Country Report – South Africa

STINT
Stiftelsen för internationalisering av
högre utbildning och forskning

The Swedish Foundation for International
Cooperation in Research and Higher Education

CR 2021:10
ISSN 1404-7209

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

Special 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

South Africa has an area three times larger than that of Sweden and a population of almost 60 million people. Some of the earliest human remains in the fossil record have been found in South Africa. The Dutch and later on British have been involved in the region and in 1961, South Africa became a republic. The country has executive (Pretoria), judicial (Bloemfontein) and legislative capitals (Cape Town).

In the period 1948–1994, apartheid favoured the white minority at the expense of the black majority and other non-white groups. Thereafter, the African National Congress, which led the opposition to apartheid, has led the government. South Africa has since struggled to address apartheid-era imbalances in wealth, housing, education, and healthcare.

Today, South Africa invests a considerable amount in education – as it has ever since the end of apartheid. However, the effects of the discriminatory education system take time to eliminate, not least on the quality of instruction.

South Africa is ranked 45th in the Economist Intelligence Unit's Democracy Index with a notably lower score in political culture. Corruption, together with social inequalities, has and still poses challenges. The unemployment rate is above 25%.

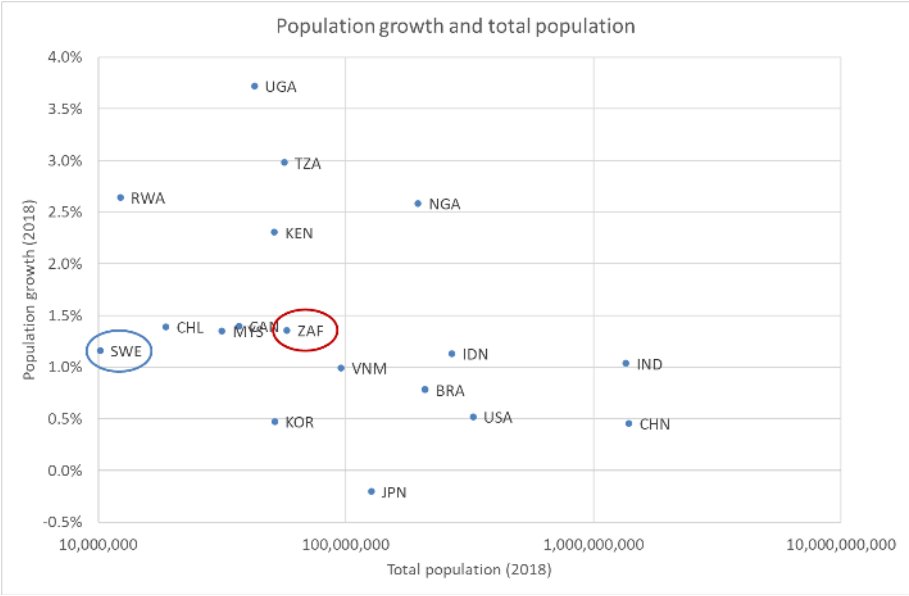
The country has natural resources such as gold, diamonds and natural gas and the economy is among the largest in Africa. Its gross domestic product (GDP) per capita is among the highest in the region; however, GDP grows slowly.

The relationship between Sweden and South Africa has developed over a long time with various aspects in focus. Academic collaboration has been a continuous ambition, even during the apartheid blockade, which has led to a dense network, as reflected in the data in this report.

Population and economic development

South Africa's population was estimated at 59.6 million in 2020, according to Statistics South Africa. The fertility rate is 2.37 births per woman, above the population replacement rate of 2.1.

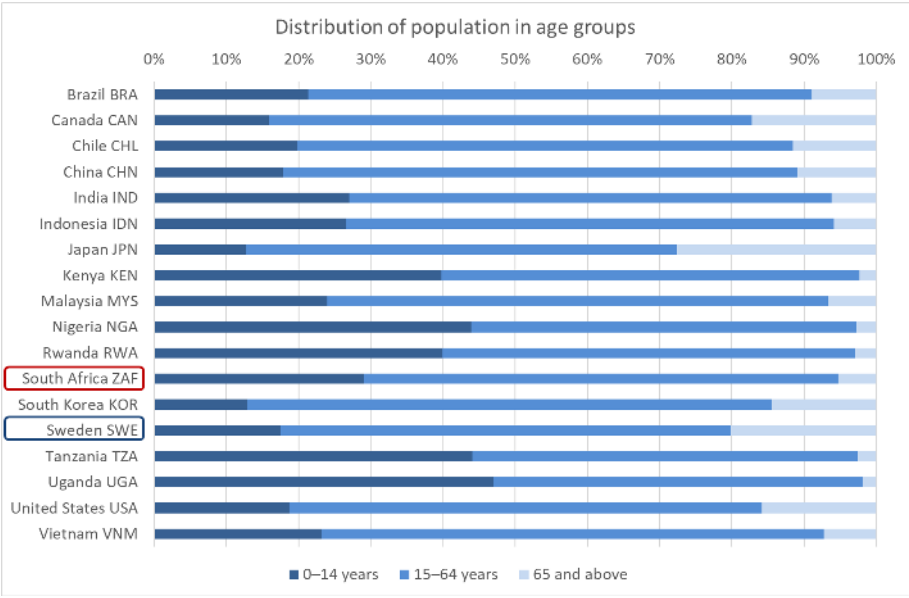
Figure 1: **Total population (logarithmic scale) and population growth**



While the birth and fertility rates are both high, they have each decreased annually, indicating the slowing of South Africa's population growth.

