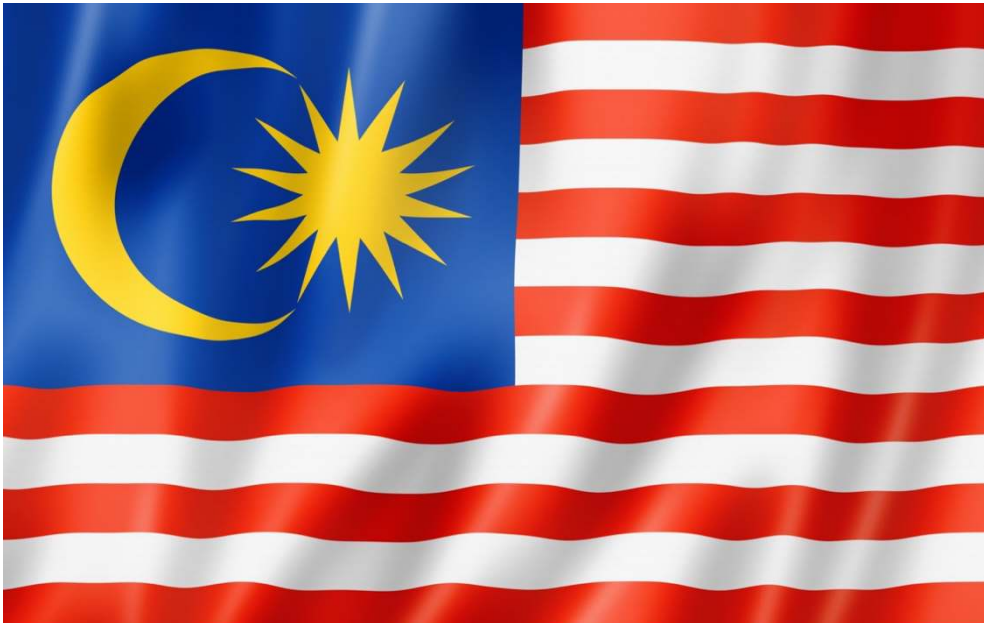

Country Report – Malaysia

STINT
Stiftelsen för internationalisering av
högre utbildning och forskning

The Swedish Foundation for International
Cooperation in Research and Higher Education

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Foreword

Recognising the importance of intelligence and analyses for the development of international strategies for higher education and research at various levels of the knowledge system, STINT has compiled a series of brief country reports focused on their academic profiles and performance.

Released as a pilot series covering 16 countries, these country reports aim to provide national overviews using current and reliable data. The selection of countries is based on STINT's existing collaborations and other criteria, not least that the selected portfolio provides an interesting illustration of developments in the academic world.

- Brazil
- Canada
- Chile
- China
- India
- Indonesia
- Japan
- Malaysia
- Kenya, Rwanda, Tanzania and Uganda
- South Africa
- South Korea
- United States of America
- Vietnam

The reports give insight into each country's knowledge system as well as its demographic and economic context. The intention is that both policy and decision makers, as well as practitioners within the Swedish higher education system, primarily, will utilise these reports in furthering international strategic collaboration at various levels.

A specific effort has been made to include the latest available data. Data were collected in July 2020; for further details about the data and methods, see the Appendix. Several persons at STINT have been involved in the production of these reports: Erik Forsberg, Andreas Göthenberg, Niklas Kviselius, Tommy Shih and Hans Pohl, who was the project leader and developed the tables and figures.

Introduction

Malaysia is a federal constitutional monarchy in South-East Asia, geographically constituting the southern half of the Malay peninsula (excluding Singapore) and the north-western part of Borneo. The Malaysian economy has overall been growing in the 4-5% range since the turn of millennium and Malaysia is expected to transition from an upper middle-income economy to a high-income economy by 2024. Malaysia is the 6th largest economy in South-East Asia and has the third highest GDP per capita of the ASEAN countries following Singapore and Brunei.

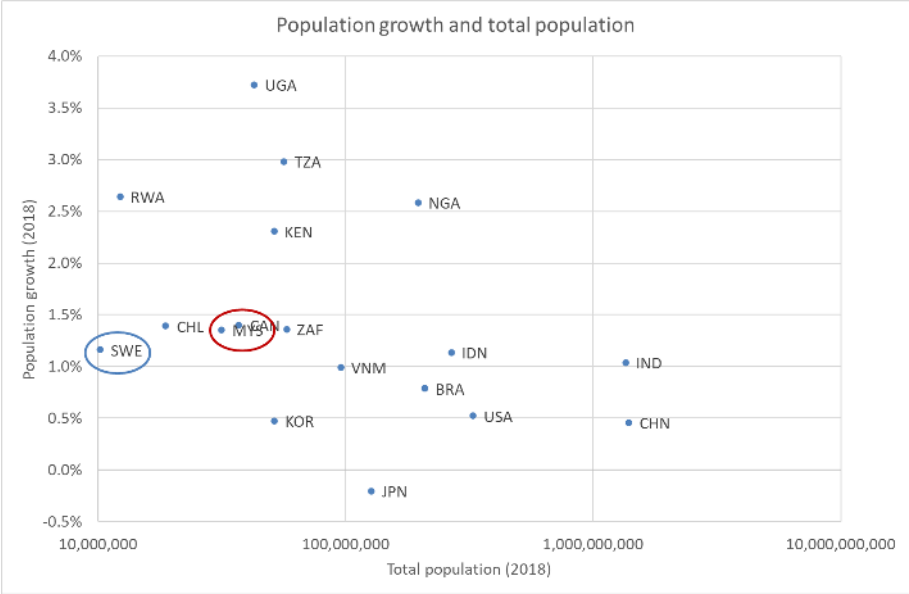
Malaysia was predominantly a mining and agricultural-based economy in the 1970's but significant diversification has taken place since, which has transformed the economy into a multi-sector economy, with agriculture, industry and services accounting for 8.8%, 37.6% and 53.6% respectively (by 2017 estimates). Exports are important for the Malaysian economy, accounting for more than 50% of the GDP. Oil and gas as well as palm oil products remain key export products, however electronics make up about half of the exports, with integrated circuits alone accounting for 21% of the exports in 2017.

In 2006 Malaysia launched the *Higher Education Strategic Plan Beyond 2020* and R&D spending in Malaysia has seen a clear and steady growth since and was at 1.4% of GDP in 2018 (according to the World Bank), up from about 0.6% in 2006. The number of full-time equivalent researchers in Malaysia has increased significantly as well, tripling in the period 2008-2012. A strong growth in scientific output has ensued, and Malaysia contributed to about 1% of the global scientific publications in the period 2015-2019, with publication volumes growing annually at 5.4%. Malaysia is also one the global centers for international education, being the fourth largest host of international branch campuses in the world.

