Chapter 1

Higher Education and Research in India

India has a very large and relatively young higher education (HE) system, which is also expanding rapidly. It has over 900 degree-granting institutions and over 40,000 colleges, with more than two-thirds of the universities and colleges being created in this century. While there are a few higher education institutions (HEIs) that have a global reputation for research, the focus and discourse of the HE system have generally been on education, with research-focused universities not getting due attention. As a consequence, despite having one of the largest HE systems in the world, the presence of Indian universities is minimal in global rankings, which are based largely on the research capability and contributions of universities.

In this chapter, we discuss the scenario of HE in India with a focus on issues more relevant from the research university perspective. For our discussions, we use the general understanding of what a research university is—one that strongly emphasizes its research mission, while continuing to offer high-quality education, and has internal systems and policies to support and promote the research mission.

In this book, we refer to all degree-granting HE institutions as universities—including institutions that may not have 'university' in their name but grant degrees, for example, the Indian Institute of Technology (IIT), Indian Institute of Science (IISc), Indraprastha Institute of Information Technology, Delhi (IIIT-Delhi), etc. However, a college which is affiliated to a university is not a university. Also, much of the discussion in the book refers to public universities, as most research universities in India currently are public universities.

In this chapter, we have provided a brief discussion on the HE system and its growth and the evolution of research universities. Then, we have discussed some key aspects of the HE system that are crucial to research universities—the PhD programme and research funding. We have also presented an analysis on how the top universities in India compare with the top universities worldwide on a few parameters.

1.1 INDIAN HIGHER EDUCATION SYSTEM

In this section, we briefly look at the evolution of the Indian HE system and the current situation. The Indian HE seems to have evolved uniquely. Most HEIs have focused more on education and less on research. As engagement in research is known to be important for quality of education, as well as the quality of the culture that prevails in a university, most HEIs in India do not offer high-quality education. The quality of education is a pressing need and a demand—an examination of the various deficiencies in the Indian HEIs and the poor quality of education is given in Chandra (2017) and Kapur and Mehta (2017).

However, the importance of research has increased now, resulting in a shift of focus from only education to research and education in many universities. This is not very different from the evolution in most other countries, where universities generally started with a focus on education, and with a lapse of time, some gradually transformed into research universities by emphasizing on research. The key difference is the timing of transition. In most developed countries, this transition took place in the early 20th century, with the World War II giving a further impetus. In India, whose basic literacy rate was less than 20 per cent at the time of independence in 1947, this transformation seems to be happening now.

1.1.1 Structure of Higher Education System

In India, HE is a concurrent subject, which means that both the central and the state governments have jurisdiction over it. Both governments actively participate and have created hundreds of HEIs that they support. Universities in India can also be private. All HEIs are required by law to be not-for-profit.

Generally, universities are created by an Act of a state government or the central government. In addition to the universities that are created by the central or state government through an Act, there are also deemed universities that are given the university status by the University Grants Commission (UGC). However, in the recent past, this mode of establishing universities has not been much in use, and most of the universities have been created through an Act of the state or central government.

Also, unlike in most parts of the world, India has the system of affiliated colleges, which means that there are universities to which hundreds of colleges may be affiliated. Overall, the HE system in India is much more complicated than that in most countries. Universities in India can be categorized in different ways as follows:

- **Deemed or act-created.** There are only two ways to create a university in India—either through an Act of the central or state government or by being granted a deemed university status by the UGC. Many central government institutions have also been declared as institutes of national importance through a central Act. A list of all universities is maintained by the UGC (2018) and is available on its website. A list of HEIs, declared as institutes of national importance, is maintained by the Ministry of Human Resource Development (MHRD; now called Ministry of Education) and is available on its website.

While these institutions are sometimes not listed as universities, as mentioned earlier, we have considered these also as universities in this book because they have degree-granting powers.

