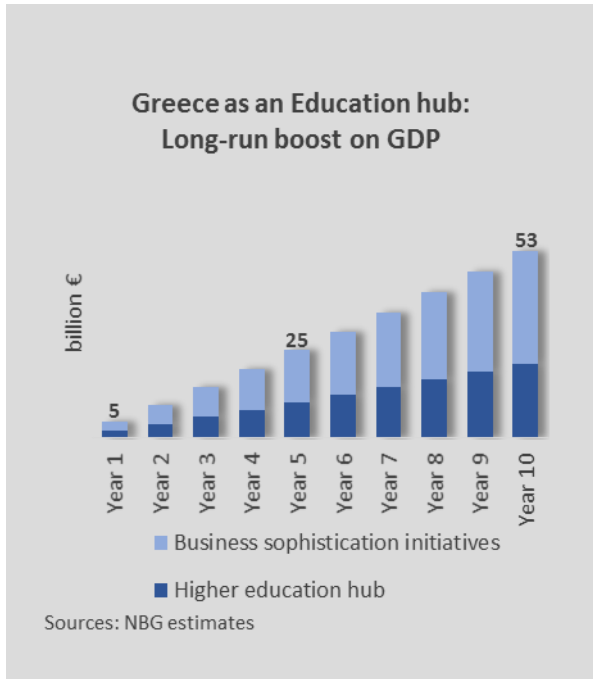
✓ attract foreign students to stay and work in Greece

with these positive synergies further increasing the growth generating effects.

According to our estimates, the boost on Greek GDP could be, *ceteris paribus*, more than €20 bn per year at the first decade of the reform, and could even reach €50 bn in case the full effect of entrepreneurial synergies be materialized.

Note that these estimates continue to underestimate the total effect on the economy, as we have assumed that the investment trend will not be affected. In reality, the aforementioned structural improvements of the Greek economy will also attract high quality investment – thus further boosting its growth potential.

BOX 1: World University Rankings

The growing globalization of higher education brought about the emergence of global university rankings, which are easily accessible and are designed to help prospective students make informed comparisons of leading universities around the world.

A frequently cited index is the QS World University Ranking, assessing university performance across four areas:

✓ Research (weight 60%): Through an academic reputation survey (weight 40%), professors are asked to identify the institutions where they believe the best work is currently taking place within their own field of expertise. Moreover, the more objective indicator of citations per faculty (weight 20%) is used to assess each university's research output and impact. Generally, the more often a piece of research is cited (referenced to another paper or book publication), the more influential it is.

✓ Teaching (weight 20%): Aiming to identify the universities that are best equipped to provide small class sizes and a good level of individual supervision, the professor-to-student ratio is taken into account.

✓ Employability (weight 10%): Through an employer reputation survey, employers are asked to identify the universities they perceive to be producing the best graduates based on their experience.

✓ Internationalization (weight 10%): The shares of international students (weight 5%) and international faculty (weight 5%) are the last components of the QS rating calculation, evaluating the university's strategy concerning the growing phenomenon of student and staff mobility.

Universities in the US and the UK dominate global rankings, with 49 and 30 universities, respectively, in the top 200 of the QS World University Rankings.

**Global University Rankings
Top 20***

UK 25%
Switzerland 10%
USA 55%
Singapore 10%
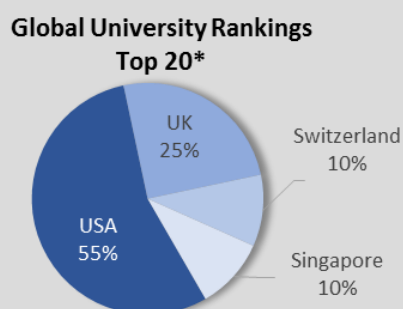
* based on the number of universities in the top 20 list of the QS Ranking
Source: QS Rankings, NBG estimates

Greece has an average ranking of 590 in 2016, with six universities participating on the QS lists and only two in the top 500. The highest ranking university is the National Technical University of Athens (EMP), which is continuously improving its position from 550th in 2012 to 395th in 2016, followed by Aristotle University of Thessaloniki, which is 490th (40 places down from 2012). We note that both the university of Crete and the Athens National and Kapodistrian University were on the top 500 list in 2012, but posted a drop of 150-200 places during the past 4 years, mainly due to the level of research (citations).

