

## Academic collaboration between Sweden and Pakistan



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## Summary

The purpose of this study is to investigate the conditions and opportunities for mutually rewarding academic collaboration with Pakistan. Given the relatively limited experience of academic collaboration between Sweden and Pakistan, this study aims to provide some facts and figures about higher education and research in Pakistan and outline existing collaborations. The intention is that it can serve as an introductory overview for higher education institutions and departments considering cooperation with Pakistan.

In 2019, more than 1,000 students from Pakistan were admitted to higher education institutions in Sweden, which is a substantial increase from 2018. When the tuition fees were introduced in 2011, 3,000 students from Pakistan studied in Sweden and approximately 650 have been registered every subsequent year. The number of outgoing students from Sweden to Pakistan is very low.

The school system in Pakistan has not managed to keep up with the population growth. In 2014, the literacy rate was 57%. On the other hand, education enjoys high status in the population and many households invest substantial resources in higher education.

The number of co-publications including researchers with Swedish and Pakistani affiliations started to increase in 2005 and has continued to increase since then. The citation impact of these co-publications is high. Compared to other emerging academic countries in the region, Pakistan is relatively early in the process, which partly explains the high growth rate.

It is probable that the collaboration to some extent builds on the participants in the programme of Pakistan's Higher Education Commission (HEC) sponsoring PhD studies abroad. Until 2011, a total of 133 PhD students were trained at Swedish universities through this programme and most of them have thereafter returned to Pakistan. Sweden's participation in the programme ended in 2011.

Whereas there are promising opportunities to carry out collaborative research in line with the principles of academic freedom in most scientific disciplines, this might be more challenging in others. The main reason is that the Pakistani government does not allow criticism of some aspects.

In terms of business and innovation, business involving both Pakistan and Sweden is rather limited. The HEC has on-going initiatives fostering academic innovation and from the HEC's perspective, the high share of academic–corporate co-publications in the collaboration with Sweden is an added bonus.

## Preface

STINT, The Swedish Foundation for International Collaboration in Research and Higher Education, was set up by the Swedish Government in 1994 with the mission of internationalising Swedish higher education and research. STINT promotes knowledge and competence development in the area of internationalisation and invests in internationalisation projects proposed by researchers, teachers and senior leadership at Swedish universities.

STINT's geographic focus is on countries outside Europe and particularly on emerging countries in science. According to a previous study by STINT, Pakistan shows rapid development in research. Moreover, it is a large country with a growing number of students. There is also limited knowledge of Pakistan in Sweden, especially regarding its higher education landscape and related policies.

The purpose of this study is to investigate the conditions and opportunities for mutually rewarding academic collaboration with Pakistan. In some emerging countries in science, a part of the academic development is based on international resources, such as funding from aid organisations. STINT's ambition is to find mechanisms for the next step in the collaboration, with balanced involvement and benefits from both sides. Pakistan is an interesting example, with some foreign funding as well as its own institutions providing funding to the universities. The intention with the report is that it can serve as an introductory overview for higher education institutions and departments considering cooperation with Pakistan.

The author of this report is Dr Hans Pohl, Programme Director, STINT.

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*Stockholm, Sweden, November 2019*

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# 1 Introduction

## 1.1 Background

One important part of the strategy of STINT, The Swedish Foundation for International Collaboration in Research and Higher Education, is to foster new academic collaborations between universities in Sweden and abroad. The focus is on countries outside Europe and a particular focus is on emerging countries in science.

According to STINT's studies, Pakistan is one such country showing rapid development in research (STINT 2017). Moreover, it is a large country of approximately 200 million people and a growing number of students, whereof Sweden has received relatively large numbers. One important factor limiting the collaboration is a lack of knowledge about Pakistan in Sweden. Many other countries are also developing rapidly in terms of higher education and research and some of them are better known, for different reasons. As resources are limited, there is a risk that Pakistan is not given appropriate attention.

Therefore, it was decided that a study should be conducted, including a visit by STINT's Programme Director to Pakistan, to meet with various actors related to its university system in order to gain a better understanding of this system and explore conditions for academic collaboration. Meetings were set up in close cooperation with the Embassy of Sweden in Pakistan and the support of the embassy has been highly valuable and appreciated.

## 1.2 Purpose

The purpose of this study is to investigate the conditions and opportunities for mutually rewarding academic collaboration with Pakistan. Given the as yet relatively limited experiences of academic collaboration between Sweden and Pakistan, the study aims to provide some facts and figures about higher education and research in Pakistan and outline existing collaborations.

## 1.3 Method and data

The study was led by STINT and carried out in collaboration with individuals with deep knowledge of different aspects of Pakistan.

The main contributors to this report were:

- *Dr Henrik Chetan Aspengren, Research Fellow, the Swedish Institute of International Affairs*
- *Dr Zain Ul Abidin, Director General (R&D), Higher Education Commission, Pakistan*
- *Ms Ingrid Johansson, Ambassador, Embassy of Sweden in Pakistan.*

In addition, internationalisation experts at Swedish universities provided input about their experiences.

However, all responsibility for the final report lies with its main author, Dr Hans Pohl.

Publication data from Scopus were used. Scopus is “the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings” (Elsevier 2019). SciVal was used to analyse the publications (Elsevier 2019a). A report published by the British Council (Ul Haque et al. 2019) serves as the primary source for section 2.