South Africa is continuing to experience a relatively high influx of migrants, especially from Sub-Saharan Africa. The abolishment of apartheid in 1994 led to the development of a new inclusive national identity. The immigration rate still increases, and the role of female migrants has grown significantly in this movement and settlement. There are flows of refugees, but the majority of immigrants are working residents and influence the economy in several sectors.

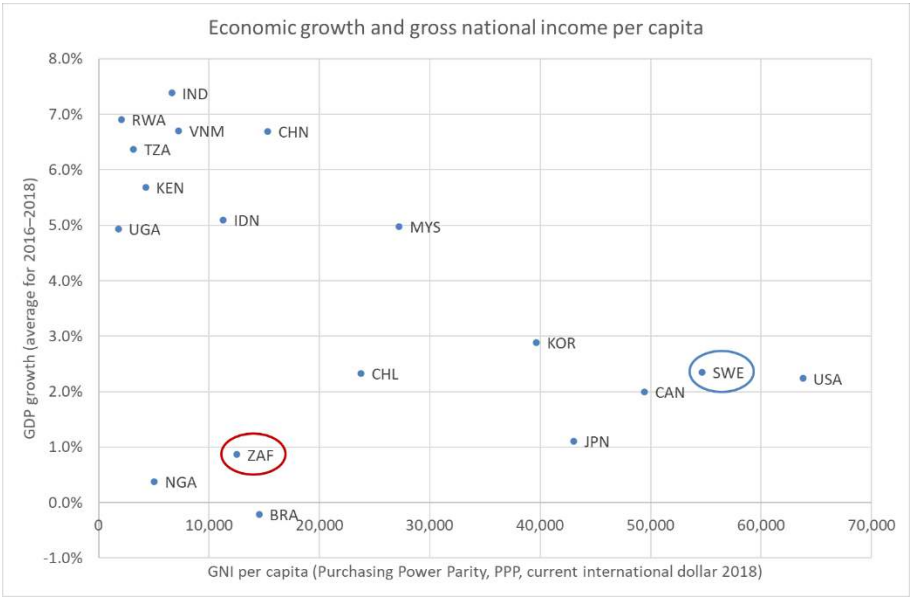
Figure 2: **The percentage of the population in each age group**



South Africa has a youthful population by European standards – about 29% of the population is under the age of 15 – but it is gradually ageing as the country's total fertility rate has declined dramatically since the 1960s. South Africa has the highest proportion of elderly people in the region, setting the country apart from the rest of Sub-Saharan Africa.

The prevalence of HIV/AIDs has created a larger than normal dependent population. HIV/AIDS is one of the most serious health concerns in South Africa. The country has the highest number of people afflicted with HIV of any country, with an estimated overall HIV prevalence rate of approximately 13% in the population. The total number of people living with HIV was estimated at approximately 7.8 million in 2020. HIV/AIDS was also responsible for South Africa's average life expectancy plunging to below 43 years in 2008, but it has rebounded to 63 years as of 2017.

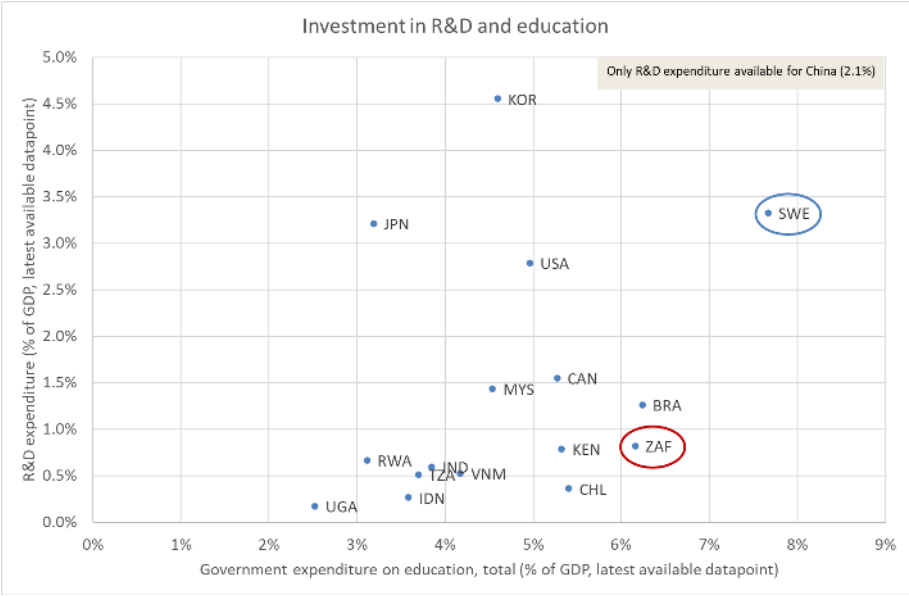
Figure 3: **Gross national income (GNI) and gross domestic product (GDP) growth**



The economy of South Africa is the third largest in Africa. Since 1996, at the end of over twelve years of international sanctions because of apartheid, South Africa's GDP almost tripled to peak at US$400 billion in 2011, but it has since declined to roughly US$385 billion in 2019. In recent years, the growth rate has been hovering around 1%. Given population growth, GDP per capita growth has been close to zero since 2014, leaving little room to reduce poverty. As a manufacturing hub, it is the most industrialised, technologically advanced and diversified economy on the African continent. Commodity prices remain important to South Africa, a major exporter of minerals and importer of oil.

