



NATIONAL SCIENCE BOARD SCIENCE & ENGINEERING INDICATORS 2020



Higher Education

Higher Education in Science and Engineering

Technical Appendix

NSB-2019-7

September 04, 2019

This publication is part of the *Science and Engineering Indicators* suite of reports. *Indicators* is a congressionally mandated report on the state of the U.S. science and engineering enterprise. It is policy relevant and policy neutral. *Indicators* is prepared under the guidance of the National Science Board by the National Center for Science and Engineering Statistics, a federal statistical agency within the National Science Foundation. With the 2020 edition, *Indicators* is changing from a single report to a set of disaggregated and streamlined reports published on a rolling basis. Detailed data tables will continue to be available online.

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Technical Appendix

Methodology Notes for International Degree Data

International data for first degrees and doctoral degrees for the “Higher Education in Science and Engineering” report were retrieved from several sources. Data were sourced from the Organisation for Economic Co-operation and Development (OECD), Eurostat, and several national and regional statistical offices. These methodology notes provide details on the degree field classifications, degree level definitions, and sources used for the international higher education data.

Degree Fields and Levels

Fields of degree used in the international section of this report are based on ISCED-F 2013, the most recent coding system of the **International Standard Classification of Education (ISCED)**, to facilitate international comparisons. **Table T2-1** shows the crosswalk of science and engineering (S&E) degree fields used to map degree data from regional and national data sources to the fields used in this report.

TABLE T2-1

Crosswalk of S&E fields for international higher education data, by selected region, country, or economy and field

(List of fields)

Indicators 2020	China^a	OECD and Eurostat, ISCED 1997 (2012 and earlier)	OECD and Eurostat, ISCED-F 2013 (2013 and later)	Taiwan
Physical and biological sciences and mathematics and statistics	Science	42 Life sciences	05 Natural sciences, mathematics, and statistics	Life sciences
		44 Physical sciences		Natural science
		46 Mathematics and statistics		Mathematics and statistics
Computer sciences	NA	48 Computing	06 Information and communication technologies	Computer sciences
Agricultural sciences	Agricultural sciences	6 Agriculture	08 Agriculture, forestry, fisheries, and veterinary	Agricultural science
Social and behavioral sciences	Economics	31 Social and behavioral science	03 Social sciences, journalism and information	Social and behavioral science
		32 Journalism and information		
Engineering	Engineering	5 Engineering, manufacturing, and construction	07 Engineering, manufacturing, and construction	Engineering

NA = not available.

ISCED = International Standard Classification of Education; OECD = Organisation for Economic Cooperation and Development.

^a China data include computer sciences under engineering.

Source(s)

Organisation for Economic Co-operation and Development (OECD), OECD.Stat; Eurostat, Education and training database; National Bureau of Statistics of China, *China Statistical Yearbook* (various years); Ministry of Education, *Educational Statistics of the Republic of China (Taiwan)* (various years).

Science and Engineering Indicators

Levels of degree for international degree data in this report are based on the ISCED 2011 system. Doctoral degrees correspond to ISCED 2011 level 8 (doctoral or equivalent). First degrees may correspond to ISCED 2011 level 6 (bachelor’s or equivalent) or include a combination of degrees at ISCED 2011 levels 6 and 7 (master’s or equivalent), depending on the data source. Some countries grant bachelor’s degrees and “long first degrees.” These degrees typically take at least 5 years to complete and involve training at a level comparable to a master’s degree in the United States. Similar to bachelor’s degree programs, long first degree programs only require completion of secondary education to enroll, and completion of a program provides the first opportunity to enter the labor market with an academic credential at the tertiary

level (excluding shorter-duration, occupationally focused programs).¹ The United States does not report long first degrees. Combined bachelor's/master's programs in the United States may provide roughly similar educational training to long first degrees, but there are very few such programs, and institutions award both degrees to these joint program graduates.

Where data are available, national totals for first degrees presented in the international S&E higher education section of the report equal the sum of first degrees at the bachelor's level and long first degrees. For countries, such as the United States, that do not report data specifically for first degrees, first degree totals are bachelor's degrees.

OECD

Unless otherwise specified, international degree data in the report were retrieved from the OECD statistical database, **OECD.Stat**. The data reported by OECD come from an annual collection of education data conducted jointly by the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (UIS), OECD, and Eurostat ("UOE data collection"). OECD degree data for 2013 and later use current ISCED codes, whereas data for 2012 and earlier were retrieved from an archived database using ISCED 1997 codes. The transition in the data reporting from 2012 to 2013 includes changes in the degree fields and levels. These changes may lead to limitations in year-to-year comparability for first degrees for some countries, but they do not appear to pose methodological concerns for constructing an uninterrupted time series for doctoral degrees.

The crosswalk of fields of degree between early (ISCED 1997) and later (ISCED 2011) years of OECD data is included in **Table T2-1**. This mapping applied to first degrees and doctoral degrees.