However, there are certain Greek universities that stand out in specific fields of study. Specifically, 5 Greek universities are among the world's top 500 in departments relevant to natural sciences (physics, chemistry, mathematics), while 2 universities have managed to reach the top 200 in engineering and technology (with the National Technical University of Athens ranking 67th), 1 in business management (Athens University of Economics and Business) and 1 in pharmacology (National and Kapodistrian University of Athens).

Source: QS Rankings, NBG estimates

Source: QS Rankings, NBG estimates
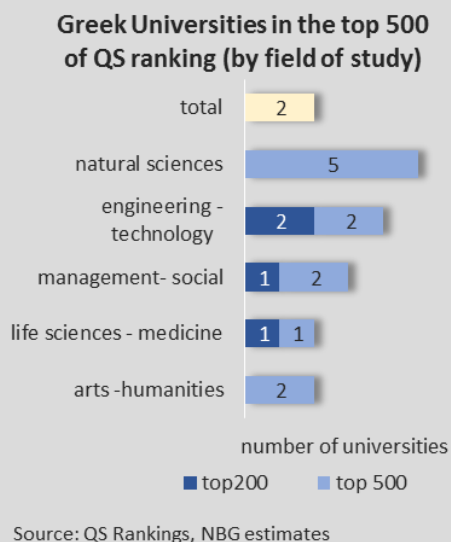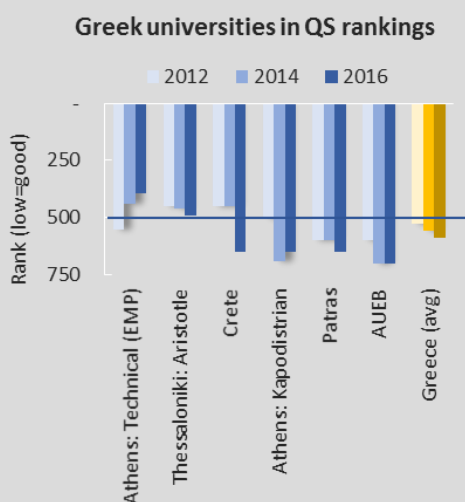
While the comparison on a nominal level is not fair for a small country such as Greece in terms of resources and recognition, even after adjusting for the population, Greece ranks relatively low, with 0.2 universities in the top 500 per million inhabitants, compared with an average performance of 0.4 in the EU (with about ½ concerning universities in the top 200). Countries with high scores in global rankings compared with their population are Finland, Ireland and Switzerland, while The Netherlands has a high performance in the top 200 rankings. We note that controlling for the population, the US and UK exhibit a medium performance (partly due to the fact that they are large countries).

Finally, it should be noted that there are several other institutions annually publishing different rankings of world universities such as the Times Higher Education World Ranking (THE), the Academic Ranking of World Universities (ARWU) and the Center for World University Rankings (CWUR). Most rankings follow similar approaches, examining university attributes like research activity, volume and impact of publications, international mobility, quality of teaching and organization, using both official statistics and survey data. However, they differ in the specific metrics used and the weight they apply on each attribute. Indicatively, Greek universities have a slightly better ranking when the Times Higher Education Index is used, with 3 universities in the top 500 instead of 2 when using the QS index described above. This is mainly because the THE gives more weight to the quality of research activity (including publications, number of citations as well as reputation surveys), while QS focuses more on the quality of teaching.

BOX 2: "Eternal" students

Greece exhibits a large number of enrolled students in tertiary education (677,000), as the ratio of enrolments per 1,000 residents stands at 62 versus 39 on average in EU. These figures, however, are misleading due to the widespread phenomenon in Greece of "eternal students" (i.e. students that substantially prolong their graduation beyond the standard duration of their studies).