Despite post-apartheid democratisation reforms, South Africa remains a dual economy with one of the highest inequality rates in the world. The government considers inequality and the high levels of unemployment, at over 25%, the most serious economic problems facing the country. The unemployment rate is even higher among youths, at around 55%. Prevailing high crime rates hamper investment and growth.

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



The South African government's expenditure on education is slightly higher than 6% of GDP, which is relatively high internationally. However, expenditure on research and development (R&D) is less than 1% of GDP. In comparison, South African expenditure on education in terms of a percentage of GDP is higher than that of Kenya, while R&D expenditure is about the same in both countries. Swedish expenditure is more than 7% of GDP for education and more than 3% of GDP for R&D (see Figure 4).

Higher education institutions in South Africa

Overall enrolments in higher education have more than doubled since the end of apartheid. More than 85% of students are enrolled at one of the 26 public universities. Significant enrolment gains have been made in distance education programmes; about a third of the students studying at public universities are enrolled in distance education. The University of South Africa, a dedicated distance education provider, is not only the largest university in South Africa with an enrolment of more than 300,000 students, but also the largest university on the African continent.

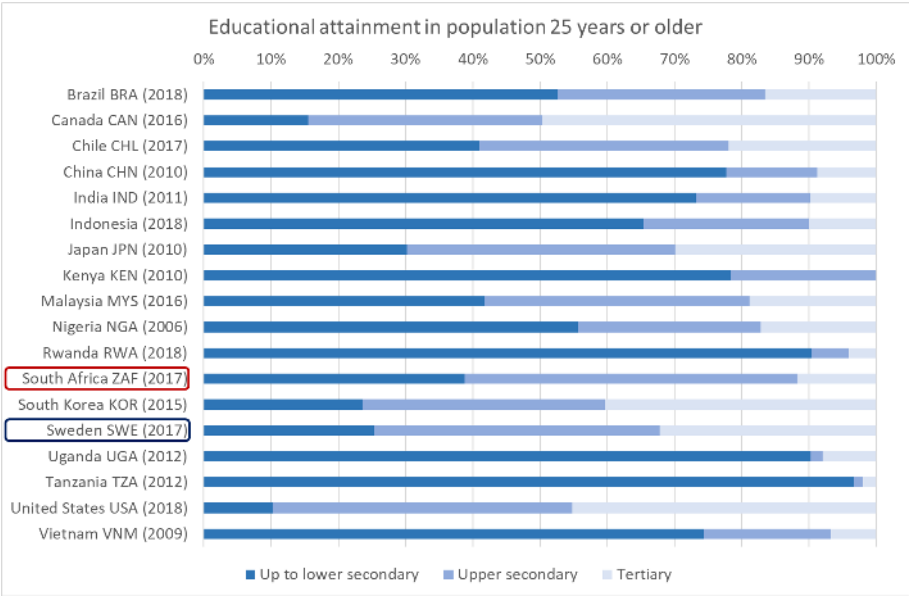
The South African higher education system attracts international students, many of them from other Southern African countries. In turn, South African students prefer the United States or the United Kingdom for studying abroad.

Eleven of the public universities are included in the *Times Higher Education* World University Ranking 2021, with the University of Cape Town (155), the University of the Witwatersrand (201–250) and the University of Stellenbosch (251–300) ranked the highest. These universities also have the highest numbers of co-publications with Swedish universities.

One ambition among national policy makers is to strengthen the smaller and newer universities. The large and very competitive universities named above would receive a very high share of research funding, were all funding applications to be reviewed exclusively on the basis of scientific quality.

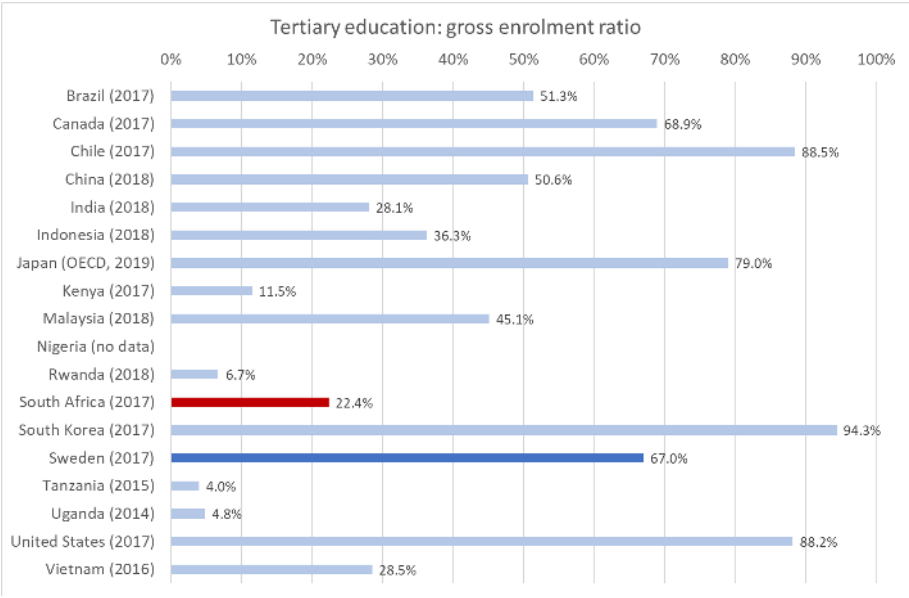
Educational attainment and student mobility

Figure 5: **Educational attainment**



In South Africa, about 50% of the population (25 years or older) had attained upper secondary education in 2017. Just over 10% had attained tertiary education (see Figure 5). By comparison, in Sweden about 40% of the population had attained upper secondary and more than 30% tertiary education.