## 2 The higher education system in Pakistan

### 2.1 Pakistan: Facts and figures

Approximately 200 million people live in Pakistan. The official language is English, and Urdu is the national language. Islamabad is the capital and the largest city is Karachi with 15 million inhabitants. Mr Imran Khan has been Pakistan’s prime minister since 2018. The Islamic Republic of Pakistan is a parliamentary democracy, but democratic decision making is somewhat restricted by non-elected military and religious authorities.

Pakistan’s economy is struggling with rising debts and higher imports than exports. The inflation rate is high and tax revenues in 2018 were very low, at 13% of GDP and decreasing. In 2019, Pakistan received substantial loans from Saudi Arabia and the United Arab Emirates. It has been argued that Pakistan must become more attractive for foreign direct investments to reduce dependency on financial aid (Malik 2019).

Islam is the state religion and 97% of the population is Muslim. Blasphemy laws are very strict. Religion has a strong influence on politics and social issues. Periodically, militant religious actions have had a strong impact. At the same time, the current government has taken some measures to reduce the influence from extreme groups.

The school system in Pakistan has not managed to keep up with the population growth. It lacks resources and the allocated resources are not used efficiently. The teacher profession has a relatively low status. In 2014, the literacy rate was 57%. On the other hand, education enjoys high status in the population and many households invest substantial resources in education.

## **2.2 Governance and funding of higher education**

The Higher Education Commission (HEC) is the principal funding and regulatory authority in Pakistan. The HEC is located in the capital Islamabad and also has four regional offices. The establishment of the HEC in 2002 led to a stronger focus on research. Funding has been increased and a faculty promotion system linked to publication volume has been introduced. The HEC also supports the establishment of Offices of Research, Innovation and Commercialisation (ORICs). Currently there are 60 such ORICs and 30 Business Incubation Centres at universities.

In 2015, Pakistan invested 0.25% of its GDP in research and development, according to data from the World Bank. In 2007 this share was 0.63%, and spending has followed a downward trend. As the GDP per capita has increased rapidly, however, this decrease probably does not mean that research and development investments have decreased in absolute terms.

A growing amount of funding of research at universities is channelled to two agencies: the HEC and the Pakistan Science Foundation (PSF). In the period 2015–2016, HEC research programmes totalled approximately 1.5 billion PKR (corresponding to 9.4 million USD).

Thematic and collaborative research is targeted through the launch of four national centres addressing Artificial Intelligence, Robotics and Automation, Big Data, and Cloud Computing National Centre of Excellence. The centres were launched in 2018 and add substantially to the HEC's investments in research.

The HEC also funds a mobility programme for PhD students. In 2018, a total of 1,614 such students were abroad, whereof approximately 50% were in Germany, South Korea or France. Swedish participation in this programme was terminated in September 2011.

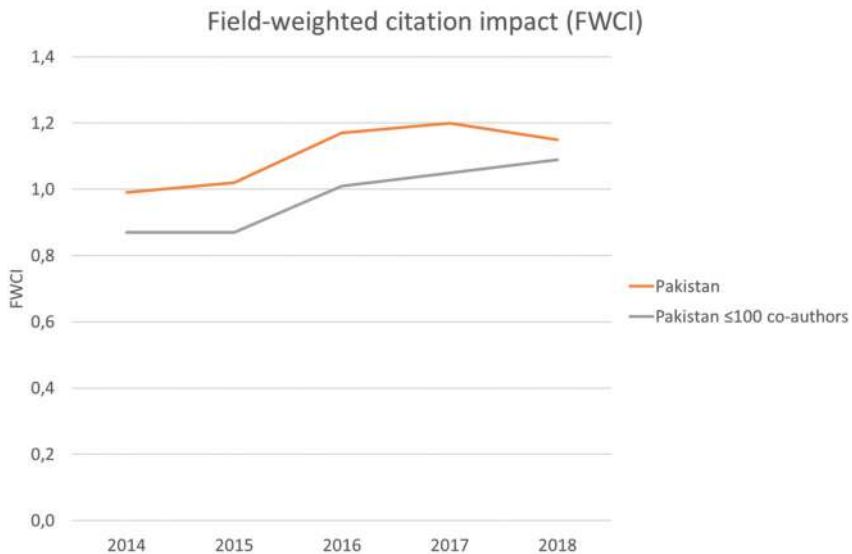
The PSF's funding of research is slight in comparison to that of the HEC. Another relatively small source of university research funding comes from cesses (a sort of taxes), which some industries have to pay based on their turnover.



Finally, research is also funded through donor programmes. France, the United States and the United Kingdom all have different types of collaborative research programmes with Pakistan.

In the report by Ul Haque et al. (2019), it is argued that the faculty promotion system based on publications is problematic, as it has emphasised quantity over quality. Publication volumes have increased substantially, but their quality has not developed similarly.