A closer look at the age structure of the students enrolled in the Greek Universities reveals that the share of the students aged over 26 (i.e. those that probably are students for more than 7-8 years) is increasing steadily during the past three decades, reaching an astonishing 42 per cent of the total students in 2015 (compared with approximately 15 per cent during the decades of '50s to '80s).

By using the age group of 26+ as a proxy of "eternal" students[19] (i.e. students that exceed the normal duration of studies by more than 2 years), we have estimated the number of "eternal" students in Universities and in Technological Institutions during the past fifteen years. Although the majority of these students are enrolled in Universities (65 per cent), the phenomenon presents high growth dynamics in Technological Institutions (increasing by 315 per cent during 2001-2015, versus 98 per cent in Universities). Note that the share of "eternal" students to total students currently stands at about 40 per cent in both Universities and Technological Institutions (compared with 29 in Universities in 2000 and 14 per cent in Technological Institutions).

Regarding the causes of this phenomenon, we distinguish the following factors:

- ✓ The initial enrolment process into tertiary education – via the Pan-Hellenic written exams – often results in options that are less desirable to the candidate; this

Tertiary education enrolments
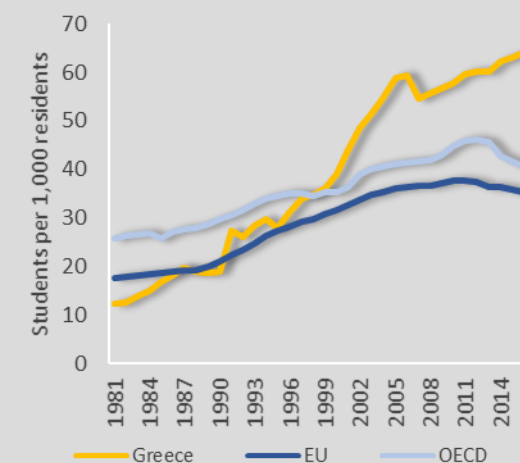
Sources: Unesco, World Bank, Eurostat, NBG estimates

Students in Greek universities per age group
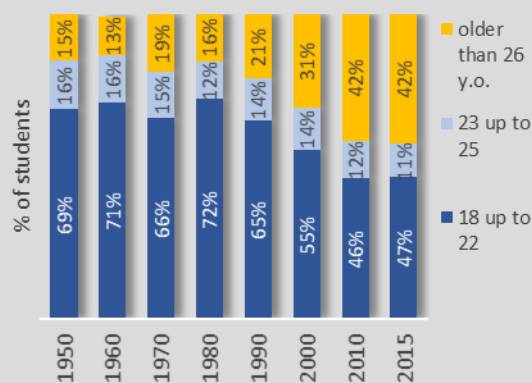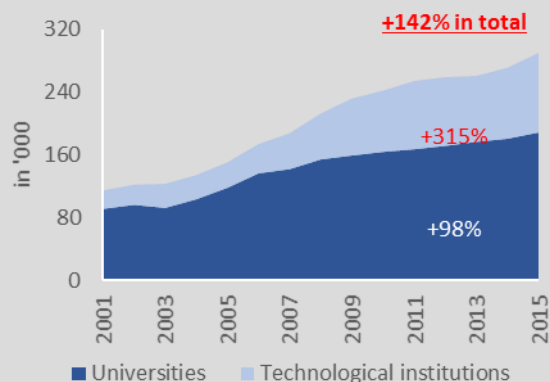

Source: El.Stat., NBG Estimates

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[19] Note that we have included in this proxy for inactive students only the 26+ students that have exceeded the normal duration of their studies.

being the negative consequence of a high "success" ratio.

✓ The low absorption of higher education graduates in the Greek labor market discourages the students from completing their studies.

✓ The absence of any motivation for the timely graduation or any penalty for exceeding the standard study time (e.g. payment of a tuition fee) further restrains the students' efforts.

✓ The establishment of several departments in rural areas makes it difficult for many students to attend the lectures.