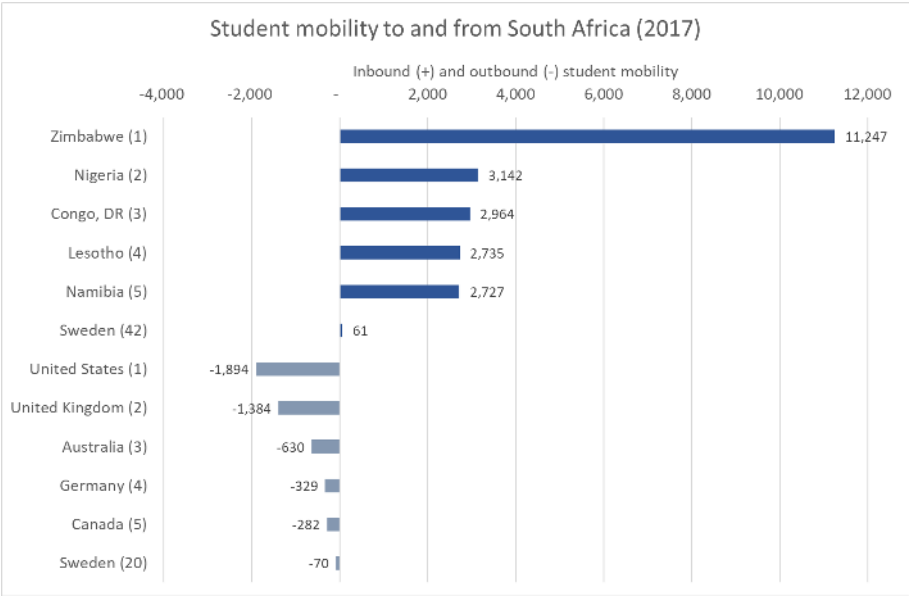
Figure 6: **Gross enrolment ratio for tertiary education**



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

In South Africa, the GER for tertiary education is 22%, which is rather low internationally but clearly higher than that of the other African countries included in this comparison. The corresponding GER for Sweden is 67%.

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



In 2017, inbound students to South Africa mainly comprised students from Zimbabwe; there were also considerable groups from Nigeria, the Democratic Republic of the Congo, Lesotho and Namibia (see Figure 7). Swedish students constitute a relatively modest group; only 61 students from Sweden went to study in South Africa the same year. The number of South African students going to study in Sweden was 70. The most popular study destinations for students from South Africa were the United States and the United Kingdom.

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

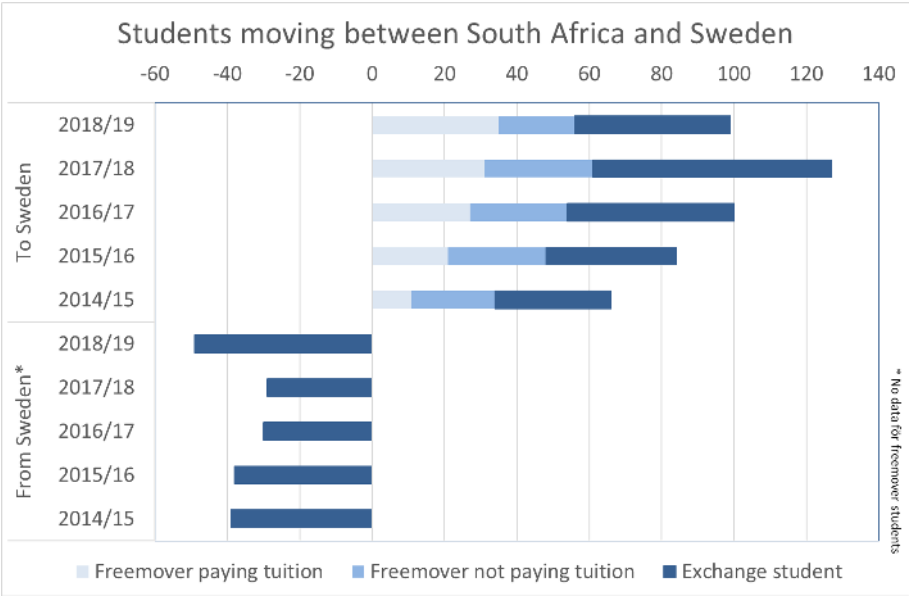


Figure 8 illustrates the inbound and outbound students to and from Sweden and South Africa. Swedish data show the number of outgoing exchange students fluctuating in recent years, with 30–50 students doing a study exchange in South Africa. A similar pattern is also seen on the South African side. Overall, more students from South Africa than from Sweden attend the bilateral exchange programmes. The number of freemover students from South Africa is similar to the number of exchange students.

