

work to selective scholarly journals, where it is more difficult to publish and the process is slower. Increasingly, there are predatory publishers that specialize in quick, easy, and cheap publishing.

#### APPROVED SCHOLARLY INDEXES

Many universities base their evaluation on faculty publications in journals included in prestigious indexes, such as Web of Science or Scopus. This “whitelist” approach is not without its flaws, as the indexes sometimes make mistakes and include easy-acceptance, pay-to-publish journals. In some cases, respected journals cannot resist the temptation to generate much revenue, so they lower their standards, accepting most submitted papers.

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**Predatory publishers hurt scientists, science, and the communication of science.**

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#### GEOGRAPHIC FOCUS

Predatory publishers have been more successful in some regions of the world than in others. One broad area that has seen many victims of predatory journals is Eastern Europe, the former Soviet republics, and Russia. In these regions, academic evaluation is often based merely on counting the number of papers published. This matches perfectly with predatory journals, who offer quick, easy, and cheap publishing. Many researchers submit papers to predatory journals but fail to realize they are counterfeit journals. Their work is quickly accepted and published, and they soon receive an invoice, usually an unexpected one, from the publisher.

When a few predatory journals invade a region and become successful at attracting articles and payments from researchers, others quickly follow. Then the number of publishers multiplies, and the number of spam e-mails grows also. We are now beginning to see low-quality and predatory open-access publishers being established in Eastern Europe and the former Soviet republics.

#### IDENTIFYING PREDATORY JOURNALS

The characteristics of predatory journals are becoming well known. As mentioned, predatory journals use spam e-mail to solicit articles, they have a fast and often fake peer review process, and they supply false information about their locations. Many now also make false claims about having impact factors or being included in prestigious academic indexes. Now it is important to verify all claims made by

open-access journals, for many are dishonest.

The lists I publish also identify predatory journals and publishers, and many researchers find them useful. These lists are found at <scholarlyoa.com>. Compiled with the help and advice of many active researchers, the lists include publishers and journals that ought to be avoided by honest researchers.

#### LONG-TERM VIEW

While publishing one’s research in a predatory journal may bring temporary gain, the long-term consequences are likely to damage a researcher’s reputation. It is not uncommon for predatory journals to disappear from the Internet after several years. Most are one-man operations, and the published articles have no backups. Researchers may be stigmatized for publishing in easy-acceptance, pay-to-publish journals. Potential employers may reject applicants who have published articles in predatory journals.

For all researchers, the best course of action is to avoid predatory journals. Carry out high-quality research and submit it to the best possible journals. This strategy is more difficult and time-consuming, but it eliminates the risks predatory journals bring and offers researchers better and more secure long-term benefits.

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## International Doctoral and Master’s Students: What the Data Tell Us

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Currently, one in ten students at the master’s or equivalent level is an international student in OECD countries, rising to one in four at the doctoral level, according to data from the UNESCO-OECD-Eurostat data collection referring to 2013. In Luxembourg and Switzerland, international students make up more than half of the total doctoral enrollment.

Master's and doctoral programs are the most advanced educational programs, informed by state-of-the-art research or professional practice. The emergence of the knowledge economy and of knowledge communities is turning research and the top professional services into increasingly internationalized activities. Accordingly, many students are seeking opportunities to go abroad for their master's or doctoral studies, particularly to countries that invest substantially in research and development (R&D).

International experience is a valuable asset for researchers and professionals, so much so that the European University Association in 2015 recommended that "doctoral candidates should be able to take part in international research activities." These activities could come through international collaborations or by studying abroad for all or part of a study program. International students bring to their host countries a variety of benefits—for example, their social and business networks from their home countries, but also the fees and other expenses they pay. In addition, international students can contribute to the host country's R&D, as students but also later on as researchers or highly qualified professionals. Doctoral students, in particular, form an integral part of the research staff of a country.

#### **HOW MANY MASTER'S OR DOCTORAL STUDENTS ARE STUDYING ABROAD?**

International students represent 11 percent of all the students enrolled in master's or equivalent programs in OECD countries, about twice as much as for bachelor's or equivalent programs. Luxembourg has the largest proportion of international students at the master's or equivalent level (67 percent), followed by Australia (38 percent), the United Kingdom (36 percent), and Switzerland (27 percent).

In all OECD countries, with very few exceptions, the proportion of international students is even higher at the doctoral than at the master's or equivalent level. One quarter of all the students enrolled at the doctoral level in OECD countries are international students. Besides the advantages for aspiring top professionals of being trained in an international environment, other factors could help to explain the high proportion of international master's and doctoral students. For example, programs in specific areas of study may not be available in some countries, or they may not have the same reputation as other programs in the same fields available abroad. In addition, students in these programs may belong to a particular subgroup of the student population that is more likely to travel and live abroad, independently of their educational choices.