Through the Act 4009/2011, the Greek state tried to control the problem of "eternal" students by introducing a rule for the maximum duration of studies (as determined by the curriculum plus 4 semesters). However, an amendment of the law in 2015 has enabled students to continue their studies without any kind of limitation in duration.

"Eternal" students* in Greek higher education

+142% in total

+315%

+98%

■ Universities   ■ Technological institutions

* exceeding the normal duration of studies by more than 2 years, as proxied by students over 26 years old
Sources: Eurostat, El.Stat., NBG estimates

BOX 3: Greek immigration trends

The global level of international migrants has historically been on an upward trend, reaching 244 million in 2015, from 173 million in 2000 and 102 million in 1980. Most immigrants originate from Asia (43 per cent), followed by Europe with 25 per cent. The destination regions are more balanced, with Asia and Europe both covering about ⅓ of international migration stock. It should be noted that on a country level, the US is a dominant destination, hosting 47 million immigrants (20 per cent), followed by Germany and Russia, hosting a much lower 12 million. Concerning the 60 million European migrants, we note that about ⅔ have moved to another European country.

Greece is a country with a high immigration rate, as about 10 per cent of the population born in Greece lives in another country, compared with a world average of about 3.3 per cent. In fact, considering the accumulated stock of Greek international migrants (not just those born in Greece), the total Greek diaspora is estimated at about 5 million.

Driven mainly by the economic and political conditions in the country, the first significant wave of Greek immigration occurred during the early 20th century when about 350,000 immigrants, mostly of low education and with no specialized training, left Greece seeking better economic opportunities abroad (mainly in the US). Again, as a result of both economic and political reasons (i.e. dictatorship), the second wave of Greek immigration occurred during the 1960s and the 1970s - leading to a peak of about 1.2 million Greek immigrants during the 1980s. Thereafter, the outflow appeared to decrease gradually until 2010, when the country was hit by the ongoing economic crisis.

The recent – third – wave of immigrants differs significantly compared with the previous two waves, as it mainly consists of young and highly educated individuals. In fact, ⅓ of Greeks leaving the country after 2010 are considered to have attended tertiary education (compared with 20 per cent in 1990 and less than 10 per cent during the previous immigration waves). This
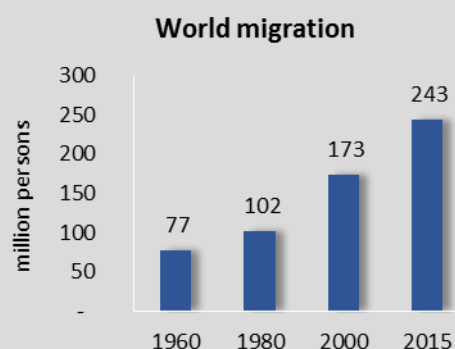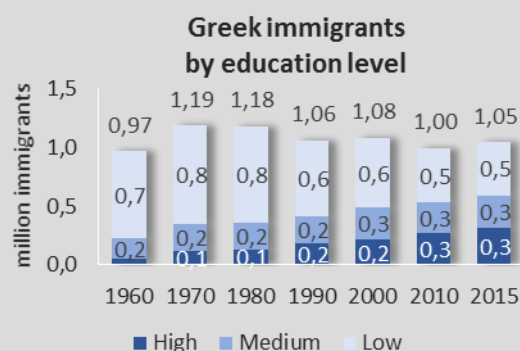

World migration

Source: UN, International Migration Report 2015

Immigration intensity*
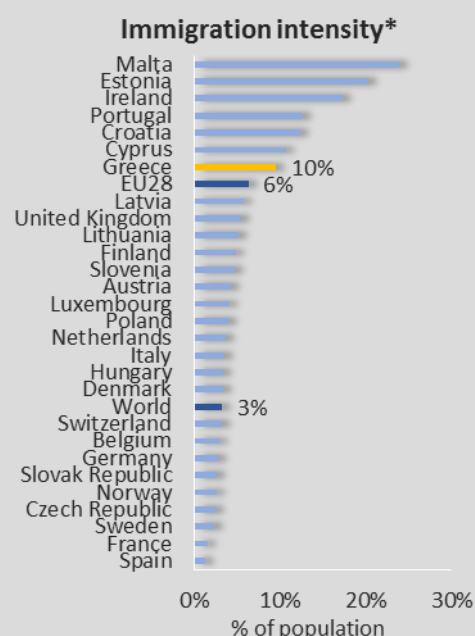
* number of immigrants as a share of population born in the source country