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

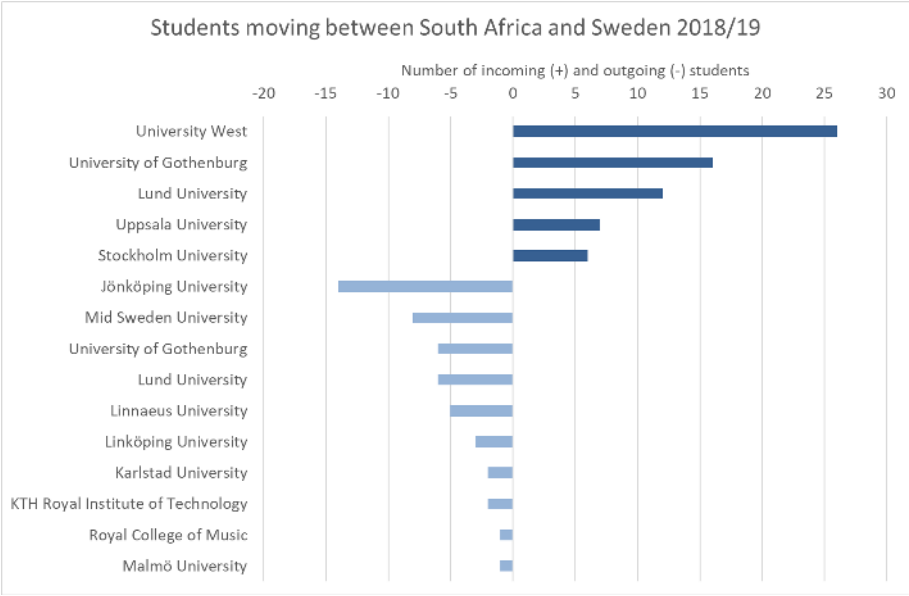


Figure 9 illustrates the inbound students from South Africa to specific Swedish higher education institutions (HEIs). By far the highest number of students go to University West. There are also a number of students attending the comprehensive universities in Gothenburg, Lund, Uppsala and Stockholm. The outbound students, comprising exchange students, come from a heterogenous group of HEIs, including smaller ones such as Jönköping University, Mid Sweden University, and Linnaeus University. Outbound students also come from larger comprehensive universities such as the University of Gothenburg and Lund University.

Research and collaboration with Sweden

South African scientific production constitutes less than 1% of the world total. There has been a steady annual growth in publications from 2015 to 2019 (at 6.2% per year). The field-weighted citation impact (FWCI) is clearly above one, which means that publications including South African researchers are cited more frequently than average publications. This may be due to the relatively high share of international co-publications, which is also higher than the global average of one. Together with the other African countries in the sample, South Africa has a high research collaboration intensity with Sweden.

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 the Appendix for detailed explanations of some of the indicators in Table 1.

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

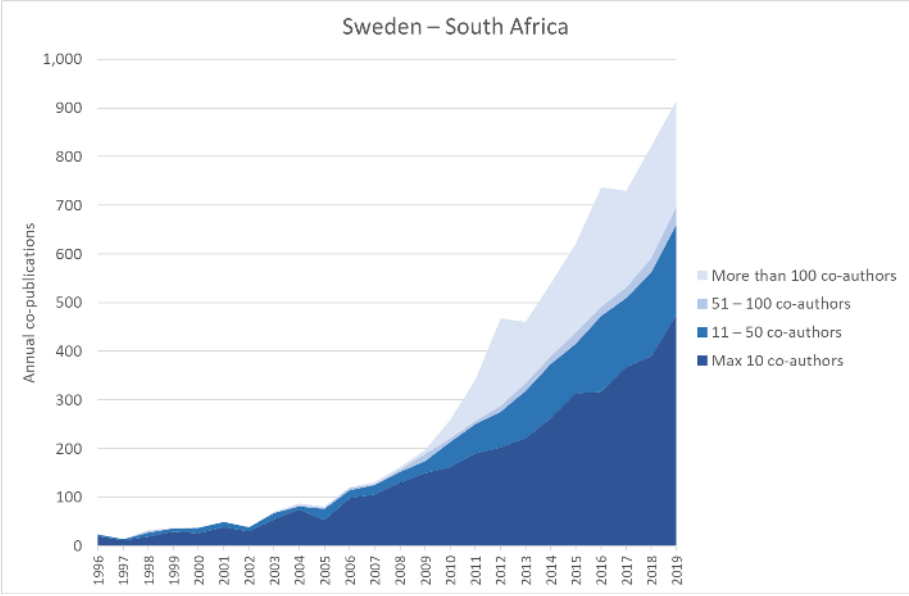
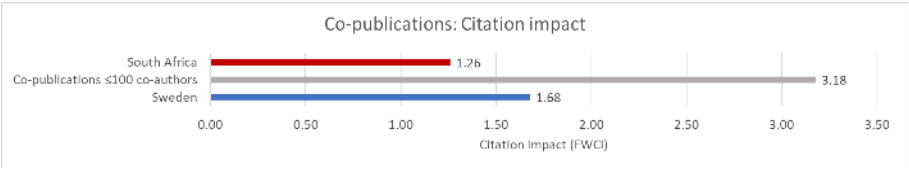


Figure 11: **Field-weighted citation impact for each country and their co-publications with ≤100 co-authors (2015–2019)**