Population and economic development

Malaysia's population is currently at 32.4 million with an annual population growth of 1.30%, which is gradually slowing down. The population distribution is highly uneven, with some 20 million residents concentrated in Peninsula Malaysia.

Figure 1: **Total population (logarithmic scale) and population growth**

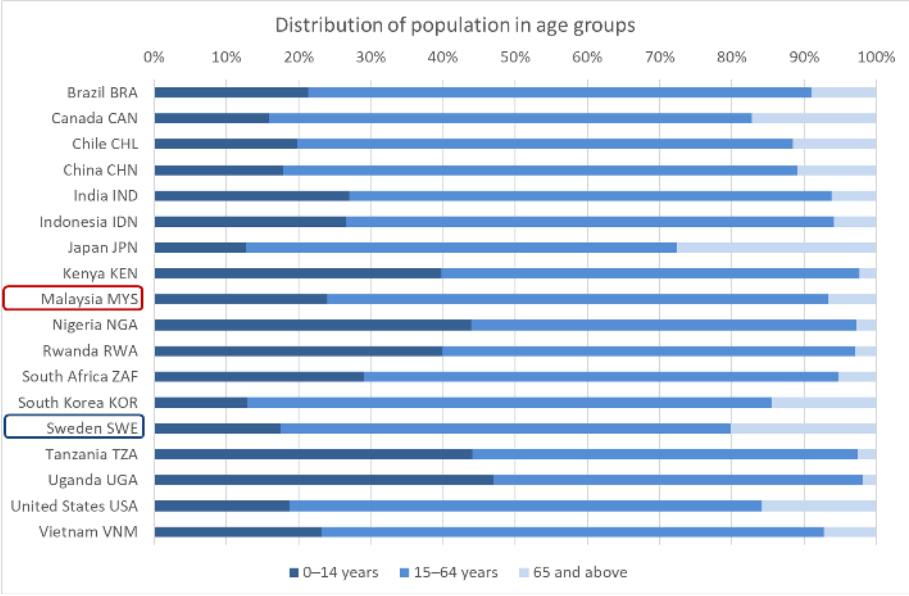


With a fertility rate of 2.01 births per woman, just under the population replacement rate, Malaysia will have to increase immigration and/or the fertility rate to avoid the negative transition effects of an aging society.

The population of Malaysia started to grow fast in the 1980s and has more than doubled since then. The equally drastic slowdown is attributed to public policy, rising education levels and overall shift in mind-set towards smaller families.

Malaysia is estimated to have roughly 4 million migrant workers, though the exact numbers are unknown, which is over 10% of the total population. Malaysia is also home to more than two million documented refugees.

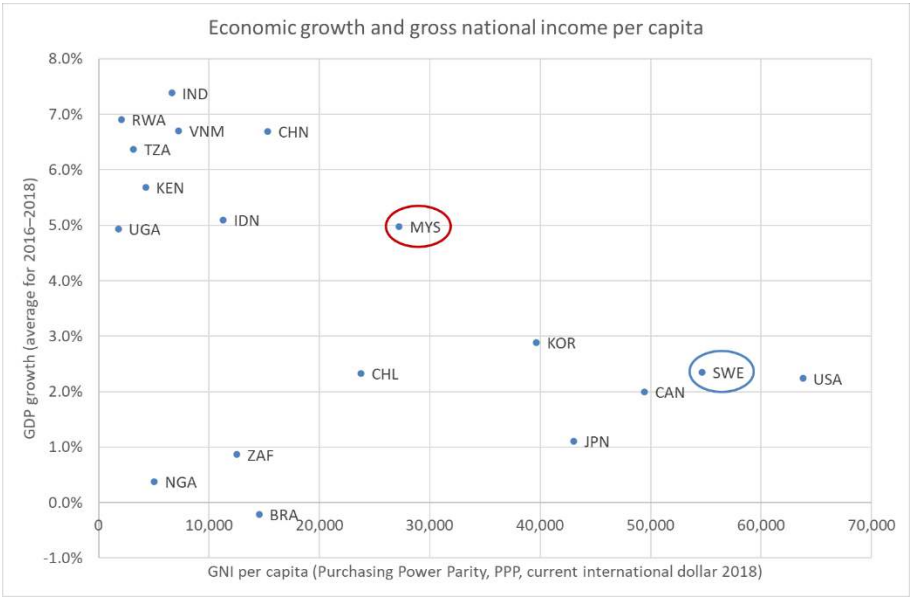
Figure 2: **The percentage of the population in each age group**



Malaysia is still riding on the population growth and additions to the work force of recent decades but must begin addressing the needs of older people now as this percentage will only grow at an accelerated rate in the years to come.

The country is expected to be an ageing nation by 2030 when it reaches the threshold of 15 per cent of its population being 60 years old or above. There is an ongoing public debate on how to address this and Malaysian policy makers are eyeing other Asian countries/cities for measures. There is a growing consensus that more investments are needed to prepare for this transition, with changes expected in areas such as healthcare, financial services, city planning and social services.

Figure 3: **Gross national income (GNI) and gross domestic product (GDP) growth**

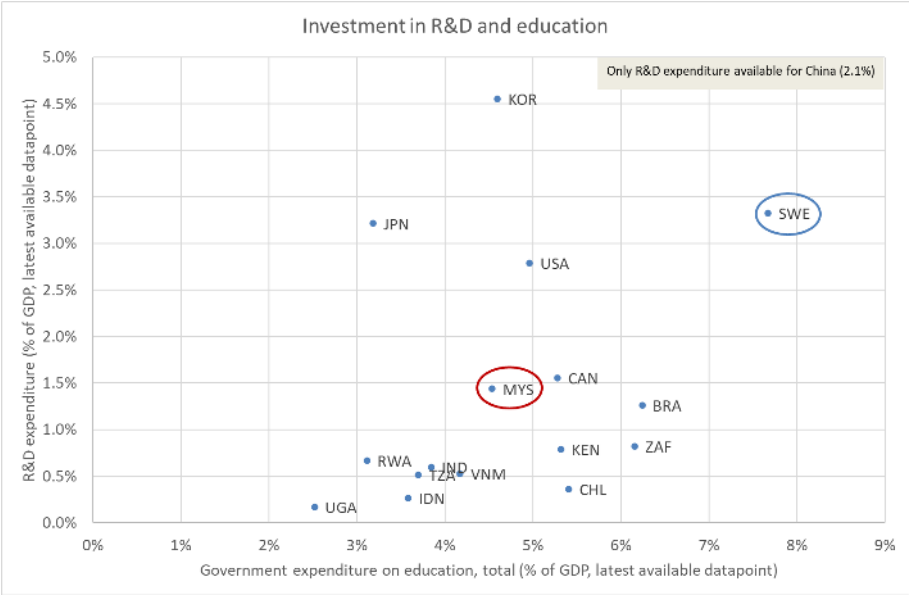


Malaysia's economy has had a healthy growth, averaging 5.4% since 2010, and is expected to achieve its transition from an upper middle-income economy to a high-income economy by 2024.