Mapping of levels of degree required different approaches for first degrees and doctoral degrees. OECD doctoral degrees were specified as ISCED 1997 level 6 (advanced research programs) for 2012 and earlier and ISCED 2011 level 8 (doctoral or equivalent) for 2013 and subsequent years. Mapping first degrees was a more complex process. Under the ISCED 1997 classification system, short-cycle tertiary education (comparable with an associate's degree), bachelor's degrees, and master's degrees are collectively categorized under level 5. To identify the ISCED 1997 level 5 degrees comparable with first degrees under the ISCED 2011 system, level 5 degrees were refined using two additional criteria:

- Program destination: A (theoretically based programs that give access to advanced research qualifications or professions with high-skill requirements)²
- Program orientation: first degree or qualification orientation

First degrees under the ISCED 2011 system were specified as the sum of first degrees at level 6 (bachelor's or equivalent) and long first degrees at level 7 (master's or equivalent). If data were unavailable for first degrees at level 6, the sum of all level 6 degrees and level 7 long first degrees was used.

OECD Data Quality Notes

This report uses OECD degree data as provided by the OECD.Stat database. Several instances of partial or complete repetition were found in the first degree and doctoral degree data.³ NCSES also observed an unexplained increase in the number of engineering doctoral degrees granted by Greece in 2006, which may be a result of misclassification of degrees by field at the time.

The change to ISCED 2011 levels of degree may have led to irregular reporting of first degree data during the transition in 2013 and subsequent years. The conventions used in this report for presenting first degrees lead to a significant drop in the number of first degrees reported by OECD for Russia, from 1,406,050 in 2012 (ISCED 1997 system) to 129,375 in 2013, the first year of ISCED 2011 reporting. The discrepancies in reporting of degrees persist across levels and categories of education in the following years. Degrees by level and category for Russia are presented in **Table T2-2** to illustrate the changes in reporting.

TABLE T2-2

Example OECD first degree data reporting: degrees awarded by Russia, by level and category of education: 2013–16

(Number)

Level and category of education	2013	2014	2015	2016
ISCED 2011 level 6 (bachelor's or equivalent)				
All degrees	129,375	120,172	214,497	589,754
First degrees	NA	NA	NA	589,754
ISCED 2011 level 7 (master's or equivalent)				
All degrees	1,269,594	1,170,798	1,011,659	710,717
Long first degrees	NA	1,114,277	936,278	633,316

NA = not available.

ISCED = International Standard Classification of Education; OECD = Organisation for Economic Co-operation and Development.

Source(s)

Organisation for Economic Co-operation and Development (OECD), OECD.Stat.

*Science and Engineering Indicators***Eurostat**

The **Eurostat data explorer** was used to retrieve degree data on European Union (EU) countries that are not OECD members and not included in the OECD statistical database. These countries include Bulgaria, Croatia, Cyprus, Malta, and Romania. The Eurostat database had high data availability for 2013–16 and moderate availability for 2005 and 2010.

In some instances, Eurostat was used to supplement missing data in 2013–16 for countries with data otherwise sourced from OECD. This approach was taken because the Eurostat database consistently provided the same data for OECD countries with joint coverage across the data sources for 2013–16. The consistency between the databases is unsurprising given that both rely on the same joint UOE data collection.

The Eurostat database uses the same ISCED system for levels and fields of education as the current OECD database. However, Eurostat provides totals for entire ISCED levels only, without the ability to identify the subset of first degrees at a given level. Specifically, there is no method to include only long first degrees at ISCED level 7 (master's degree or equivalent), without including all degrees at ISCED level 7. Therefore, totals for ISCED level 6 (bachelor's degree or equivalent) were used for first degrees for the select non-OECD EU members listed previously.

Other Countries and Economies**China**

All years of data for China come from the **China Statistical Yearbook of the National Bureau of Statistics of China**. Data for 2000–14 remain unchanged from *Indicators 2018*. New data were available for 2015, although data on degrees by field were not available for 2016. The 2015 data for first degrees were retrieved from Table 21-13, "Number of Regular Students for Normal Courses in HEIs [Higher Education Institutions] by Discipline," from the 2016 China Statistical Yearbook.

India

Degree award data for India were retrieved from OECD for 2015 and 2016. Data for India for 2000–14 remain unchanged from *Indicators 2018*. These data were retrieved from the India Department of Higher Education's **All India Survey on Higher Education**. The OECD database was not used for prior years where its coverage of higher education for India is extremely limited.

Japan

Data for Japan for 2000–14 remain unchanged from *Indicators 2018*. These data were retrieved from the Ministry of Education, Culture, Sports, Science and Technology Survey of Education. Data for 2015 and 2016 were sourced from OECD. The OECD database was not used for prior years because its coverage of higher education for Japan is extremely limited for most years. The change in data source from 2014 to 2015 led to a significant drop in the number of degrees in the social and behavioral sciences.

Taiwan

All years of data for Taiwan use the Ministry of Education Main Statistics, Summary of Tertiary Education Institutes file. Data for 2000–14 remain unchanged from *Indicators 2018*; new data were available for 2015 and 2016.

Notes

- 1 For a detailed discussion on classifying educational programs to ISCED levels, see OECD. 2018. *OECD Handbook for Internationally Comparative Education Statistics 2018: Concepts, Standards, Definitions and Classifications*. Paris, France: OECD Publishing. Available at <https://doi.org/10.1787/9789264304444-en>. Accessed 24 February 2019.
- 2 In contrast, shorter-duration ISCED 1997 5B programs focus on acquiring occupation-specific skills and credentials and include the equivalent of associate's degrees.
- 3 The National Center for Science and Engineering Statistics (NCSES) observed repeated data for the following countries in the years specified: Argentina (2013–14), France (2001–02 and 2003–04), India (2013 and 2016), Saudi Arabia (2014–15), and Turkey (2012–2013).