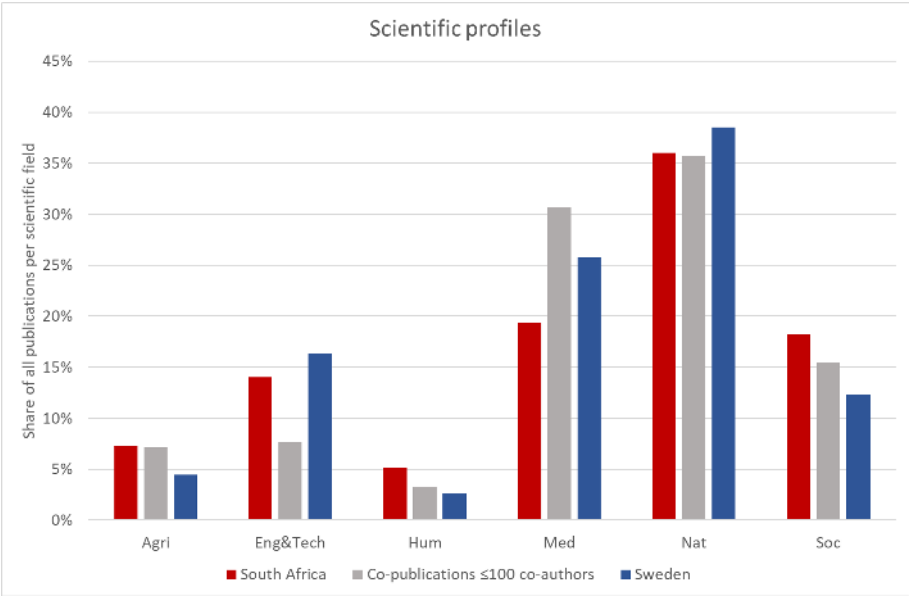


Co-publications between Sweden and South Africa are dominated by co-operations with up to ten co-authors, as indicated in Figure 10. During the last decade there has been a drastic increase in the number of co-publications between Sweden and South Africa. Both Sweden and South Africa benefit when researchers work together. As can be seen in Figure 11, co-publications (with up to 100 co-authors) have a significantly higher FWCI than the total FWCI of each country.

In 2016, STINT together with the Swedish Higher Education Authority (UKÄ) organised a university presidents' delegation to South Africa to promote academic cooperation between the countries. One outcome is that

several Swedish and South African HEIs have formed the SASUF network, which has been co-funded by STINT.

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



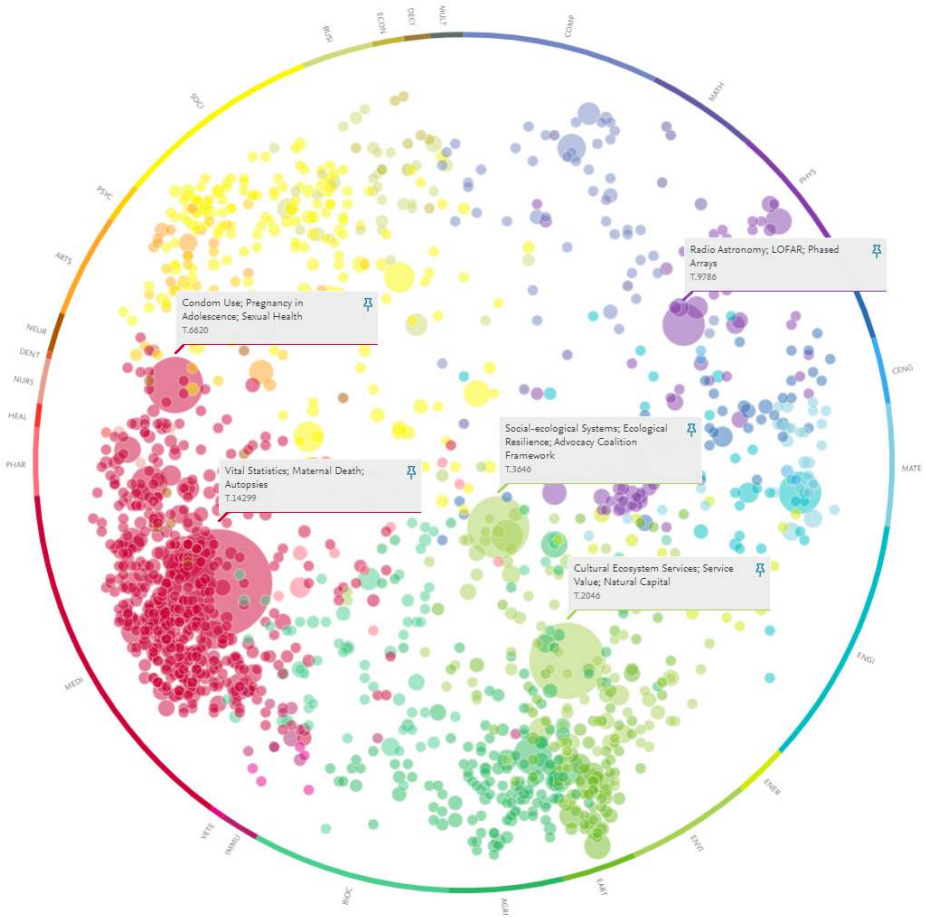
In Figure 12, the scientific profiles of research collaborations between Sweden and South Africa are compared with the overall profiles of these countries in various fields. For example, approximately 5% of the publications with South African participation are within the humanities. In Sweden, the share is clearly lower at 2.5%. If all scientific fields collaborated internationally to the same extent, the shares of co-publications involving both countries would typically lie between the national shares. This is also the case in Sweden–South Africa collaborations, with two exceptions: medicine is overrepresented whereas engineering and technology is underrepresented. Compared to almost all other bilateral collaborations studied, the shares of co-publications in the humanities and social sciences are very high.

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

The word cloud in Figure 13 was produced using Elsevier's Fingerprint Engine. It shows the most prominent keyphrases occurring in publications with co-authors affiliated to Swedish and South African institutions, based on their titles, abstracts and keywords. Large, green words signal highly relevant and growing keyphrases. Given the overall growth in co-publications between Sweden and South Africa, most keyphrases are green.