Figure 1: Citation impact for publications in Pakistan

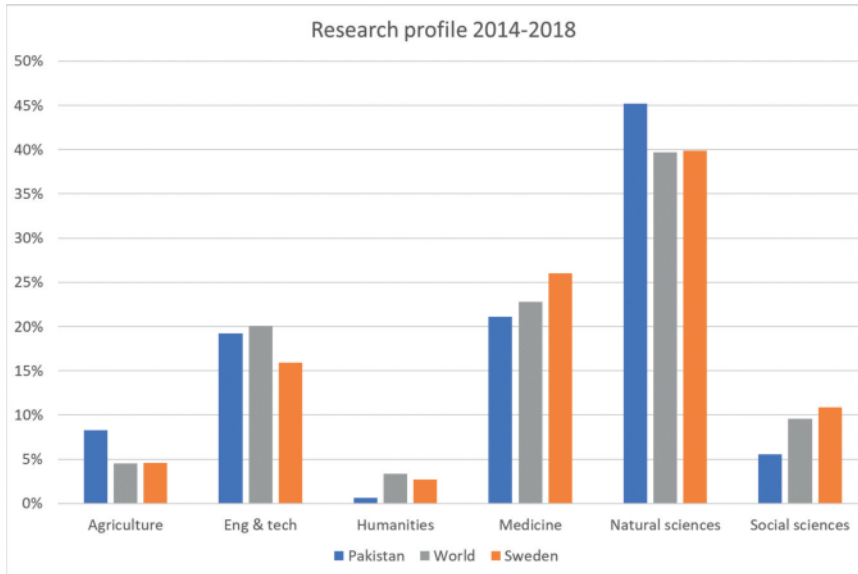


This assertion is contradicted by Scopus publication data (see Figure 1). The citation impact<sup>1</sup> trend is positive and above the world average of 1.

Another issue mentioned in the report is the lack of research in the humanities and social sciences. In Figure 2, the academic profile of Pakistan is illustrated based on Scopus publications (the blue bars). Compared to the world average and to Sweden, Pakistan's publications in the humanities represent a very small share. Publications in the social sciences also have a lower share than the world average, but the difference is not as dramatic. Corresponding data for Japan or China show even lower shares of publications in the social sciences.

<sup>1</sup> One good quality indicator for publications is the field-weighted citation impact (FWCI). Citations are formal references to earlier work done in an article or patent, frequently to other journal articles. A citation is used to credit the originator of an idea or finding and is usually used to indicate that the earlier work supports the claims of the work citing it. The number of citations an article receives in subsequently published articles provides an indication of the quality or importance of the reported research. When calculating the FWCI, the number of citations a publication receives is normalised with respect to the academic discipline, publication year and type of publication. A FWCI equalling 1 indicates that the publication enjoys world average citation impact. A higher FWCI indicates higher impact (Elsevier 2019b).

Figure 2: Research profiles



According to Ul Haque et al. (2019), there is a lack of national demand for research. The government shows limited interest in evidence-based policy. The same holds true for industry, which has a limited research and innovation capacity. It is argued that the huge China–Pakistan Economic Corridor (CPEC) project is an opportunity to create productive links between policymakers, business and universities.

The actual effect of CPEC has been debated locally and internationally. Some argue that it is not as beneficial to provincial Pakistani interests, but rather benefits the state and larger business conglomerates (including the army), while others point to benefits in certain sectors, for example the energy sector.

### 2.3 Institutions

The demand for higher education is increasing and the growing economy has led to larger numbers of students at the universities. The university system in Pakistan has grown rapidly during the last two decades: from fewer than 50 recognised universities in 1999 to 204 in 2019. Of these, 123 (or 60%) are public and 81 (40%) are private. Interestingly, on the same website the HEC also lists almost as many illegal or fake universities or campuses (HEC 2019).

For the academic year 2014/15, 47,500 full-time faculty members were employed, whereof 21% hold a PhD. Approximately 1.4 million students were enrolled at universities during the same period. Almost all PhDs are awarded by the public universities. The number of awarded doctorates increased by 50% from 2010 to 2014, with close to 1,400 PhDs being awarded in 2014.

The HEC ranks the universities in Pakistan. The latest available ranking is for 2015 and the criteria and scores/weights are listed in Table 1.

Table 1: **HEC ranking indicators**

Component	Score
Quality assurance	15%
Teaching quality	30%
Research	41%
Finance & facilities	10%
Social integration / community development	4%
Total	100%

The overall result of the 2015 ranking is presented in Table 2.

Table 2: **HEC ranking of universities in Pakistan**

Rank	University	Relative score
1	Quaid-e-Azam University, Islamabad	100.00
2	University of the Punjab, Lahore	83.28
3	National University of Science & Technology (NUST)	80.27
4	University of Agriculture, Faisalabad	78.72
5	Aga Khan University	77.28
6	COMSATS Institute of Information Technology	76.51
7	Pakistan Institute of Engineering and Applied Sciences (PIEAS), Islamabad	74.88
8	University of Karachi	70.09

Based on their total publication volume for 2014–2018, the eight largest HEIs in Pakistan are listed in Table 3.

Table 3: **Eight research-intensive universities in Pakistan**

Name	Publication volume	FWCI
COMSATS Institute of Information Technology	8973	1.40
Quaid-I-Azam University	7119	1.81
National University of Sciences and Technology Pakistan	5457	1.11
University of the Punjab	4911	1.10
University of Agriculture Faisalabad	4593	1.04
Aga Khan University	3463	3.17
University of Karachi	3145	0.71
University of Peshawar	2842	0.90

With one exception (the University of Peshawar), the universities with high publication volumes are also among the top 8 in the HEC ranking.