- **Central, state or private.** This is about the ownership or who financially supports the university. Central government institutions are funded either by a central government ministry or by a department/agency. Some of these are called central universities (e.g., Delhi University, Banaras Hindu University [BHU]), while others are called institutes of national importance (e.g., IITs, National Institutes of Technology [NITs]). The state government funds state universities. Private universities, though generally created through an Act of a state government, do not get any budgetary support from the centre or a state. It is worth mentioning that as per the current laws, government institutions have to follow the reservation policies for admissions while private universities do not have to follow these. (Reservation is a complicated subject, which is not discussed in this book—it requires that, of the total number of seats for the incoming student cohort, certain fractions have to be reserved for students from some categories. Reservations often also apply to employees.)
- **Affiliating or non-affiliating.** Affiliating universities can affiliate colleges, while non-affiliating universities cannot affiliate any colleges. For example, in Delhi, IP University is an affiliating university, while IIIT-Delhi (Indraprastha Institute of Information Technology Delhi) and IIT Delhi are both non-affiliating universities. In the affiliation model, the education programme design, the course syllabus and so forth are all decided by the affiliating university—the colleges affiliated to the university have to teach these courses as per the prescribed curriculum. The exam assessment is carried out mainly by the university, although some part of the assessment may be given to colleges. Finally, the degree is also granted by the university. The university often has a separate unit that deals with the affairs of its affiliated colleges—setting the syllabus, conducting exams, getting the exam copies graded, giving degrees, interacting with colleges and so forth. Most colleges

> have their own faculty, management structure (with representation from the affiliating university) and finances. The affiliating approach is a peculiarity of the Indian HE system, which has been abolished in most parts of the world.

The bulk of undergraduate (UG) education happens in affiliated colleges—India has more than 40,000 colleges, and more than 80 per cent of students get their bachelor's degrees through colleges. Almost no research is expected in colleges. As this book is about research universities, we have focused only on universities and not on colleges. It should be mentioned that India is one of the few countries where this model of affiliated colleges still exists. The recently proposed National Education Policy (NEP) of the Government of India (NEP 2019) recognizes that lack of autonomy for teachers regarding what they teach and how they teach is demotivating and therefore proposes to abolish the affiliation system and convert all affiliated colleges into autonomous colleges with full control over their programmes, courses, syllabus, assessment, etc. It envisages that there will be some amalgamation of colleges leading to about 10,000 to 20,000 such colleges each with an enrolment of 2,000 to 5,000 students.

Let us look at how universities are distributed with respect to the aforementioned parameters. The distribution of universities is shown in Table 1.1 (AISHE 2018, 31).

Of these universities, about 280 universities are affiliating, that is, they have colleges affiliated to them where much of the UG teaching is carried out based on the syllabus developed by the affiliating university. On an average, an affiliating university has more than 125 colleges affiliated to it, and according to some reports, a few of these universities have more than 500 colleges affiliated to them, the largest having almost 1,000 colleges.

An affiliating university often has regular programmes at the master's and PhD levels, which are taught and managed within the university and not in colleges (although some colleges may be allowed to have master's programmes). Hence, an affiliating

Table 1.1 *Distribution of Universities*

S. No.	Type of University	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
1	Central university	42	43	43	44	45
2	Institute of national importance	68	75	75	100	101
3	State public university	309	316	329	345	351
6	State private university	153	181	197	233	262
4	Deemed university—government	36	32	32	33	33
5	Deemed university—private	80	79	79	79	80

Source: AISHE (2018, 31).

university may also be a respected research university—for example, Delhi University—which has many affiliated colleges but is also considered a good research university. For discussion on research universities, universities without their affiliated colleges can be treated as regular universities.

For the base funding for public universities (i.e., the yearly grant for running the institution), there are three main sources. The first is the Central Government Ministry dealing with education, namely MHRD, most central governments created technical institutions such as IITs, NITs, Indian Institutes of Science Engineering and Research (IISERs), central government's IIITs and Indian Institutes of Management who get their base funding through this channel. The second is the UGC, which gets its funds from the MHRD. This channel is used by most central government universities, such as Delhi University, University of Hyderabad, and Jawaharlal Nehru University (JNU). The third is the state governments—most state universities receive funding through this channel, although a few of them may also get some support from the UGC.

However, this is not the complete picture. Some of the specialized institutions, which are universities and grant degrees, are associated with different ministries. For example, for many of the universities focusing on medicine, the funding is provided by the Ministry of Health and Family Welfare. Similarly, the Ministry of Law and Justice provides funds to some of the law universities and the Ministry of Agriculture & Farmer Welfare supports some of the agricultural universities.