'South Africa' is the most prominent keyphrase whereas 'Sweden' is very small. This may indicate that research done in collaboration between the countries has a stronger focus on the South African context. Other keyphrases such as 'wine', and some geographical names confirm the focus on predominantly South African topics. Otherwise, several of keyphrases pertain to health and medicine.

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



Publications involving Swedish and South African researchers are predominantly in the red (medicine), green (environment) and yellow (social) fields (see Figure 14). The large bubbles in the centre of the circle indicate multidisciplinary collaborations. Bubble size corresponds to the topic's share of all included co-publications. Two labelled bubbles pertain to ecological topics and two to human reproduction. Astronomy (purple) is another collaboration topic.

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 South Africa (≤100 co-authors)	Share of all publications at the Swedish institution	FWCI
Stockholm Environment Institute	40	5.9%	4.25
Royal Swedish Academy of Sciences	16	4.0%	10.85
Swedish Museum of Natural History	49	3.7%	1.78
Swedish Meteorological and Hydrological Institu	19	3.2%	4.07
Linnaeus University	107	3.0%	4.24
Umeå University	307	2.5%	2.35
Jönköping University	48	2.3%	2.26
IVL Swedish Environmental Research Institute	8	2.0%	2.94
Stockholm University	359	2.0%	3.19
Swedish University of Agricultural Sciences	179	2.0%	2.61
Karolinska Institutet	532	1.5%	3.90
University of Gothenburg	308	1.4%	4.48
Karlstad University	24	1.2%	2.73
SP Technical Research Institute of Sweden	8	1.2%	2.13
University West	10	1.2%	2.30
University of Skövde	13	1.1%	0.63
Malmö University	25	1.1%	0.90
Luleå University of Technology	54	1.0%	1.12
Uppsala University	276	0.9%	3.42
Lund University	294	0.9%	3.04

Table 2 ranks Swedish institutions based on their co-publications with South Africa as a share of their total publication output. As many African nations, South Africa is very active in international collaborations and has a field-weighted internationalisation score of 1.29 (with 1 being the global average). South Africa's collaboration intensity with Sweden is at 111% (Table 1), which is explained by Table 2 where we see that all listed Swedish institutions have a co-publication share with South Africa that exceeds South Africa's share of the total global publication volume. Most of the top five Swedish institutions with the largest shares of co-publications focus on environmental science in their research collaborations with South Africa, with the exception of Linnaeus University's collaborations that are predominately in the social sciences.

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

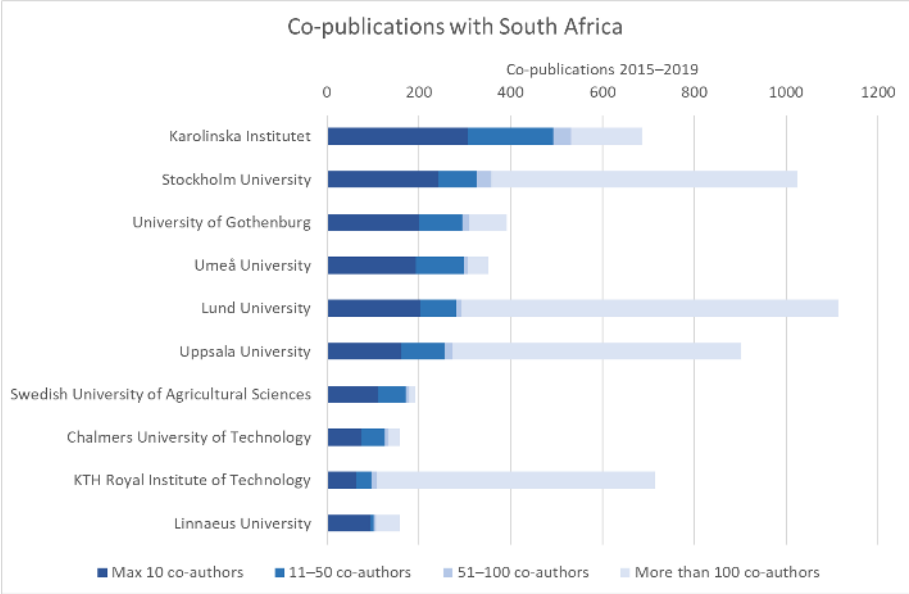


Figure 15 lists the ten Swedish universities with the highest numbers of co-publications with South Africa, ranked according to the number of co-publications with up to 100 co-authors. These are the same as the top ten Swedish universities by overall publication volume, with the exception of the inclusion of Linnaeus University. The technical universities are ranked lower regarding their number of co-publications with South Africa than in the overall ranking, which is consistent with the significant underrepresentation of engineering and technology, and the slight underrepresentation of the natural sciences, as seen in Figure 12. The large shares of co-publications with more than 100 co-authors between Stockholm University, Lund University, Uppsala University and KTH Royal Institute of Technology with South African institutions are predominantly in the field of particle physics and, to a lesser degree, astronomy.