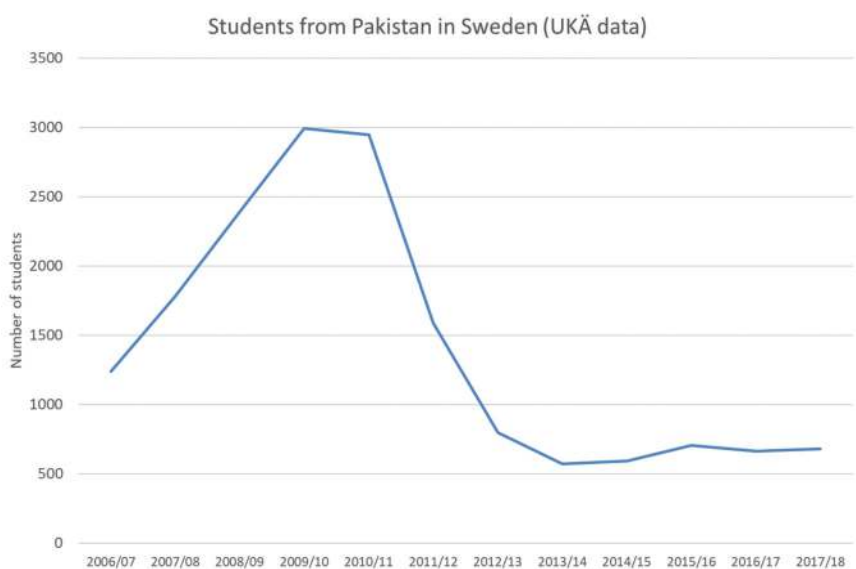
## 3 Pakistan–Sweden collaboration

### 3.1 Student mobility

#### 3.1.1 Outbound from Pakistan

When students from Pakistan study abroad, approximately 20% (or 10,000) study in Australia. Thereafter follow the United States (6,100), the United Kingdom (5,500) and the United Arab Emirates (4,575). Sweden is number 11 as a destination country (UNESCO 2019).

Figure 3: Students from Pakistan in Sweden



In the 2017/18 academic year, a total of 679 students from Pakistan were registered at Swedish universities. The number of students from Pakistan has been relatively stable since the drastic drop after the introduction of tuition fees, see Figure 3. In Table 4, the top ten universities hosting students from Pakistan are listed. Another 14 universities also host at least 5 students each (UKÄ 2019).

Table 4: **Universities hosting students from Pakistan**

University	Students 2017/2018
Linnaeus University	126
Stockholms University	80
Jönköping University	73
Linköping University	45
KTH Royal Institute of Technology	43
Uppsala University	42
Halmstad University	33
Södertörn University	28
Umeå University	27
University of Gothenburg	26

In 2019, 1,044 students from Pakistan were admitted to Swedish universities, representing a substantial increase. Further statistics from the Swedish Institute are given in Table 5.

Table 5: **Students from Pakistan to Sweden (SI 2019)**

	Number of persons
Total number of applicants	4,858
Fee-paying applicants	2,094
Admitted	1,044
Granted Swedish Institute scholarships	8

### PhD students

The HEC programme funding doctoral studies abroad included a total of 133 PhD students in Sweden. Almost all have now concluded their studies and returned to Pakistan, as the contract stipulates returning to and working for at least 5 years in Pakistan after 4 years of PhD studies. The Swedish Institute partnered the HEC in this programme. Its role was mainly to help with the placement of the students and manage disbursements to them.

A total of 17 Swedish universities participated in the programme, whereof KTH Royal Institute of Technology (41), the Swedish University of Agricultural Sciences (20), Linköping University (14) and Uppsala University (14) hosted the largest numbers.

The distribution of scientific disciplines, as defined by the HEC, is shown in Table 6.

Table 6: **Scientific disciplines of PhD students from Pakistan in Sweden**

Discipline	Number of PhD students
Physical Sciences	54
Engineering & Technology	45
Biological & Medical Sciences	20
Agriculture & Veterinary Sciences	13
Arts & Humanities	1

The programme was terminated in 2011 as the conditions for PhD students were not considered acceptable from the Swedish side. One example is the funding of 900 Euro per month and student, which was not considered sufficient.

### 3.1.2 Inbound to Pakistan

UNESCO does not publish any statistics for inbound students to Pakistan. According to the interviews, most inbound students come from countries in the Middle East and Africa. Iran, Saudi Arabia, Nigeria and Afghanistan were mentioned.

## 3.2 Research collaboration

### 3.2.1 Overall development

The number of co-publications including researchers with Swedish and Pakistani affiliations increased rapidly until 2016 (see Figure 4).