#### **WHAT SUBJECTS DO INTERNATIONAL STUDENTS STUDY?**

Almost 60 percent of international doctoral students study

science, engineering, or agriculture. This is much higher than the proportion of doctoral students enrolled in these fields among national students (around 40 percent), and also higher than the proportion of international students enrolled in these fields at the master's level (about 30 percent). In some countries (Luxembourg, the Netherlands, New Zealand, Switzerland, and the United States), more than half of all students enrolled in doctoral programs in science, engineering, or agriculture come from abroad. This reinforces the potential for countries to expand their labor force's skills base, as doctoral students may stay on in their host countries as professionals, technicians, and researchers after their studies, fostering innovation and the successful introduction of new technologies and organizational processes in the economy. According to some estimates, about one quarter of international students stay in the host country after graduating from a tertiary education program in OECD countries.

#### **WHICH COUNTRIES ARE SENDING AND RECEIVING MASTER'S AND DOCTORAL STUDENTS?**

The United States hosts 38 percent of all international students enrolled in doctoral or equivalent programs in OECD countries. This is the largest share, followed by the United Kingdom (13 percent), France (8 percent), and Australia and Germany (both 5 percent). At the master's level, the top five countries remain the same but the market is less concentrated: the United States' share is 21 percent, whereas the United Kingdom (16 percent), France and Germany (both 11 percent), and Australia (8 percent) have larger shares.

In terms of countries of origin, 23 percent of international students studying in OECD countries come from China, more than from any other country, followed by India (8 percent), and Germany (4 percent). The majority (53 percent) come from Asia. Intra-European mobility is still important at the master's and doctoral levels (26 percent of international students enrolled in EU21 countries come from another EU21 country), although a bit less than for tertiary education overall (where the proportion is 30 percent). In Canada and the United States, regional mobility accounts for a smaller share of the total, as only about 10 percent of the international students at the master's and doctoral levels come from Northern or Latin America.

#### **WHAT MAKES HOST COUNTRIES ATTRACTIVE?**

Countries investing substantial resources into R&D in tertiary education seem to be particularly attractive destinations for international doctoral students. For example, Switzerland has the highest level of expenditure on R&D per student in tertiary educational institutions among OECD countries (around USD13,600), and also the second highest proportion of international students at the doctoral level

(after Luxembourg). In contrast, Chile, the Russian Federation, and Mexico have less than 5 percent of international students at the doctoral level and spend less than USD2,000 per student on R&D in tertiary educational institutions.

The correlation of expenditure on R&D per student in tertiary educational institutions with the proportion of international doctoral students is 0.69, stronger than with the proportion of international master's students (0.57). It is also interesting that R&D investments are strongly associated to the enrollment of international students to doctoral programs, but not to enrollment in doctoral programs overall: the correlation between expenditure on R&D per student in tertiary educational institutions and the entry rate of national students to doctoral programs is close to 0.

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**The emergence of the knowledge economy and of knowledge communities is turning research and the top professional services into increasingly internationalized activities.**

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Tertiary education R&D expenditure could attract international master's and doctoral students by enhancing the quality of research training in a country's universities, as well as their research capacity and visibility. But it could also be a proxy for other factors attracting international students, such as the innovativeness of the economy, or social and cultural factors related to a thriving knowledge society. These other factors could be attractive not only for students enrolled in doctoral or academic master's programs, but also for those enrolled in professional master's or equivalent programs.

To sum up, a large proportion of students at the master's and doctoral levels in OECD countries is international. International students at these levels tend to choose countries investing substantial resources on R&D in tertiary educational institutions. This offers these countries an opportunity to attract future workers with advanced training, particularly in science and technology. Some countries are already doing this: in Luxembourg, the Netherlands, New Zealand, Switzerland, and the United States more than half of those enrolled in a doctoral program in science, engineering, or agriculture are international students. ■

## Does Research Mobility Have an Effect on Productivity and Impact?

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With the globalization of science and the availability of online resources to help identify potential international collaborations, researchers are seeking opportunities outside their institutions and sometimes outside their country of origin. It is unknown, however, whether these types of scientific mobility have a positive effect on the productivity or impact of their work. On the one hand, mobility can be positive since researchers moving to a new affiliation and/or country might find opportunities to expand their network and further their knowledge and expertise. On the other hand, the period of adjustment and familiarization with a new affiliation and/or country can potentially delay the publication of new studies. In addition, one's affiliation with a new institution might take time to be recognized by the scientific community. By using data depicting researchers output, the affiliations they belonged to, and the overall impact of their work, we sought to discover whether researchers' "productivity" in terms of the number of publications they produce, and the "impact" of these publications in terms of number of total and relative citations they receive, is affected by mobility. In order to examine this question, we collected data on the number of affiliations, countries, number of publications, and citations for 700 researchers from 10 disciplines between 2010 and 2015. We compiled a diverse list of seven disciplines: (1) Neuroscience; (2) Mechanical Engineering; (3) Arts & Humanities; (4) Oncology; (5) Environmental Geology; (6) Business and; (7) Infectious Diseases. Using SciVal™ (Elsevier product) researcher profile, we identified the affiliations and countries where each researcher was assigned based on his/her publications. We found that mobility between at least two affiliations increases both output (number of publications) and impact (number of citations). The disciplines that see the most benefit from affiliation mobility are Mechanical Engineering; Oncology; Arts & Humanities; and Infectious