The World Bank praises Malaysia in that the country has successfully diversified its economy from agriculture and commodities in the 1960s, to manufacturing and services sectors. Less than 1 percent of Malaysian households are living in extreme poverty, and the government's focus has shifted toward addressing the well-being of the poorest 40 percent of the population.

Openness to trade and investment has been instrumental in employment creation and income growth, with about 40% of jobs in Malaysia linked to export activities. The central government revenue is heavily dependent on oil exports, creating some vulnerability as the oil price fluctuates.

Figure 4: **Expenditure on education and research and development (R&D), both as a percentage of GDP, data predominantly for 2017 or 2018**



The Malaysian government expenditure on education is around 4.5% of GDP and the expenditure on research and development (R&D) is close to 1.5% of GDP. The expenditures on education as well as R&D, are higher than that of neighbouring Indonesia in terms of percent of GDP. In comparison, Swedish government expenditure is more than 7% of GDP for education and the total expenditure is more than 3% of GDP for R&D, see Fig. 4.

Higher education institutions in Malaysia

HEIs in Malaysia consist of public universities and polytechnics as well as private universities and university colleges. The *Private Higher Education Institutions Act* (1996) that allowed for private universities to operate in Malaysia, also allowed for the establishment of branch campuses of foreign universities. The motivations for allowing foreign universities to operate branch campuses in Malaysia included the ability to offer international opportunities domestically for Malaysian students as well as to attract international students and establish Malaysia as a regional hub for higher education in South East Asia. Today there are 15 branch campuses in Malaysia making Malaysia the 4th largest host of international branch campuses in the world (following China, UAE and Singapore). A majority of these are branch campuses of universities from the United Kingdom and Australia, but Malaysia is also the host of one of China's few overseas campuses, Xiamen University Malaysia.

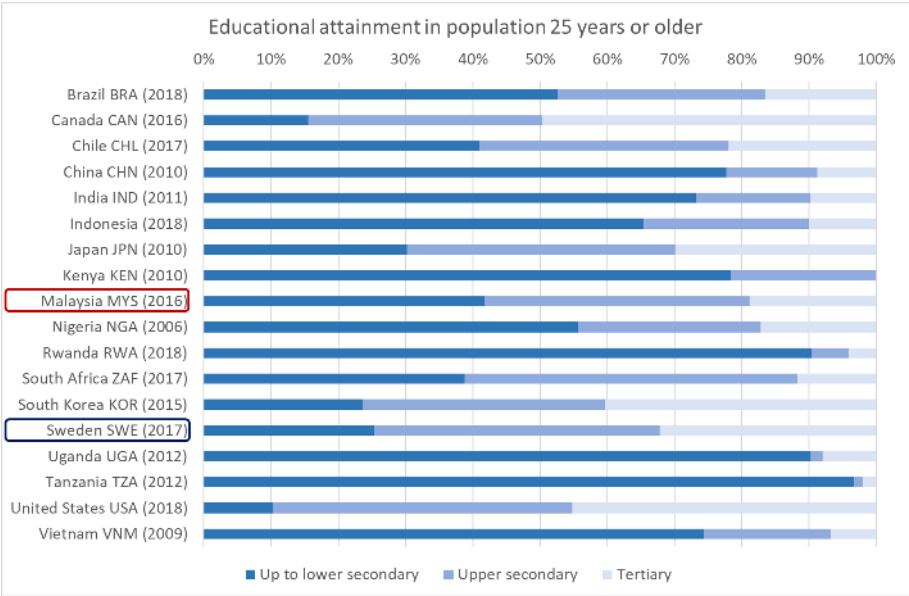
Public universities dominate in R&D, 9 out of 10 of the Malaysian universities with the largest publication volumes are public universities (Universiti Teknologi Petronas being the exception). The *Higher Education Strategic Plan Beyond 2020*, granted five of the public universities[1] the status 'research universities', providing additional government funding and increased autonomy. These five are the largest universities in Malaysia by publication volume. Malaysian universities score rather differently in the main international university rankings[2] due to different scoring emphases. QS ranks University of Malaya as number 59 in the world (top 300 in THE and ARWU) and the other research universities rank among the top 200 universities globally.

[1] University of Malaya, Universiti Putra Malaysia, Universiti Kebangsaan Malaysia, Universiti Sains Malaysia, and Universiti Teknologi Malaysia

[2] QS World University Rankings 2021, Times Higher Education World University Rankings 2021 and the Academic Ranking of World Universities (ARWU) 2020

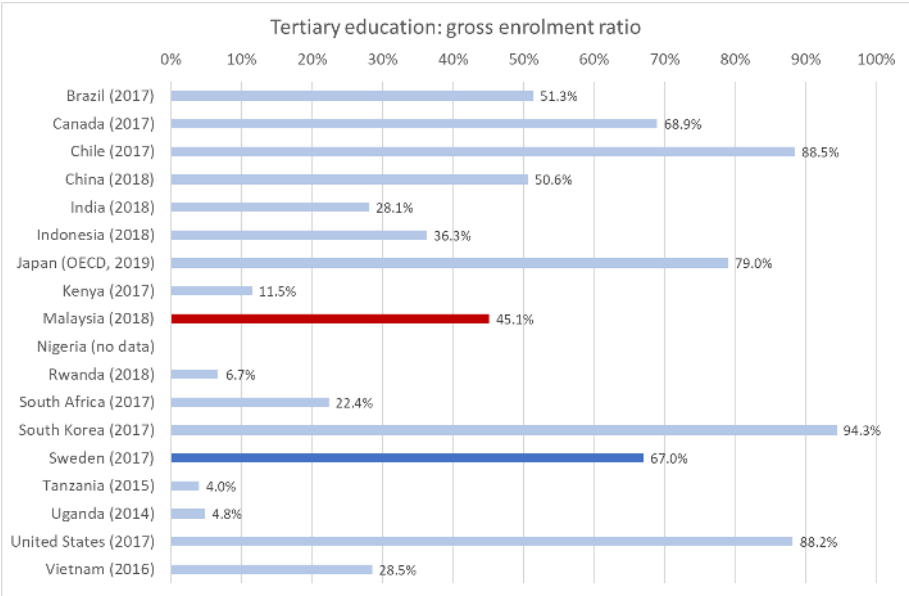
Educational attainment and student mobility

Figure 5: **Educational attainment**



There is no recent data on educational attainment for the population in Malaysia. About 40% of the population (25 years or older) had attained upper secondary education in 2016. Tertiary education was attained by close to 20%, see Fig. 5. The attainment of higher education is higher in Malaysia than in neighbouring Indonesia. In comparison, in Sweden about 40% of the population had attained upper secondary school and more than 30% had attained tertiary education.