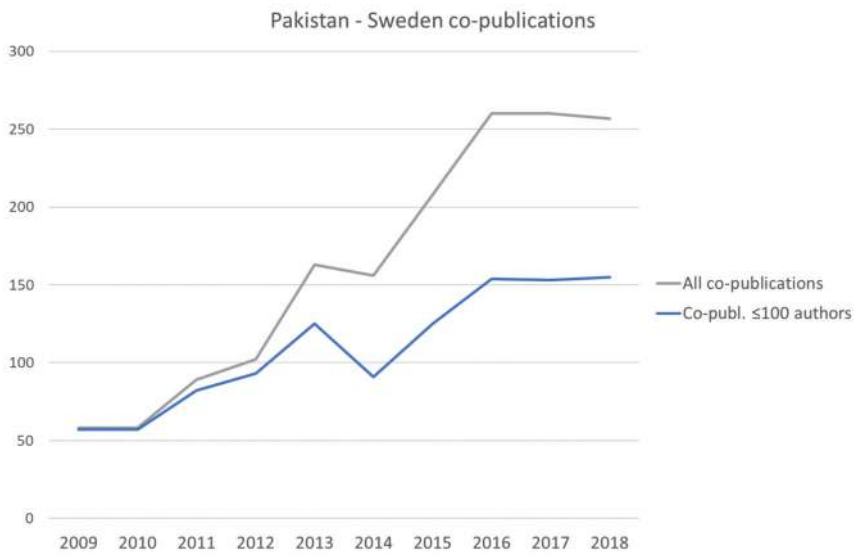
Figure 4: Total number of co-publications Sweden Pakistan



A relatively large share of more recent co-publications involves many co-authors, often more than 3,000, see Figure 5. Such hyper-authored publications represent collaboration in global networks rather than collaboration between Sweden and Pakistan. As they tend to distort the analysis of data, the following study treats them separately, using a limit of 100 co-authors.

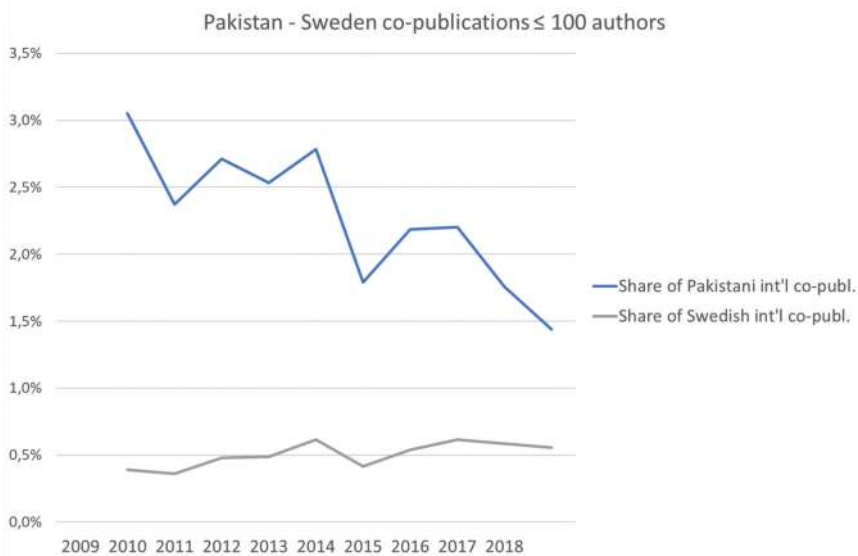


Figure 5: Hyper-authored publications



When relating the co-publication volume to Sweden’s and Pakistan’s total volumes of international publications, it becomes clear that co-publications with Sweden represent a larger share for Pakistan (see Figure 6). However, this share is rapidly decreasing.

Figure 6: Co-publications in relation to all int'l co-publications



A closer look at the period 2014–2018 is presented in Table 7. The citation impact indicator FWCI is explained above (see 2.2) and the share of academic–corporate co-publications serves to indicate collaboration between the academy and the industry.

Table 7: Comparing key indicators for Sweden and Pakistan

2014–2018	FWCI	Share academic–corporate co-publ
Co-publ. ≤100 authors	3,09	7.7%
All co-publications	8,76	25.3%
Pakistan	1,12	1.0%
Sweden	1,70	7.2%

The co-publications with Sweden and Pakistan are rewarded with a high FWCI, clearly higher than the national values for Sweden or Pakistan, also when the hyper-authored co-publications are removed. Academic collaboration with industry is probably not as common in Pakistan, as the share of such co-publications is very low. The world average is 2.3%. Still, co-publications with Sweden include corporate actors to a relatively large extent.

### 3.2.2 Most active HEIs

KTH Royal Institute of Technology had the highest number of co-publications with Pakistan, when looking at the co-publications with 100 co-authors or fewer (see Table 8). But compared to some of the other universities, the FWCI was rather modest. The publications including the University of Gothenburg enjoyed a very high citation impact.

The figure in parentheses following the name of each university indicates its rank in Sweden in terms of publication volume. Karolinska Institutet was the largest producer of publications during this period.

Table 8: Indicators based on co-publications Sweden–Pakistan (Swedish universities)

Co-publications Sweden - Pakistan 2014 - 2018	All co-publications		Co-publ≤100 authors	
	Volume	FWCI	Volume	FWCI
Royal Institute of Technology (5)	139	1.86	136	1.13
Karolinska Institutet (1)	187	37.78	90	4.01
Uppsala University (3)	297	18.69	87	1.93
Linköping University (8)	88	1.97	78	1.31
Swedish University of Agricultural Sciences (10)	54	1.45	53	1.28
University of Gothenburg (4)	98	59.11	48	15.86
Lund University (2)	321	17.94	41	4.11
Stockholm University (6)	46	6.38	38	1.41
Umeå University (9)	68	24.24	33	3.10
Dalarna University (28)	37	89.02	<15	-

A similar list for the universities in Pakistan indicates that the largest producer of publications in Pakistan also has the highest number of co-publications with Sweden (see Table 9). The medical Aga Khan University enjoyed a very high citation impact for its co-publications with Swedish universities.