Public universities get their annual grant mainly to cover their establishment and running expenses. The level of annual grant is typically decided based on the last year's grant with a suitable increase to cover for inflation. Funds may also be provided for any special needs the university may have in the current year. A university submits the request for funds with details about the level of funds needed for different expenditure heads, and the funds are granted to the university for expenses such as salary, pension and maintenance. Any fund that is not used in the current year has to be returned to the government (or accommodated in the budget for the following year).

We have just given a short overview of the structure of the HE system. A detailed discussion on the various aspects of the Indian HE system including the structure and growth, access and equity, role of private sector, regulatory framework, financing, etc. is given in Agarwal (2009).

1.1.2 Growth of Higher Education

Much has been written about the HE set-up in India and its growth, and an annual report also comes out giving the figures and discussing different aspects (AISHE 2018; Varghese et al. India Higher Education Report). The intent of this book is not to discuss the growth of HE in general; rather, it focuses on research universities and their education system. However, to provide the context, let us briefly look at the growth of universities, colleges and student enrolment in India. The growth of degree-granting institutions, which comprise all universities, including the ones

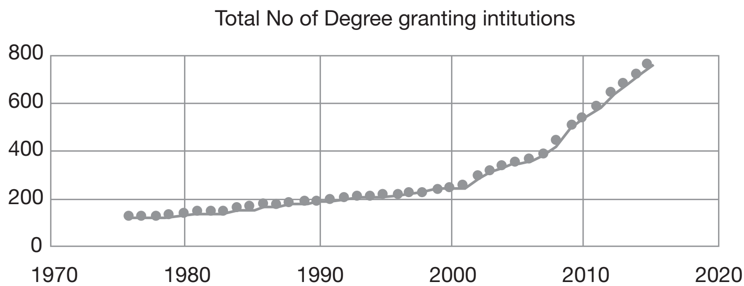

Figure 1.1 *Growth of Universities and Institutes in India*
Source: DST (2017, Table 8).

created by the central or state government, deemed universities and institutes of national importance created by the government of India, is shown in Figure 1.1 (data from DST [2017, Table 8]).

As shown in Figure 1.1, the rate of growth has increased significantly in this century. As a result, the number of universities increased from 240 in 2000 to more than 750 in 2015.

As mentioned earlier, a vast majority of UG education takes place in affiliated colleges. Hence, colleges are high in number. The total number of colleges and their growth, as well as the enrolment of students in HE and their growth, is shown in Figure 1.2—the *y*-axis on left represents the number of colleges (data from DST [2017, Table 8]).

The model of affiliated colleges permitted the private sector players to become active participants in HE. Private universities were still uncommon, and establishing one was difficult. The requirements for establishing colleges were generally modest in terms of capital, labs, land and so forth, allowing more private players to establish them. With the robust control being exercised by the affiliating university, not only in curriculum and programmes but also in tuition fees, it was probably felt that a broader private participation helped satisfy the demand for HE without the adverse potential side effects of profiteering. This

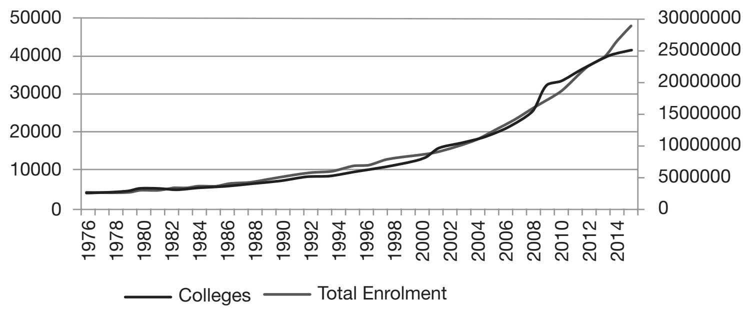

Figure 1.2 *Growth of Colleges and the Total Enrolment*

Source: DST (2017, Table 8).

allowed rapid expansion of HE with lesser investment by the governments. Most affiliating universities kept control on the fees. Although the cost of education was ensured to be modest, the quality of faculty was a challenge, as their compensation had to be correspondingly adjusted. Consequently, the quality of education suffered in many of these colleges.