Source: World bank, OECD, NBG estimates


Greek immigrants by education level

Source: World Bank Database, OECD, IAB (brain drain data), NBG estimates

brings into focus the brain drain phenomenon and its detrimental effects on human capital in Greece and the potential growth of the country. Specifically, combining data for the educational level of Greek immigrants and of employees in Greece, it is estimated that about 20 per cent of Greeks with tertiary education (in Greece and abroad) are employed abroad (compared with 9 per cent on average in the EU).

The main destination country is Germany, attracting about 30 per cent of Greek immigrants in 2015, followed by North America (mainly the US) with 25 per cent and Australia with 11 per cent. We note that during the past 20 years, the UK has increased its share as a target market from 1 per cent to 5 per cent.

Destination countries of Greek immigrants
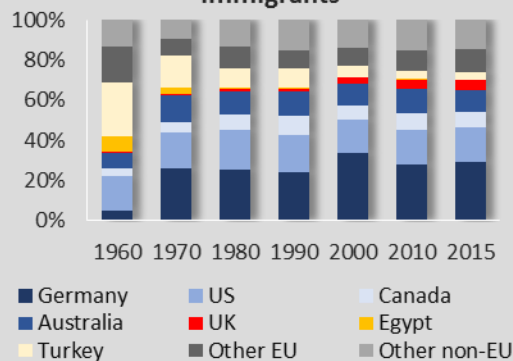
Source: World Bank Database, OECD, IAB (brain drain data), NBG estimates

APPENDIX: Econometric models

A. NBG Education Model

NBG Research estimated a global universities competiveness model in order to assess the underlying potential of Greece's higher education. The model is based on cross-section data for the world's main host countries for international students.

Our sample consists of 50 countries, which attract 86 per cent of total international students. In order to account for the effect of the different size of each country, we have expressed the variables either in per capita terms (i.e. number of students and number of professors) or as a share of GDP (i.e. R&D expenditures). The explanatory variables for each country's inbound students per capita are the following:

✓ a University Independence Index, based on OECD estimates[20]

✓ the number of highly-cited professors per capita, based on the "List of Highly Cited Professors" (Thomson Reuters, 2016)

✓ the level of R&D expenditure in higher education as a share of GDP

✓ a language variable, taking the value 4 for English-speaking countries, 3 for German-speaking countries, 2 for French-speaking countries, 1 for countries with high English literacy and 0 for countries with low English literacy.

Our model explains 85 per cent of the global distribution of international students. Based on the estimated coefficients, we have constructed the NBG Education Index.

$$inb_i = 6.44\ ind_i + 2{,}501\ res_i + 1{,}412\ rd_i + 231.52\ lang_i + 788.60$$
$$\quad\ (6.79)\qquad (2.13)\qquad (2.75)\qquad (2.35)\qquad (2.62)$$

$$R^2 = 0.85,\ DW = 2.45$$

where:

inb_i: inbound students in 2015 for the country i (per million residents, source: UNESCO),

ind_i: university independence index of country i (source: OECD)

res_i: highly-cited professors in country i (per million residents, source: Thomson Reuters)

rd_i: R&D expenditures in higher education in country i (as a share of GDP)

$lang_i$: language dummy for country i (as described above)

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[20] Martins, J. O., Boarini, R., Strauss H., and De la Maisonneuve, C. (2009), "The policy determinants of investment in tertiary education", OECD Journal of Economic Studies, volume 2009, no 1.

i: Albania, Armenia, Australia, Austria, Bahrain, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, China, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Kyrgyzstan, Latvia, Lithuania, Malaysia, Mauritius, Netherlands, New Zealand, Norway, Poland, Portugal, Qatar, Romania, Russia, Serbia, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, UK, US

T-statistics in parentheses below coefficient estimates.