Table 9: Indicators based on co-publications Sweden–Pakistan (Pakistani universities)

Co-publications Sweden - Pakistan 2014–2018	All co-publications		Co-publ≤100 authors	
	Volume	FWCI	Volume	FWCI
COMSATS Institute of Information Tech (1)	415	2.12	125	1.37
Quaid-I-Azam University (2)	65	2.52	62	0.95
Aga Khan University (6)	123	53.46	60	15.70
University of Sindh (22)	39	1.04	39	1.04
National Univ of Sciences and Tech Pakistan (3)	30	2.24	30	2.24
Univ of Engineering and Technology Lahore (13)	29	1.17	29	1.17
University of Agriculture Faisalabad (5)	28	1.08	28	1.08
University of the Punjab (4)	173	9.03	25	1.18
Lahore University of Management Sciences (19)	56	1.90	<15	-
Contech International Health Consultants (51)	34	104.33	<15	-

Other indicators are included in Table 10 and Table 11, all based on co-publications with a maximum of 100 co-authors. The growth indicator is based on linear regression for the period 2014–2018. All but one Swedish university show a growing number of co-publications with Pakistan. Compared to the total output from each university, KTH has the highest share. In the co-publications including the University of Gothenburg or Lund University, corporate actors are involved to a large extent.

Table 10: Further indicators based on co-publications Sweden–Pakistan (Swedish universities)

Co-publ Sweden - Pakistan ≤100 authors 2014–2018	Volume	FWCI	Growth	Share of all publ	Share of academic-corporate co-publ
Royal Institute of Technology (5)	136	1.13	54%	0.64%	2.2%
Karolinska Institutet (1)	90	4.01	31%	0.26%	10.0%
Uppsala University (3)	87	1.93	32%	0.30%	8.0%
Linköping University (8)	78	1.31	-23%	0.57%	3.8%
Swedish University of Agricultural Sciences (10)	53	1.28	41%	0.60%	1.9%
University of Gothenburg (4)	48	15.86	40%	0.22%	22.9%
Lund University (2)	41	4.11	34%	0.14%	22.0%
Stockholm University (6)	38	1.41	180%	0.22%	5.3%
Umeå University (9)	33	3.1	188%	0.28%	6.1%
Dalarna University (28)	<15	-	-	-	-

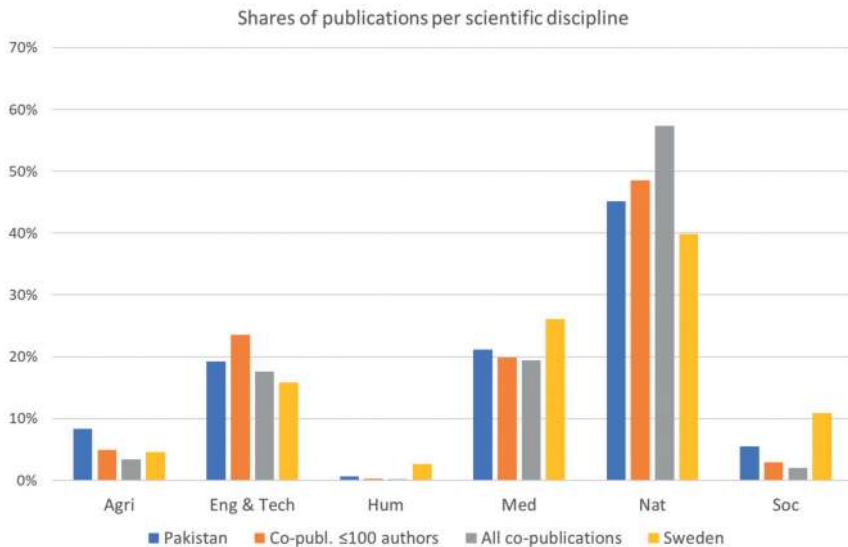
Table 11: Further indicators based on co-publications Sweden–Pakistan (Pakistani universities)

Co-publ Sweden - Pakistan ≤100 authors 2014–2018	Volume	FWCI	Growth	Share of all publ	Share of academic-corporate co-publ
COMSATS Institute of Information Tech (1)	125	1.37	113%	1.39%	6.4%
Quaid-I-Azam University (2)	62	0.95	135%	0.87%	3.2%
Aga Khan University (6)	60	15.7	93%	173%	21.7%
University of Sindh (22)	39	1.04	44%	4.30%	0.0%
National Univ of Sciences and Tech Pakistan (3)	30	2.24	116%	0.55%	0.0%
Univ of Engineering and Tech Lahore (13)	29	1.17	283%	1.65%	6.9%
University of Agriculture Faisalabad (5)	28	1.08	309%	0.61%	3.6%
University of the Punjab (4)	25	1.18	-8%	0.51%	4.0%
Lahore University of Management Sciences (19)	<15	-	-	-	-
Contech International Health Consultants (51)	<15	-	-	-	-