It should also be mentioned that the gross enrolment ratio (GER)—which captures the percentage of students eligible for HE who actually get enrolled—is currently around 25 per cent in India and is expected to reach 30 per cent in the next few years. In many developed countries, such as the USA, Australia and European countries, the GER is generally more than 80 per cent. In China, it is about 40 per cent.

It is a stated goal of the Indian government to further increase the GER. It is also known that the demographics in India is biased towards the youth, for example, more than 20 per cent of the population is between the ages of 0 and 10 years and another 20 per cent is between the ages of 10 and 20 years. This means that the HE system needs to grow just to accommodate the larger number of young people graduating from schools to maintain the existing GER. And to increase GER, the HE system will have to continue to grow at a fast pace for the next couple of decades.

1.1.3 Evolution of Research Universities

We have discussed earlier the overall HE system in India and the growth of education. As the focus of the book is on research universities, in this section, we look at the evolution of research universities in India. We continue our discussion using the general understanding that a research university is one that focuses strongly on research (in addition to ensuring high-quality education), which gets reflected in a high-quality and extensive PhD programme and research output in terms of research papers. It should be mentioned that this narrative of evolution is broad and loose, as no extensive research has been performed to study the evolution of research universities in India.

1.1.3.1 Early Universities: Before Independence

The modern university system in India was started with the establishment of university of Calcutta by the British. This was followed by universities of Bombay and Madras. These universities were set up with a clear purpose of developing educated human resources for the British administrative machinery in India. (This is one of the main reasons why, after some debate, English was chosen as the medium of instruction in these universities.)

Although these universities were created mainly with the purpose of education, they did have research programmes. Given that they had some outstanding faculty and were perhaps the only places with PhD programmes, they emerged as centres for research. In that sense, these were the first research universities in India. Based on the data on the production of PhDs, as discussed later in the chapter, some of the top research universities around the time of independence were the University of Calcutta, the University of Madras, the University of Bombay, Lucknow University, Allahabad University, BHU), Agra University, Punjab University, Aligarh Muslim University (AMU) and so forth.

However, the focus of these institutions remained on education, which was indeed an important need of the country at the time. The data show that the total number of PhDs produced till the 1920s was less than one per year, and it was just about three per year in the entire country even in the 1930s (the decade before independence). A very senior academician in a prominent university at the time of independence informally mentioned that, as faculty, they were expected to only teach. Some of the talented faculty were involved in research not because they were expected to but because they wanted to, and thankfully, the university had leadership that allowed research to be pursued.

1.1.3.2 Establishment of Universities with Research as a Mission, Such As IITs, IISc and JNU

Between 1950 and 1975, about 100 universities were established in India, many of which had research as a mission. These included the original five IITs, All India Institute of Medical Sciences (AIIMS), IISc, Tata Institute of Fundamental Research (TIFR), Tata Institute of Social Sciences, Birla Institute of Technology & Science (a private university), University of Hyderabad, Jadavpur University, Indian Agricultural Research Institute, JNU, Indian Statistical Institute (ISI) and so forth. Seven of the top 10 engineering institutions as per the National Institutional Ranking Framework, 2018 (NIRF 2018), and about 8 of the top 10 universities (as per the rankings) were created during this period or earlier. Hence, we can say that these are the initial set of research universities established in India.

This period also saw the establishment of national research lab systems such as Indian Space Research Organization (ISRO), Defence Research and Development Organization (DRDO), Department of Atomic Energy (DAE) and Council of Scientific and Industrial Research (CSIR) (some of them were actually established earlier but got support for growth in this period). This dual system with research labs expected to do mission-oriented research and universities mainly for education and academic research diluted the research agenda for universities. Universities were largely perceived as having the mission of improving HE in the country—establishing new models of education, new programmes, admission approaches and so forth—besides training the next generation of researchers through their PhD programmes. The support for research provided to them was also modest. As a result, many universities focused more on teaching. Following the Soviet model of having research for national needs in research labs has had some gains, but those have not been sufficient and much more could have been done in terms of research output as well as the quality of research, if such labs were established in partnership with universities, as is the case in countries like Germany and USA. (Chandra 2017, Chapter 6). Overall, this division hurt the evolution of universities as important and high-quality research centres (Hatakenaka 2017). Universities, however, tend to attract talent from everywhere in the world—given the academic freedom and education programmes to train the next generation of researchers and other professionals. As a result, many of these institutions evolved as research institutions with some fine researchers.