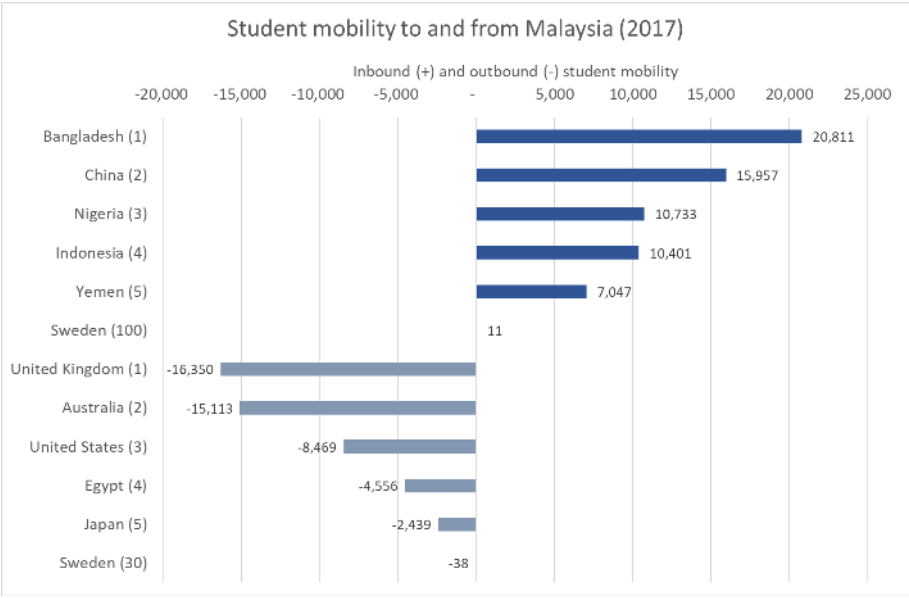
Figure 6: **Gross enrolment ratio to tertiary education**



The gross enrolment ratio (GER) for tertiary education is indicated in Fig. 6. It is the ratio of students enrolled in tertiary education divided by the 5-year age group starting from the official secondary school graduation age. It indicates the capacity of the education system to enrol students of a particular age group.

In Malaysia, the GER for tertiary education is 45%, which is higher than for neighbouring Indonesia, 36%. The corresponding GER for Sweden is 67%.

Figure 7: **Inbound and outbound students, origins and destinations**



The number of inbound and outbound students to and from Malaysia is relatively balanced. Inbound students come mainly from developing and emerging economies such as Bangladesh, China, Nigeria, Indonesia, and Yemen. Students from Malaysia favour Anglo-Saxon study destinations such as the United Kingdom, Australia, and the United States. Having a relatively large Muslim population, there is also quite a significant Malaysian contingent studying in Egypt.

Figure 8: **Inbound and outbound students to and from Sweden per year**

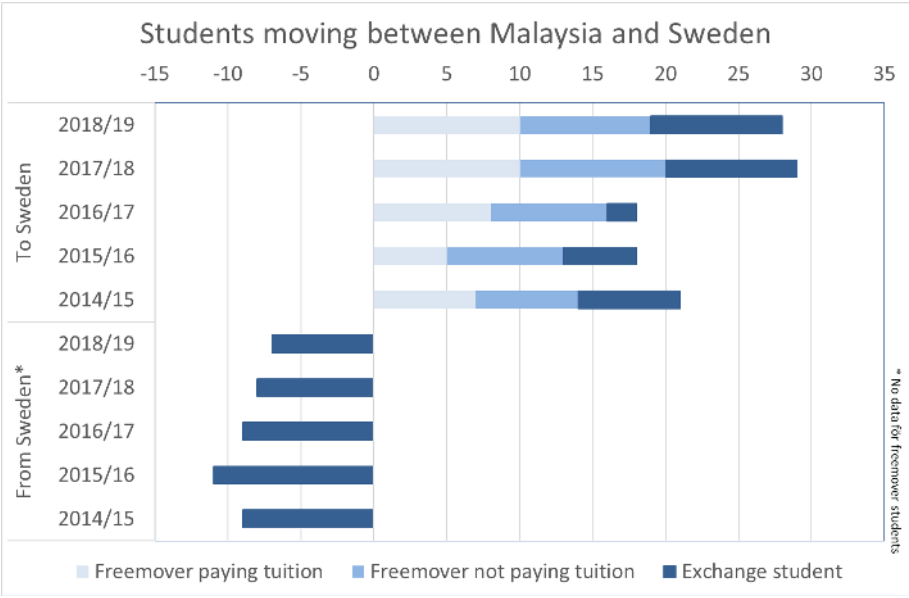
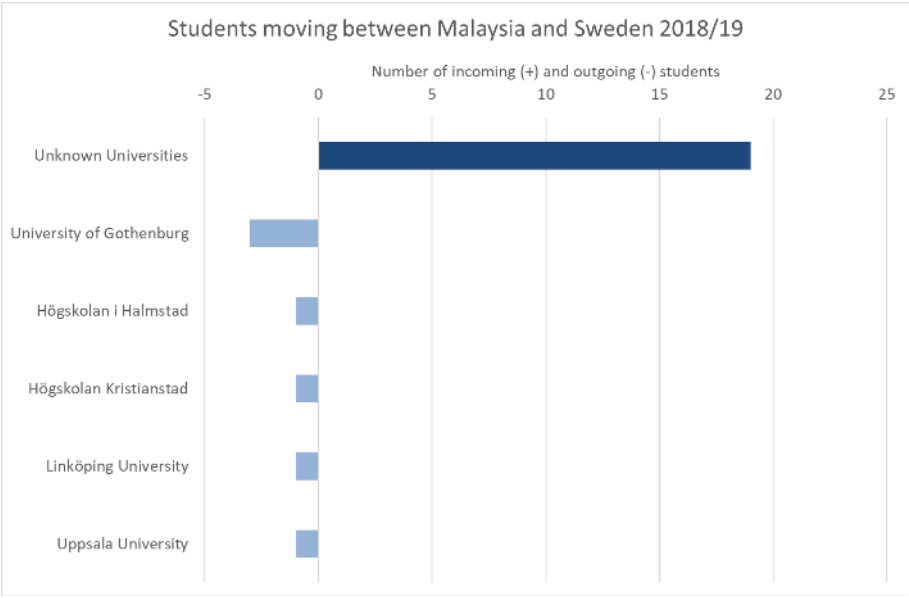


Fig. 8 illustrates the inbound and outbound students from and to Sweden. Malaysia is a not a common study destination for Swedish students, about 5-10 students do a study exchange in Malaysia per year. Sweden is neither a very common study destination for Malaysians. While the number of incoming students from Malaysia to Sweden is larger than the number of outgoing Swedish students to Malaysia, the balance in exchange of students between the two countries can still be characterized as symmetrical.