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

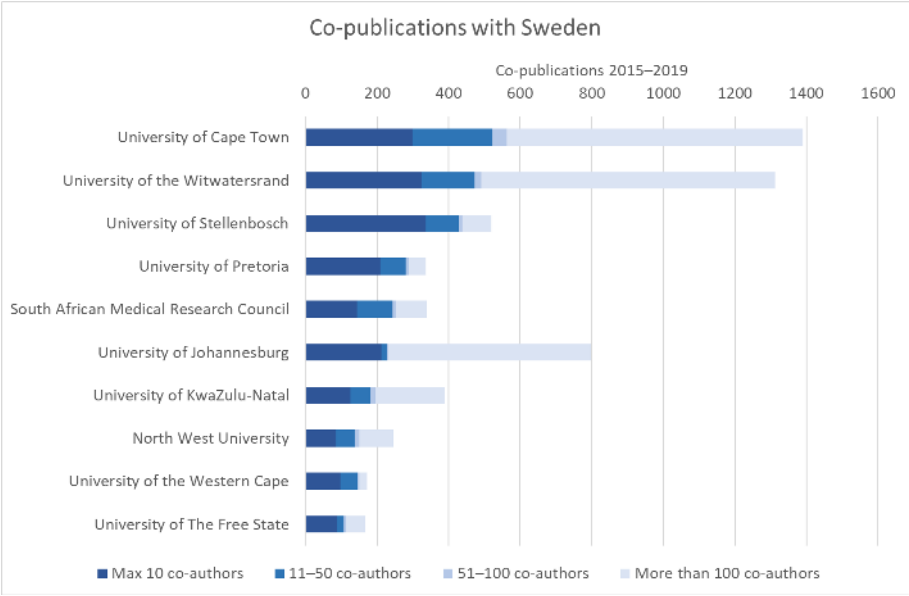


Figure 16 lists the ten South African universities with the highest numbers of co-publications with Sweden, ranked according to the number of co-publications with up to 100 co-authors. With the exception of the South African Medical Research Council, these are also the top South African universities by overall publication volume and those topping the list are the South African universities with the highest international rankings. The University of Cape Town, the University of the Witwatersrand and the University of Johannesburg have a large share of co-publications with more than 100 co-authors. These are predominantly in the field of particle physics, as is the case for the Swedish institutions with the largest shares of Swedish–South African co-publications with more than 100 co-authors.

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

Publications 2015–2019 with up to 100 co-authors	University of Cape Town	University of the Witwatersrand	University of Stellenbosch	University of Pretoria	South African Medical Research Council	University of Johannesburg	University of KwaZulu-Natal	North West University	University of the Western Cape	University of The Free State	With South Africa
Karolinska Institutet	144	86	111	19	53	4	55	21	36	9	532
Stockholm University	57	34	74	26	3	13	24	44	20	10	358
University of Gothenburg	61	46	27	44	13	6	23	23	20	26	308
Umeå University	40	169	32	34	136	7	22	11	11	4	307
Lund University	51	36	63	14	6	29	16	29	15	5	292
Uppsala University	89	49	34	19	17	18	23	4	23	1	273
Swedish University of Agricultural Sciences	24	17	23	36	-	9	18	5	1	7	179
Chalmers University of Technology	38	2	33	6	8	1	9	4	14	-	133
KTH Royal Institute of Technology	11	11	17	7	-	4	5	17	8	1	108
Linnaeus University	6	2	12	8	-	17	6	8	5	2	107
With Sweden	563	491	438	289	253	232	195	151	151	112	2,742

The co-publication matrix in Table 3 shows the co-publications (with up to 100 co-authors) between the top ten collaborating institutions in Sweden and South Africa and thus gives an indication of the distribution of the collaborations between Swedish and South African HEIs and research institutes. The blue/green bars represent the ratio of the number of co-publications between two HEIs/research institutes to the total number of co-publications (for the Swedish institution). While the South African collaborations of the top ten Swedish institutions by co-publication volume are overall not concentrated to a single partner, Swedish–South African research collaborations can still be said to be rather concentrated, as almost all of the resulting co-publications involve the top ten institutions from both countries listed in Table 3.

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

In some cases, there are clear differences in the student mobility data from UNESCO and UKÄ. Different reporting periods and definitions (see below) might explain some of these differences.

Methods

According to the UNESCO Institute for Statistics, 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, the 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 1, 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 publications 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 frequently 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.[1] 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.[2]

Figure 12, Distribution of publications per scientific field (2015–2019). The scientific profile is calculated using the OECD categorisation of publications in six scientific fields: agricultural sciences, engineering and technology, humanities, medical sciences, natural sciences, and social sciences. For each field, the share of publications is calculated using the

[1] 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.

[2] 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

number of publications within the field and the total number of publications in the dataset.

The **word cloud (Figure 13)** is a feature in SciVal, which uses the Elsevier Fingerprint Engine to extract distinctive keyphrases within the publication set. For more information, see https://www.elsevier.com/solutions/elsevier-fingerprint-engine

The **wheel of science (Figure 14)** 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. 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.

STINT, the Swedish Foundation for International Cooperation in Research and Higher Education, was set up by the Swedish Government in 1994 with the mission to internationalise Swedish higher education and research.

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

STINT promotes internationalisation as an instrument to:

- Enhance the quality of research and higher education
- Increase the competitiveness of universities
- Strengthen the attractiveness of Swedish universities

STINT's mission is to encourage renewal within internationalisation through new collaboration forms and new partners. STINT for example invests in young researchers' and teachers' international collaborations. Moreover, STINT's ambition is to be a pioneer in establishing strategic cooperation with emerging countries in research and higher education.

STINT
Stiftelsen för internationalisering av högre utbildning och forskning
The Swedish Foundation for International Cooperation in Research and Higher Education

Wallingatan 2, SE-111 60 Stockholm, Sweden
Telephone +46 8 671 19 90. Fax +46 8 671 19 99
info@stint.se, www.stint.se