Some of the institutions, particularly the IITs, were set up with strong collaboration and support from different developed countries. For example, IIT Bombay was established with the help from Russia, IIT Delhi with the help from the UK, IIT Madras with the collaboration of Germany and IIT Kanpur with the collaboration of the USA and a Kanpur Indo-American Program in which some of the top universities such as Caltech, Carnegie Mellon University, Massachusetts Institute of Technology, Purdue, Princeton, Ohio State and so forth participated actively. Collaboration with such research universities also helped research take roots in such institutions in India.

1.1.3.3 Growth of Research-Oriented Universities in this Century

After the establishment of the leading research institutions, the next few decades in HE focused more on increasing educational opportunities for the youth. This period saw a tremendous rise in demand for HE, and getting into premier institutions became harder and harder. This increased demand was met mostly by starting new colleges and teaching-focused universities.

This century has seen a significant expansion of universities with research as a key mission. As these universities are young, many may not have yet evolved into full research universities by a quantitative definition (e.g., the number of PhDs graduated or the number of full-time PhD scholars), but they have research as a key mission and recruit faculty suitably. Some facts about the growth of universities in India in this century are as follows:

- The number of IITs expanded from 6 to 23. IIT, as a system, aims to have research as an integral part of the mission.
- Seven IISERs were established—somewhat along the lines of the successful IISc.
- Some of the well-recognized research-focused IIITs were established, including Gwalior, Jabalpur, Allahabad, Bangalore, Hyderabad and Delhi (some were established a few years before 2000).
- Eleven new AIIMS have been established, taking their number to 12—earlier there was only 1 in Delhi.

Thus, in the last two decades, there has been a rapid expansion of universities with research as a focus, many of which can evolve into mature research universities.

This century also saw the rise of global rankings of universities. As these rankings are based mainly on research performance, the focus of existing elite institutions on research has also increased. As an example, data for an IIT indicated about 400 publications per year during 1985–2000. However, the yearly publications jumped to more than 900 by 2005, increased to more than 1,400 per year in the subsequent 5 years and again increased to more than 1,800 per year in another 5 years. The trend in many of the other leading research institutions is likely to be similar, suggesting that these research universities have increased their emphasis on research in this century.

The data from Web of Science for 5-year windows also show that for the top 25 institutions, the average growth of publications from 1991–1995 to 1996–2000 was about 20 per cent. For the same institutions, the average growth from the last decade of the previous century to the first decade of this century was 100 per cent. Similarly, data for the top 20 institutions from Scopus suggest that the average ratio of the number of publications in two consecutive 5-year periods in the previous century (1985–1989/1990–1994) was 1.29, but the ratio for two 5-year periods in this century (2006–2009/2000–2004) was 1.88. These indicate that the rate of increase in publications increased substantially in this century.

Overall, we can say that this century has witnessed the expansion of research universities in India, the impact of which will be felt in the coming decades. The current scenario of research universities in India can be summarized as follows:

- A couple of them were established before independence.
- Most were established in the first few decades after independence, many of which have global rankings and aspire to improve their global standing.
- Many young research universities (less than two decades old) exist, which aspire to be globally respected universities. How they would perform in the research mission is to be seen—the coming decade will probably show more evident trends.

It should be added that a few universities have come up or are coming up in the private sector with a stated desire to be globally respected research universities. Also, significant funds are being deployed as philanthropic contributions for establishing and running these universities. While it is early days, some of these can evolve into private research universities in the coming decades, as has happened in the USA.

1.2 PRODUCTION OF PHDS

The concept of PhD degree originated in Europe, where the early PhDs were granted in the 12th century. However, the PhD in its modern form, that is, with a research thesis, took firm roots in Europe in the 1800s—mainly with the establishment of the Humbolt's Model in Germany, which then spread. With changes, it was taken up and expanded in the USA which, by the mid-1900s, became a major producer of PhDs in the world.