Figure 9: **Inbound and outbound students to Sweden 2018/19, per higher education institution**



The mobility between Sweden and Malaysia is very low as could be seen in Fig. 8 and the data available for inbound students from Malaysia is sparse. Less than 20 students from Malaysia came to Sweden to study in the academic year 2018/19. Exchange students from Sweden studying in Malaysia came from 5 higher education institutions.

Research and collaboration with Sweden

Malaysian scientific production makes up 1.05% of the world total. In terms of annual growth of publications (2015-2019) there is a stable growth (roughly 6% per annum). The FWCI is fairly high at 1.01, which is on par with the world average. Malaysia's share of international co-publications, as measured by the FWIS, is 1.06.

Table 1: **Selected publication indicators**

Based on publications 2015–2019							
Country	Annual publication volume (average)	Share of world	Annual volume growth 2015–2019	Citation impact	Share of int'l co-publ	Share of ac.-corp. co-publ.	Collabo-ration intensity with Sweden
		%	%	FWCI	FWIS	%	$NCII_{100}$
Brazil	79,128	2.54%	4.4%	0.90	0.79	2.1%	72%
Canada	110,493	3.55%	2.0%	1.51	1.31	4.2%	75%
Chile	13,929	0.45%	5.9%	1.22	1.42	2.0%	70%
China	559,913	17.98%	8.7%	1.02	0.55	2.4%	47%
India	164,707	5.29%	6.5%	0.82	0.43	1.2%	55%
Indonesia	24,572	0.79%	54.3%	0.92	0.58	0.7%	31%
Japan	133,011	4.27%	1.0%	0.95	0.69	5.4%	70%
Kenya	3,082	0.10%	7.2%	1.73	1.92	4.5%	124%
Malaysia	32,636	1.05%	5.8%	1.01	1.06	1.5%	30%
Nigeria	8,476	0.27%	14.0%	0.98	1.17	1.3%	36%
Rwanda	427	0.01%	11.2%	3.30	2.40	5.2%	203%
South Africa	24,423	0.78%	6.2%	1.26	1.29	2.9%	111%
South Korea	85,265	2.74%	2.0%	1.05	0.69	4.5%	35%
Sweden	42,975	1.38%	2.2%	1.68	1.55	8.3%	n/a
Tanzania	1,660	0.05%	7.8%	1.81	1.98	3.4%	178%
Uganda	1,741	0.06%	7.1%	1.76	2.04	4.8%	170%
United States	685,704	22.02%	0.9%	1.42	0.86	4.7%	74%
Viet Nam	7,649	0.25%	24.9%	1.43	1.67	2.2%	40%
World	3,113,580	100.00%	2.8%	1.00	1.00	2.6%	n/a

See appendix for detailed explanations some of the indicators in Table 1.

Figure 10: **Annual co-publications per number of co-authors**

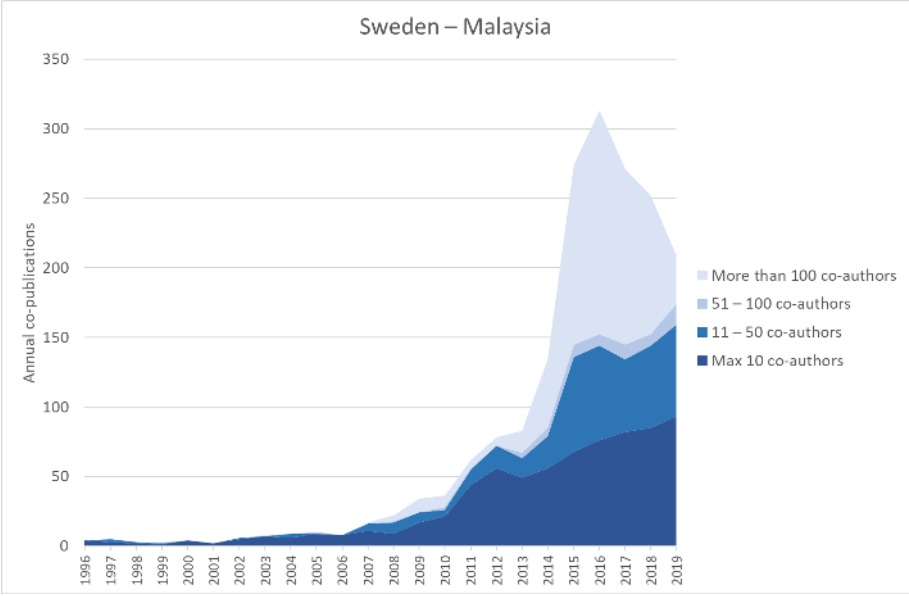
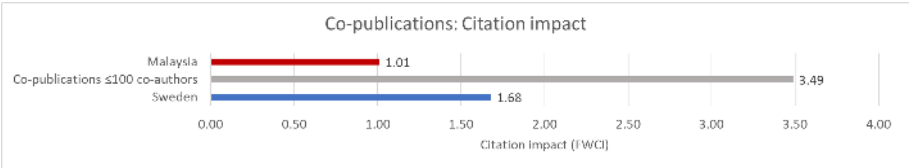
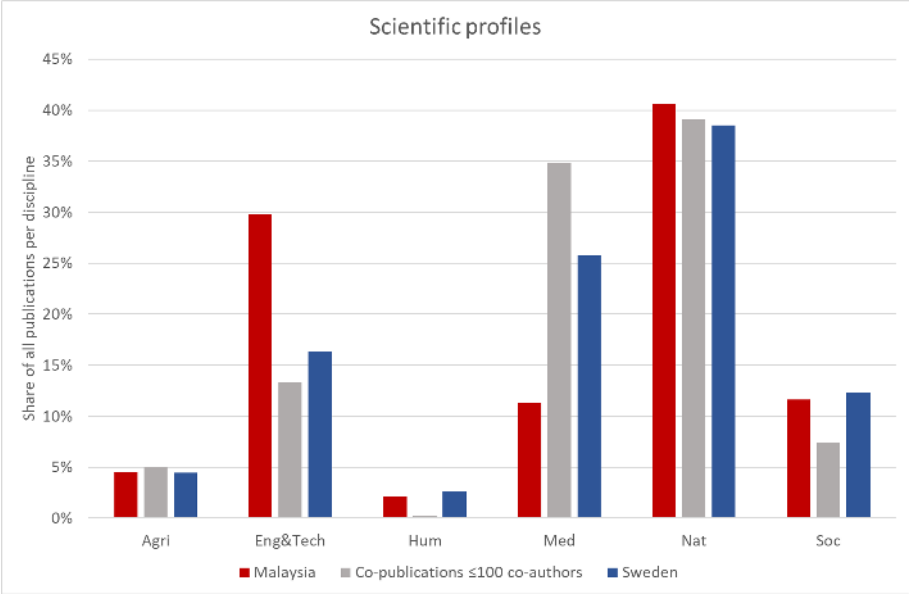