### 3.2.3 Scientific disciplines involved

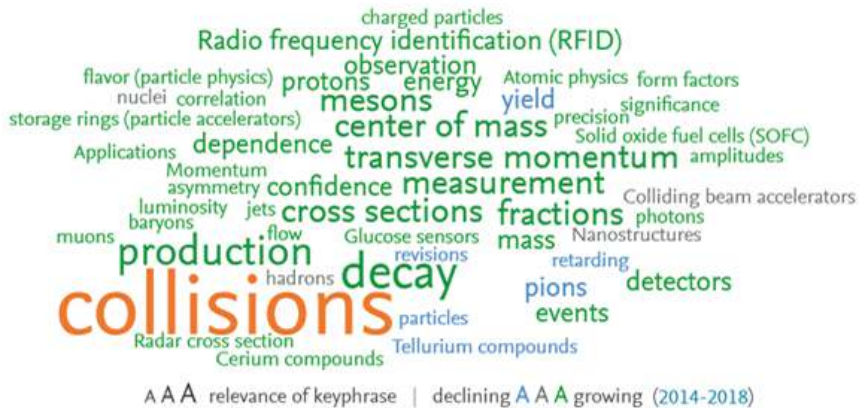
Figure 7 shows that co-publications between Sweden and Pakistan to a large extent are in engineering and technology or the natural sciences. Very few of the co-publications are classified as humanities or social sciences publications. The hyper-authored publications are predominantly in the natural sciences.

Figure 7: Scientific profiles



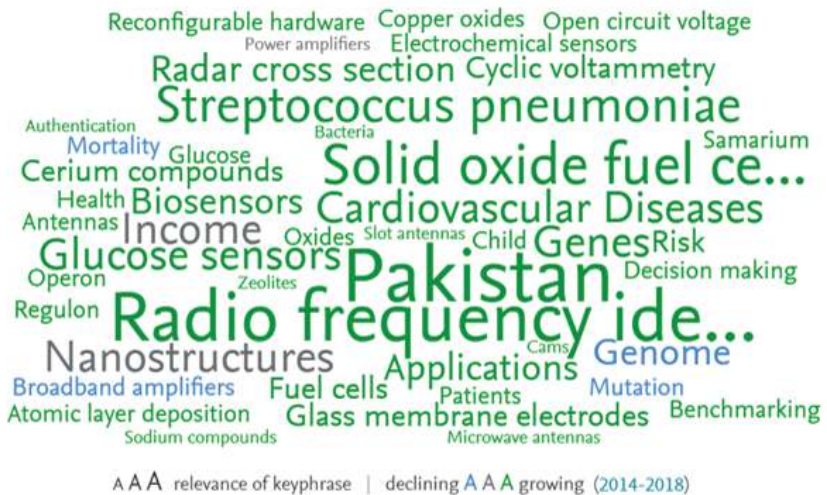
Elsevier has a tool in SciVal giving a so-called fingerprint of the publications. The fingerprint of all co-publications between Sweden and Pakistan shows several key phrases relating to the large research networks in natural science (see Figure 8).

Figure 8: Fingerprint of Sweden-Pakistan co-publications



A fingerprint of co-publications with a maximum of 100 co-authors includes key phrases relating to other disciplines as well, such as medicine (see Figure 9).

Figure 9: Fingerprint of Sweden-Pakistan co-publications ( $\leq 100$  authors)



### 3.3 Experiences at Swedish universities

Historically, KTH Royal Institute of Technology was deeply involved in the establishment of a technical university in Sialkot, Pakistan. KTH was asked by the Pakistani government to establish a campus and deliver education, see Deiaco and Melin (2007). The total project volume was estimated to exceed 5 billion SEK. In 2007, KTH decided to halt the project at an early stage, due to the deteriorating security situation (SVD 2007).

STINT enquired whether the leaderships of a few of the larger Swedish universities would like to participate in a fact-finding delegation to Pakistan. Two central internationalisation managers at large Swedish universities gave relatively extensive answers. These universities have relatively few students from Pakistan and are not listed in Table 4. This sub-section is based on these answers and it should be noted that other universities probably have had different experiences.

#### University A

The university leadership participates in fact-finding missions such as the proposed one, either to strengthen existing collaborations or to develop new contacts. The latter requires very strong motives.

From an educational perspective, we have two tracks: exchange students and international recruitment. We have exchange student agreements with India. Student interest in this exchange is rather weak, even though it is strongly supported by Swedish companies. We would not anticipate many applicants for an exchange to Pakistan. In the other direction, the interest would probably be much greater. An exchange student arrangement must be balanced, otherwise tuition fees must be paid. We have had many applicants from Pakistan but only a few of those who were admitted arrived, probably because of funding issues. Therefore, we are not planning to intensify student recruitment from Pakistan.

We have some collaborations in research, but they only involve a few researchers. There is no explicit ambition to intensify research collaboration with Pakistan and we always take care to determine new international directions centrally.

From an innovation perspective, our international collaborations are to a large extent based on our strategic partnerships with companies, and linked interests in education and research. They have not expressed interest in Pakistan.

## University B

The leadership has very limited time for this type of fact-finding activity. If the leadership participates, it signals strong involvement and interest from the university. In the case of Pakistan, it is more relevant to send a lower-level delegate from the university.

Our involvement in Asia must improve and there are many important countries for us. Presently, Pakistan is not among the countries at the top of this list.