An extensive and respected PhD programme is the hallmark of a research university—the size and quality of the PhD programme indirectly indicate the size and quality of the level of research activity, and hence is perhaps the most important feature that distinguishes a research university from others. Some classification frameworks of universities define research universities in terms of the size of the PhD programme—the oldest and most well-known Carnegie Classification of Universities in the USA classifies a university as a research university based only on the size of its PhD programme. (More about classification frameworks for research universities are discussed in Chapter 2.) Given the importance of the PhD programme for research universities, this section briefly discusses the evolution and current status of the PhD programme in India. A more detailed discussion on the PhD programme in India can be found in Jayaram (2008).

1.2.1 Early Stages of the PhD Programme

In India, the PhD programme started towards the end of the 19th century—Calcutta University in 1877 granted the first PhD. The Universities of Calcutta, Madras and Bombay gave the early PhDs—these are the earliest universities in the modern format and were established in 1857 by the British. A few other universities were established in the 19th century, for example, Lucknow University, Allahabad University and Roorkee University. Until the mid-1900s, very few universities granted PhDs, and the production of PhDs was modest. The number of PhDs produced in the early years, in accordance with the reports of Association of Indian Universities (AIU 1975a, 1975b, 1975c, 1975d), is shown in Table 1.2.

As we can see, the production of PhDs in India was quite low until before independence (in 1947). This was because the

Table 1.2 *Total Number of PhDs Graduated in India in the Early Years*

	Up to 1920	1921–1930	1931–1940	1941–1950	1951–1960	1961–1970
Social science	10	12	33	163	687	1,909
Biological science	2	6	51	155	785	3,196
Humanities	15	29	86	308	1,092	3,880
Engineering and technology	0	2	3	30	146	580
Other physical sciences	12	50	152	383	1,533	5,171
Total PhDs	39	99	325	1,039	4,243	14,736

Source: AIU (1975a, 1975b, 1975c, 1975d).

universities set up by the British were intended to develop human resources to support the administration—research was not a goal, although the PhD degree provision was there. We can see that the production of PhDs rose rapidly in the two decades after India's independence. The PhD output in India was a little more than 1 per cent of the output in the USA in the 1930s, which climbed to about 5 per cent in the 1950s—the decade after India's independence. (Data on PhD production in USA are from Chiswick [2010].)

In the early 1900s, PhDs were mostly being granted by the oldest three universities. Others started granting PhDs later, but a few universities dominated the PhD output. These included, besides the oldest three, universities in Lucknow, Allahabad, Banaras and Agra (AIU 1975a, 1975b, 1975c, 1975d).

The first two decades after independence also witnessed the establishment of some of the major research universities, including the original five IITs and the IISc. Many of these focused on engineering and sciences, and within two decades of independence, PhDs were being granted in engineering also in reasonable numbers. Before independence, hardly a few PhDs graduated in engineering. In the decade after independence, the number of PhDs in engineering grew to about 150 (from 30 in the 1940s) and then to 580 in the following decade. The engineering institutions granting most PhDs included the IITs, University of Roorkee, BHU and Jadavpur. Most of these institutions remain as the leading research institutions in engineering and related areas till today. By 1960s, they were graduating almost half of all PhDs in engineering—a clear sign of research in engineering shifting to the engineering institutions.

1.2.2 Recent Trends in the Production of PhDs

In India, about 900 universities have degree-granting powers. Most of them have doctoral programmes. The structure of the modern doctoral programme is what prevails in many countries—the doctoral thesis that reports some original research by the candidate is the main component—one that distinguishes it from most other programmes. Besides the thesis, most universities have a course requirement depending on the degree the candidate has at the time of joining the PhD programme—thus, for example, candidates with a master's degree will have to do fewer courses compared with candidates with bachelor's. Some universities may have publication requirements for submitting a thesis. The approach for thesis examination varies but generally involves some external experts and a thesis defence.

The PhD programme in India is largely research-based. Professional doctorate programmes that exist in many countries (e.g., the UK) are very few—Pharm D (Doctorate in Pharmacy) is one such programme which was started in 2008. The PhD degree may sometimes have a different name, for example, some of the management institutions call it Fellow Program in Management.