Figure 11: **Field-weighted citation impact for each country and their co-publications with ≤100 co-authors (2015–2019)**



Co-publications between Sweden and Malaysia are dominated by cooperations with 50 or less co-authors, as indicated in Fig. 10. During the last 5 years there has been a drastic decrease in the number of co-publications between Sweden and Malaysia, which is due to a sharp decline in very large cooperations, i.e., publications with more than 100 co-authors. Cooperations with 50 or less co-authors have increased during the last 10 years. Both Sweden and Malaysia benefit when researchers work together. As can be seen in Fig. 11, co-publications (100 co-authors or less) have significantly higher FWCI than what it is for each country, i.e., scientific quality increase for both the Swedish and Malaysian side when researchers work together.

Figure 12: **Distribution of publications per scientific discipline (2015–2019)**



The scientific profiles in Figure 12 shows the distribution over scientific disciplines of the research collaboration between Sweden and Malaysia as well as the individual such for Sweden and Malaysia. For example, approximately 30% of the publications with Malaysian participation are within engineering and technology. In Sweden, the share is clearly lower at 16%. If all scientific disciplines collaborated internationally to the same extent, the shares of co-publications involving both countries would typically be between the national shares, as it is in natural sciences. Medicine is clearly over-represented in the collaborations between Sweden and Malaysia at the expense of engineering and technology, the humanities, and the social sciences.

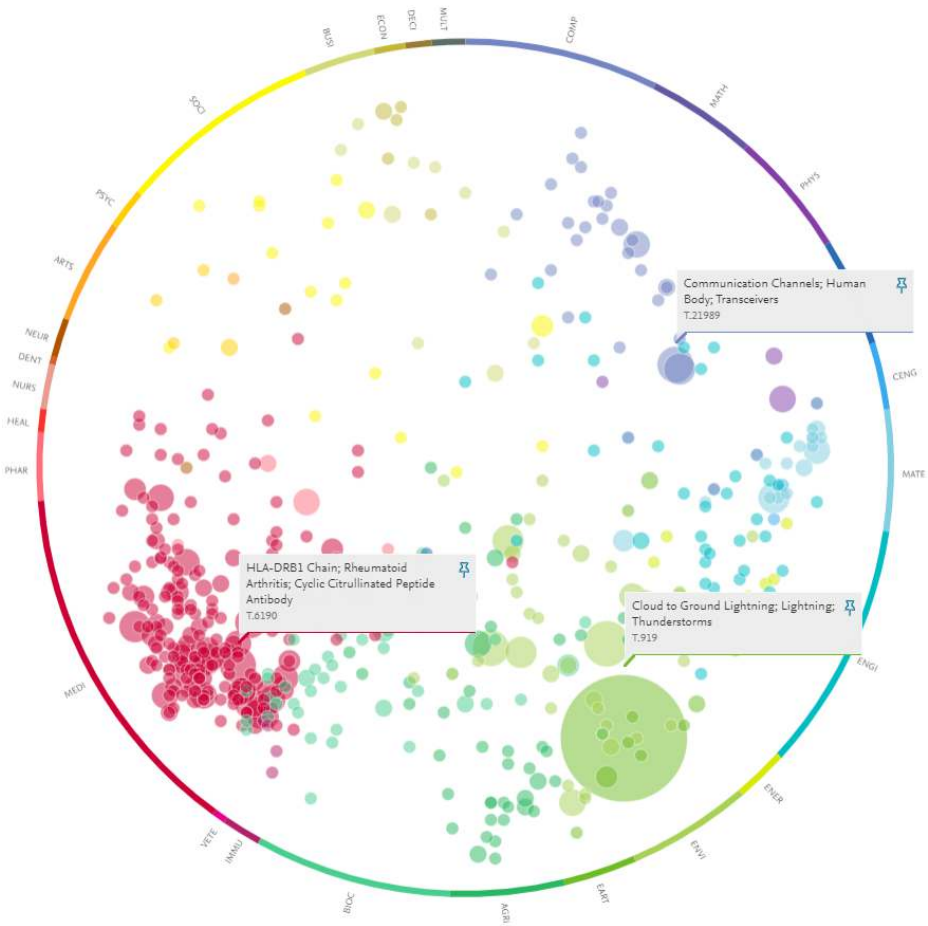
The high share of co-publications in medicine is surprising. Below in this report, the higher education institutions with the highest numbers of co-publications are listed and it could be expected that Karolinska Institutet is deeply involved.

Figure 13: **Word cloud based on co-publications with ≤100 co-authors (2015–2019)**

The word cloud in Figure 13 is produced using Elsevier's Fingerprint Engine. It shows the most prominent key phrases based on the titles, abstracts, and keywords in the co-publications with Swedish and Malaysian co-authors. Green and large texts signal highly relevant and growing key phrases.

Several of the key phrases relate to health and medicine. Coffee and tea are mentioned and a few other words that are more related to Malaysia than Sweden. 'Malaysia', 'Pakistan' and 'European' but not 'Sweden' are included, which indicates that there is a stronger focus on issues that are not directly related to the Swedish context.

Figure 14: **Wheel of science based on co-publications with ≤100 co-authors (2015–2019)**



Publications involving Swedish and Malaysia researchers are found predominantly in the fields of medicine (red) and environmental science (green), see Figure 14. However, there are dots all over the wheel of science. The largest dot relates to lightning and thunderstorms. The size relates to the topic's share of all included co-publications.