We receive many applications from students in Pakistan, but the quality of many of these applications is low, and the students are not admitted. There are also difficulties relating to the process managed by the Swedish Migration Agency.

## 4 Discussion: Promoting win-win collaboration

### 4.1 Barriers to collaboration

Pakistan has been through violent periods. This means that visitors to Pakistan often are worried about safety. Safety and security issues were limiting factors some years ago, but the security situation in all the major cities has improved during the last five years. The Swedish Ministry of Foreign Affairs advises travellers to Pakistan to be cautious and discourages travel to some regions of the country (UD 2019).

The external conditions, with respect to neighbouring India, have deteriorated. Pakistan and India came close to military conflict in February 2019. The recent unilateral change of the political status of Kashmir by the Indian government has further negatively affected the relations between the two neighbours in the immediate term.

Whereas there are promising opportunities to carry out collaborative research in line with the principles of academic freedom in most scientific disciplines, this might be more challenging in others. The main reason is that the Pakistani government does not allow criticism of some aspects.

Pakistan conducts limited business with Sweden. Swedish exports to Pakistan represent around 0.3% of Sweden's total exports while imports from Pakistan amount to 0.1% of all imports. The companies involved include Ericsson, Tetra Pak, IKEA, SAAB and H&M. There is also little tourist exchange between Sweden and Pakistan. Combined, these factors lead to low overall knowledge about the country.



## 4.2 Students and education

As mentioned above, it is at present challenging to organise balanced, large-scale student exchanges. This means that most student mobility will continue to be inbound to Sweden. Given the relatively large volumes, some universities in Sweden obviously manage the recruitment process. One suggestion could be to facilitate knowledge sharing among the universities in Sweden.

The overall size of the HEC's PhD abroad programme suggests that Pakistan graduates more PhDs abroad than in the country. As the in-country volumes rapidly increase, this will probably not be the case much longer. The PhDs educated abroad in this programme must return to Pakistan and then become excellent nodes for continued collaboration.

## 4.3 Research collaboration

The study of co-publications clearly shows that research collaboration is mutually rewarding. This is probably the best motivator for continued and increased collaboration. One important factor behind these collaborations are probably the PhD students from Pakistan who graduated in Sweden and thereafter returned to Pakistan.

Pakistan is not the only rapidly growing academic country in the region. Compared to other emerging academic countries, Pakistan is relatively early in the process, which partly explains the high growth rate.

One question meriting further study would be how these collaborations are funded. During the past five years, STINT has only funded two (i.e. all submitted) applications for mobility projects including Pakistan. One granted project at Mid Sweden University witnesses a very positive development of its collaboration with Pakistan.

The universities with the highest Scopus publication volumes in Pakistan have lower total volumes than the largest Swedish universities. COMSATS's publication volume compares approximately to that of the Swedish University of Agricultural Sciences (SLU), which is ranked tenth in Sweden in terms of volume. But the volumes increase more rapidly in Pakistan so the differences will probably become smaller. In terms of citation impact, most of the universities with high publication volumes in Pakistan have slightly lower FWCI. However, the differences are not huge, and Aga Khan University had higher FWCI than Karolinska Institutet for publications 2014–2018.

## 5 Conclusions

This study provides some facts and figures relating to academic collaboration between Sweden and Pakistan with the purpose of increasing understanding of the country in order to facilitate support of mutually rewarding collaborations.

Pakistan is developing rapidly, and the country faces some challenges, not least concerning its school system. The overall trend in the development of the academic sector is positive. Still, it is not to be expected that a balanced exchange of a substantial volume of students can be achieved in the next few years.

Several Swedish universities have received and still receive students from Pakistan, predominantly at Master level, but also PhD students. There are some challenges in Sweden's process of managing applications from Pakistani free-mover students.

It is assumed that the collaboration to some extent builds on the participants in the HEC's programme sponsoring PhD studies abroad. A total of 133 PhD students were educated at Swedish universities and most of them have thereafter returned to Pakistan.

Research collaboration has been growing rapidly but the volumes are still relatively modest. From Pakistan's perspective, research collaboration with Sweden has increased more slowly than with other countries, thus leading to a lower share of co-publications including Sweden in 2018, compared to 2009. In terms of citation impact, one proxy for publication quality, the co-publications including Sweden and Pakistan clearly have higher citation impact than national publications in Sweden or Pakistan.

KTH Royal Institute of Technology and COMSATS Institute of Information Technology are the institutions with the highest number of co-publications including Pakistan and Sweden. In relative terms, KTH Royal Institute of Technology has the highest share of publications including Pakistan, whereas the University of Sindh has the highest share in Pakistan.

Engineering and technology, and the natural sciences are slightly overrepresented among the scientific disciplines involved in collaborations. The humanities and social sciences are underrepresented.

In terms of business and innovation, business involving both Pakistan and Sweden is rather limited. The HEC has on-going initiatives fostering academic innovation and from their perspective, the high share of academic–corporate co-publications in the collaboration with Sweden is an added bonus.

One important factor limiting collaboration is the lack of knowledge about Pakistan in Sweden. Many other countries are also developing rapidly in terms of higher education and research and some of them are better known, for different reasons. As resources are limited, there is a risk that Pakistan is not given appropriate attention.

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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. For example, STINT 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.



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