The production of PhDs in India has continued to grow in almost all fields of study. Organisation for Economic Co-operation and Development (OECD) has data on the production of PhDs in many countries on its website. The data show that, in terms of the total number of PhDs produced, India stands fifth. It is worth noting that, although the number of

PhDs produced in India was tiny compared with the USA around independence (around 5%), the situation is quite different at present—India graduates about one-third the number of PhDs graduated by the USA.

The total production of PhDs in recent years has continued to rise (despite a dip in 1 year). The overall production of PhDs in India and the total number of PhDs in different fields of study are shown in Table 1.3 (data obtained from All India Survey of Higher Education annual reports for different years, e.g., AISHE (2018)—they are available online).

With the emergence of IITs and other research-focused HEIs after independence, the production of PhDs shifted more to these institutions towards the end of the previous century, as discussed earlier. For the recent few years, which are more indicative of the existing situation, data from the NIRF are an excellent source. The NIRF, in its 2018 edition (NIRF 2018), has compiled and published data of the top 100 universities and the top 100 engineering institutions—the two largest groups—as well as the top few institutions in different specializations such as management, law and medicine. The data suggest that the top 10 institutions, in terms of number of PhDs produced, on an average produced about 160 PhDs per year for engineering institutions and about 400 per year for universities during 2014–2017.

In any large HE system, it is expected that only top universities will be research-focused, with the rest focusing on education. It is clearly desirable that these top research universities grant most of the PhDs. The PhD production data in the USA indicates that the top 50 universities, out of a about 400 PhD-granting institutions, graduate about half of the total PhDs (Nerad 2008). This is a sign of a healthy HE system—the top universities are almost always research-focused and are most likely to have the best and most rigorous PhD programmes, leading to high-quality PhD graduates.

For a similar analysis, we have considered the top 25 universities and the top 25 engineering institutions (as per the NIRF ranking; referred to as 25 + 25) and their PhD graduation data

Table 1.3 *Production of PhDs in India in Different Fields in Recent Years*

	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
Humanities	2,994	3,463	3,570	2,759	3,191	3,015	3,727
Social sciences	4,271	4,770	5,403	4,785	4,950	6,462	6,700
Biological sciences	5,659	6,406	5,063	4,253	5,063	5,542	8,212
Engineering and technology	2,081	2,186	2,583	2,597	2,785	3,366	4,907
Other physical sciences	2,678	2,571	2,551	2,533	2,923	3,495	3,924
Others	3,874	4,257	4,695	4,914	5,263	6,921	6,938
Total	21,557	23,653	23,865	21,841	24,175	28,801	34,408

Source: AISHE (2018).

Table 1.4 *PhDs Produced by Top 25 + 25 Institutions*

	2015	2016	2017
PhDs from top 25 engineering institutes	2,437 *(11.16%)*	2,633 *(10.89%)*	2,903 *(10.08%)*
PhDs from top 25 universities	6,536 *(29.94%)*	6,438 *(26.63%)*	6,331 *(21.99%)*
Percentage of total PhDs from these top 25 + 25 institutions	*41.1%*	*37.52%*	*32.79%*

Source: NEP (2019).

and compared them with the overall production of PhDs. The total number of PhDs graduated from these institutions and their contribution to the total number of PhDs in the country are shown in Table 1.4. The trend seems to indicate that the PhD production in universities beyond these 25 + 25 is growing faster than in these universities. The new National Education Policy (NEP) of India (NEP 2019) envisages that the PhD programme in the research universities will be expanded considerably and will produce most of the PhDs in the country.

The fraction of full-time PhDs in top institutions compared with the rest is worth noting. The data indicate that PhD students in the top 25 institutions are mostly full time—about 85 per cent in both engineering institutions and universities. This is expected because top research universities rely on dedicated full-time PhD students (and dedicated postdocs in some advanced countries). This percentage drops significantly in the rest of top 100 institutions (about 45% and 68% in engineering institutions and universities, respectively).