Table 2: **The 20 institutions in Sweden with the highest share of co-publications with ≤100 co-authors (2015–2019). Only institutions with at least 300 publications during the period are included**

Institution	Co-publications with Malaysia (≤100 co-authors)	Share of all publications at the Swedish institution	FWCI
Royal Swedish Academy of Sciences	13	3.2%	2.49
Umeå University	141	1.2%	2.41
Mälardalen University	19	0.8%	3.10
Swedish Museum of Natural History	10	0.8%	2.53
Stockholm Environment Institute	5	0.7%	1.89
Karolinska Institutet	261	0.7%	2.78
Luleå University of Technology	25	0.5%	4.29
Lund University	135	0.4%	1.64
Swedish Defence University	1	0.4%	0.00
Blekinge Institute of Technology	5	0.4%	0.35
Uppsala University	115	0.4%	3.04
Swedish University of Agricultural Science	35	0.4%	3.51
Karlstad University	7	0.3%	2.95
University of Gothenburg	78	0.3%	10.77
Swedish Meteorological and Hydrological I	2	0.3%	4.45
Stockholm School of Economics	3	0.3%	0.55
Vattenfall	1	0.3%	0.51
Stockholm University	56	0.3%	3.28
IVL Swedish Environmental Research Insti	1	0.3%	1.22
Linköping University	36	0.3%	1.66

Table 2 lists the HEIs and research institutes in Sweden that has the largest number of co-publications (with less than 100 co-authors) with Malaysia as a share of their total publication output. Even though Malaysia performs well in international collaborations by comparison, it's field-weighted internationalisation score is 1.06, its collaboration intensity with Sweden at 30% is very low (see Table 1). Of the comprehensive Swedish universities, only Umeå University has a co-publication share with Malaysia comparable with Malaysia's share of the total global publication volume (which is 1.05%). The significantly higher co-publication share that the Royal Swedish Academy of Sciences has is largely due to one Swedish scientist that has dual affiliations in Sweden and Malaysia.

Figure 15: **Top ten Swedish institutions with the highest number of co-publications with ≤100 co-authors (2015–2019)**

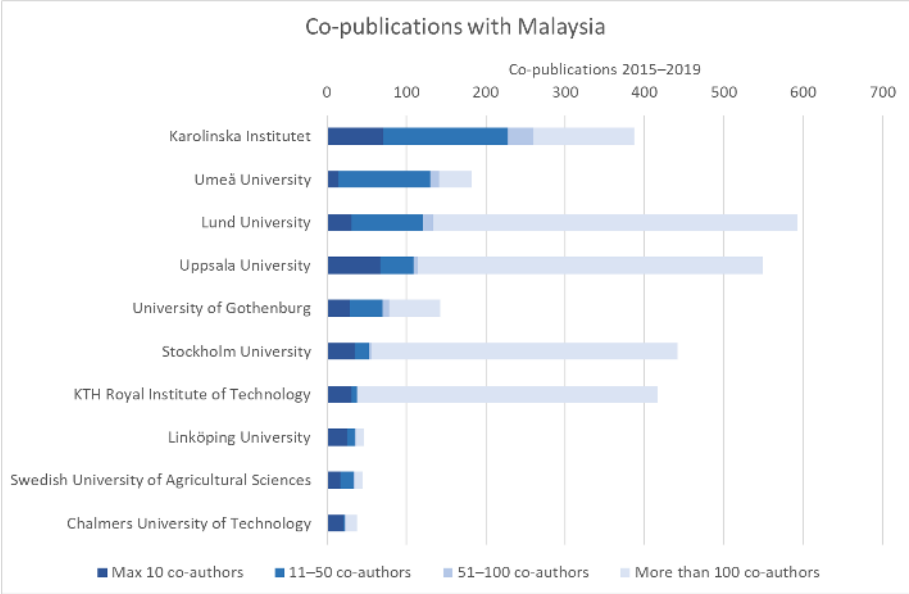


Fig. 15 lists the ten Swedish universities with the highest numbers of co-publications with Malaysia, ranked according to the number of co-publications with less than 100 co-authors. These are all the same as the top ten Swedish universities by publication volume overall, however with some differences in the ranking order, the two most noticeable being Umeå University ranking substantially higher up and Chalmers University of Technology ranking lower than in the overall ranking. A large part of Umeå University's co-publications with Malaysia are larger international studies in the field of medicine with 50-100 co-authors. Lund University, Uppsala University, Stockholm University and KTH Royal Institute of Technology all have large numbers of co-publications with Malaysia with more than 100 co-authors and in all four cases these are almost all in the field of particle physics. Fig. 11 showed that the number of co-publications between Malaysia and Sweden with more than 100 co-authors saw a sharp decline during the period 2015-2019, and we can thus conjecture that particle physics collaborations have seen a decrease during this period.

Figure 16: **Top ten Malaysian institutions with the highest number of co-publications with ≤100 co-authors (2015–2019)**

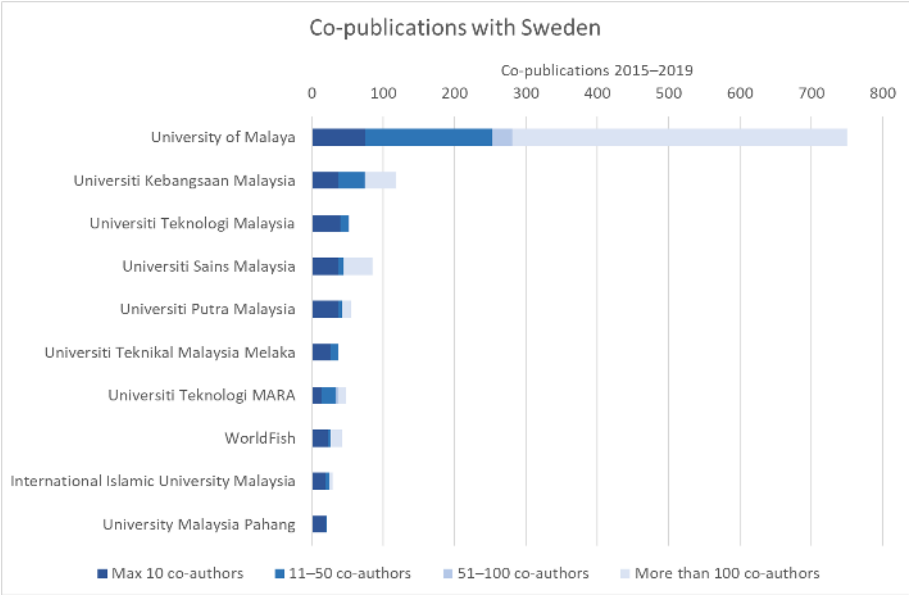


Fig. 16 lists the ten Malaysian universities with the highest numbers of co-publications with Sweden, ranked according to the number of co-publications with less than 100 co-authors. The top seven of these are also the top seven Malaysian universities by publication volume overall, and the top five are also the five Malaysian universities with research university status. University of Malaya strongly dominates the scientific collaboration between Malaysia and Sweden, though a clear majority of the co-publications between University of Malaya and Swedish institutions are the results of large-scale international collaborations in the fields of medicine and particle physics, which is why co-publications with a large amount co-authors dominate.