B. NBG Long-term Education-adjusted Growth Model

NBG Research estimated a global growth model in order to assess the effect of higher education in Greek growth. The model is based on panel data for the world's main host countries for international students during the past two decades.

The modelling framework is the one adopted in the vast majority of empirical studies that assess the relationship between education and economic growth. It can be described as an augmented Cobb-Douglas production function in order to take into account the role of human capital. Our sample consists of 38 countries with annual data for the period 1995-2015. With the dependent variable being GDP per employee, the explanatory variables used are the following:

- ✓ the FDI-to-GDP ratio (as a proxy of physical capital)

- ✓ the tertiary education employment shares adjusted by the country's average NBG education index of the previous 35 years (as a proxy for quality-adjusted human capital)

- ✓ the number of university professors per capita adjusted by the country's NBG education index (as a proxy for quality-adjusted academic human capital)

- ✓ a business sophistication index (based on WEF estimates)

As the assumption of homogeneous parameter estimates across countries is considered a strong one, we chose the estimation method of PMG[21]. This allows us to estimate non-stationary dynamic panels in which the short-run dynamics can be country-specific, while the long-run relationship is valid across all countries. After testing for (i) the non-stationarity of the variables (according to Augmented Dickey-Fuller unit root test) and (ii) the hypothesis that the long-run coefficients are the same for all countries (according to the Hausman test), we have estimated the following coefficients:

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[21] Pesaran, H., Yongcheol, S., and Smith, R., (1999), "Pooled mean group estimation of dynamic heterogeneous panels", Journal of the American Statistical Association, 94, 621-634.

NBG Long-term Education-adjusted Growth Model		
Variables	**Coefficients**	**t-statistics**
Long-run relationship		
fdi_i	0.21	12.45
hc_i	0.60	9.21
ahc_i	0.03	6.17
bs_i	0.24	9.07
$ahc_i \times bs_i$	0.05	2.31
Short-run dynamics		
Error correction	-0.25	4.52
$D(gdp_i(-1))$	0.27	3.21
Constant	1.52	3.83

where:

fdi_i: fdi stock as a share of GDP in country i (source: UNCTAD),

hc_i: tertiary education employment shares adjusted by the country's average NBG education index of the previous 35 years in country i

ahc_i: universities' researchers per million residents adjusted by the country's NBG education index in country i

bs_i: business sophistication index in country i, which is a composite index based on relevant sub-indices of the WEF Global Competitiveness Index, as follows:

$$bs_i = 1/8*(\text{State of cluster development}) + 1/8*(\text{Nature of competitive advantage})$$
$$+ 1/8*(\text{Value chain breadth}) + 1/8*(\text{Control of international distribution})$$
$$+ 1/8*(\text{Production process sophistication}) + 1/8*(\text{Extent of marketing})$$
$$+ 1/8*(\text{Company spending on R\&D}) + 1/8*(\text{Reliance on professional management})$$

gdp_i: GDP divided by labor force in country i

i: Australia, Austria, Belgium, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Republic of, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK, US

Note that all variables are expressed in logarithmic terms.

Our estimates confirm the existence of a long-run relationship, as the error correction term is negative and statistically significant. In particular, the average speed of adjustment of 0.25 means that the gap between actual and equilibrium GDP would be closed relatively fast, implying a deviations' half-life of around 2 years. Focusing on the long-term coefficients, all variables are statistically significant and with the expected sign.

Moreover, the statistically significant coefficients of academic human capital, business sophistication and their product indicate the existence of a moderation effect, i.e. that the relationship between two variables (in our case, growth and academic human capital) depends on a third variable (in our case, business sophistication index). The effect of a moderating variable is characterized statistically as an interaction[22]. In our case, business sophistication as a moderating variable affects the strength of the relation between academic human capital and growth.

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[22] Aiken, L.S., and West, S.G. (1991), "Multiple regression: Testing and interpreting interactions", Thousand Oaks, Sage.

SECTORAL REPORT

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