Table 3: **Co-publication matrix for the top ten in both countries showing the number co-publications with ≤100 co-authors (2015–2019)**

Publications 2015–2019 with up to 100 co-authors	University of Malaya	Universiti Kebangsaan Malaysia	Universiti Teknologi Malaysia	Universiti Sains Malaysia	Universiti Putra Malaysia	Universiti Teknikal Malaysia Melaka	Universiti Teknologi MARA	WorldFish	International Islamic University Malaysia	University Malaysia Pahang	With Malaysia
Karolinska Institutet	161	18	-	20	1	-	7	-	9	-	260
Umeå University	122	2	1	-	-	6	1	-	-	-	141
Lund University	91	4	8	4	5	-	3	2	1	-	134
Uppsala University	29	22	18	4	12	31	10	-	12	1	114
University of Gothenburg	21	15	-	3	-	-	15	1	-	12	78
Stockholm University	13	-	-	1	6	-	-	13	3	1	56
KTH Royal Institute of Technology	13	4	4	-	5	5	-	-	-	-	38
Linköping University	18	2	3	2	2	-	1	-	3	-	36
Swedish University of Agricultural Sciences	2	-	1	1	5	-	-	6	-	-	35
Chalmers University of Technology	10	1	3	4	1	1	-	-	-	-	24
With Sweden	281	75	53	45	43	38	37	27	25	21	764

The co-publication matrix in Table 3 shows the co-publications (with less than 100 authors) between the top ten collaborating institutions in Sweden and Malaysian and thus gives an indication of the distribution of the collaborations between Swedish and Malaysian HEIs and research institutes. The blue/green bars in the squares visualizes the ratio of the number of co-publications between two HEIs/research institutes to the total number of co-publications (for the Swedish institution). It is quite clear that the scientific collaboration between Malaysia and Sweden is rather concentrated involving few key institutions. University of Malaya contributes to 37% of all co-publications between Malaysia and Sweden and the co-publications between the top ten Malaysian institutions Sweden account for 84% of all co-publications. Most Swedish institutions also only have substantial collaborations with only one or a few Malaysian institutions.

Appendix: data and methods

Data

The report is based on data from the following organisations, accessed in June/July 2020:

- Population and economic data: World Bank, see https://databank.worldbank.org/home.aspx
- Educational attainment and student mobility: UNSCO, see http://data.uis.unesco.org, and the Swedish Higher Education Authority (UKÄ), see https://www.uka.se/statistik--analys/statistikdatabas-hogskolan-i-siffror.html (with one data point from the OECD for Japan)
- Research: Publication data from Scopus, the broadest available publication database, see https://www.elsevier.com/solutions/scopus?dgcid=RN_AGCM_Sourced_300005030

Methods

According to the UNESCO Institute for Statistics (UIS), an internationally mobile student is an individual who has physically crossed an international border between two countries with the objective to participate in educational activities in a destination country, where the destination country is different from his/her country of origin. For measuring international mobility in education, UNESCO, OECD and Eurostat have agreed that the preferred definition of the country of origin should be based on students' educational careers prior to entering tertiary education. See http://uis.unesco.org/en/methodology#Q5

The research section includes several indicators and figures that might require further explanation.

Table **Selected publication indicators**. The annual growth is calculated by using linear regression to approximate the volume development during the period 2015–2019. The field-weighted citation impact (FWCI) is a normalised indicator comparing the citations a publication receives with other pub-

lications in the same scientific field, from the same year, and in the same type of publication. If the FWCI is above one, the publication is more cited than the world average, and vice versa. The field-weighted internationalisation score (FWIS) is normalised in a similar manner. A FWIS above one means that the publications are more international (include more international co-authorships) than the world average, and vice versa.[3] Academic–corporate co-publications include at least one academic and one corporate affiliation and at least two co-authors. Finally, the normalised collaboration intensity index (NCII) illustrates how the collaboration differs from a situation when Sweden (or another entity) collaborates with all countries in proportion to their share of all international co-publications globally. For example, authors with an affiliation in the United States participate in 16% of all international co-publications globally. In Sweden's international co-publications, the share of US co-authors is 11%. The NCII is calculated as the actual share divided by the 'expected' share, i.e. 11/16 = 67%, which indicates that US collaboration is underrepresented in Sweden's portfolio of international co-publications.[4]

Figure **Distribution of publications per scientific discipline (2015–2019).** The scientific profile is calculated using the OECD categorisation of publications in six scientific disciplines: agricultural sciences, engineering and technology, humanities, medical sciences, natural sciences, and social sciences. For each discipline, the share of publications is calculated using the number of publications within the discipline and the total number of publications in the dataset.

The **word cloud** is a feature in SciVal, which uses the Elsevier Fingerprint Engine to extract distinctive keyphrases within the publication set. For more

[3] For more details, see Pohl, H., Warnan, G. and Baas, J. (2014), 'Level the playing field in scientific collaboration with the use of a new indicator: Field-weighted internationalization score', *Research Trends* 39, 3–8.

[4] For a more detailed description, see Pohl, H. (2020), 'Collaboration with countries with rapidly growing research: supporting proactive development of international research collaboration', *Scientometrics* 122(1), 287–307. https://doi.org/10.1007%2Fs11192-019-03287-6

information, see https://www.elsevier.com/solutions/elsevier-fingerprint-engine

The **wheel of science** is another feature directly available in SciVal. Each bubble represents a topic. The size of the bubble indicates the output of the entity on that topic. The position of the bubble is based upon the all science journal classification (ASJC) categories of the journals in which the scholarly output is published. The position is related to the topic as a whole and is not affected by the entity examined. The greater influence an ASJC has over a topic, the closer the topic is dragged to its side of the wheel of science. As a result, the topics closer to the centre of the wheel are more likely to be multidisciplinary, compared to the topics along the edge of the wheel.

Note that a topic may be placed at the edge of the wheel, but still be considered multidisciplinary because it is equally influenced by a number of ASJCs that are located on the same side of the wheel.

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STINT promotes knowledge and competence development within internationalisation and invests in internationalisation projects proposed by researchers, educators and leaderships at Swedish universities.

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