There is a possible explanation for this large number of part-time PhDs. It is quite likely that most of these part-time PhD candidates are working as faculty in some university or college. According to the HE regulators, PhD is essential for high-level positions (e.g., full-time professor) or promotion. Hence, the demand for pursuing a PhD increased because many universities and affiliated colleges had a large number of faculty who did not have PhDs. As these candidates in teaching-focused institutions are working full time as faculty and often have considerable teaching load, they have little motivation for doing research. Such candidates often end up enrolling for PhD in a local university, or in the affiliating university.

In India, the tradition of industry researchers doing part-time PhD is not quite prevalent, and generally, only a small number of such PhD scholars are present. It should be pointed out that only companies having a reasonable internal R&D programme and some part of their business benefiting from research will permit some of their employees to do part-time PhD. Other corporations have no incentive to send their employees for PhD. In most situations, companies and candidates prefer doing PhD in a top research university to get the maximum benefit. Top institutions, particularly in engineering, also encourage such candidates because they bring in a good industry perspective and possible linkages. A decent proportion of part-time PhD candidates in a top research university may be such candidates.

1.3 RESEARCH FUNDING FOR UNIVERSITIES IN INDIA

Let us now discuss the other crucial aspect of a research university—research funding. Research is expensive and research universities need funding to support their research. Without adequate support, research universities cannot thrive. In India, as in most countries, research funding is provided through a few research-sponsoring bodies. The basic budgetary support for a university is mostly for the educational mission, though it may also include support for PhD students.

Research funding to universities is dependent on the overall research expenditure in a country. Therefore, we first consider the overall pattern of research funding in various countries and compare it with India's expenditure. Then, we consider the funds available to universities for research—a context more important when discussing research universities.

1.3.1 R&D Expenditure

Traditionally, research is carried out in a few types of organizations. These can be categorized as follows:

- Universities
- Government R&D (in labs, agencies, etc.)
- Business sector
- Others (nonprofits, focused groups, etc.)

The first three are the major players in research in most countries. The total R&D funding and the main sources for the USA, the UK, and Australia are shown in Table 1.5 (Willetts 2018, 111, ABS Website).

The business sector is the largest investor in R&D in these developed countries, which have a highly respected and globalized HE system besides a strong economy. In developed economies, many businesses thrive and expand on innovation and new developments, for which R&D is essential. Therefore, businesses in developed countries invest heavily in R&D. The business sector accounts for more than half the total R&D expenditure; in the USA, it is 70 per cent.

Another point to note is the ratio of expenditure for R&D in universities compared with government R&D. Much of the

Table 1.5 *R&D Expenditure in Some Developed Countries (in US$ billion)*

Country	Total	Universities	Govt. R&D	Business Sector	Others	Academia/ Govt. R&D
UK (2014)	44	11	3	28	2	3.7
US (2013)	457	65	48	322	22	1.4
Australia (2013)	33	10	4	19	1	2.5

Source: Willetts (2018, 111, ABS Website).

R&D funding in universities comes from government sources. Although companies also fund research in universities, funding by corporations is generally a tiny fraction of the total. The bulk of the research funding for universities comes from sponsored research projects granted by sponsoring agencies, which are themselves sponsored by the government. In other words, the overall government funding mostly goes to two sectors: government R&D labs and centres and universities. Thus, the ratio of expenditure on universities and government R&D set-up indicates how the government research budget is spent. In the developed countries, the R&D expenditure in universities is more than that in the government R&D set-up, often many times more, as shown in Table 1.5. These countries have taken an approach that the government R&D budget is best spent by sponsoring research in universities while keeping sensitive and mission-critical research with the government.

In India, traditionally, the business sector (i.e., called the private sector in India) has not invested significantly in research. This is probably because, earlier, much of the economy was rather low-tech, and the focus was on producing goods using existing technologies and know-how. Consequently, the investment in R&D was felt as not necessary. Also, the size of the economy, as well as the size of corporations, was rather small, leaving little room for research investment. Few data are available on the research investment in the private sector in the decades after independence. However, in the 1970s–1980s, the private sector R&D investment was generally around 10 per cent of the overall R&D expenditure. This increased to 20 per cent by the end of the previous century. It may be noted that the liberalization and opening up of the Indian economy happened in 1991—perhaps this increase was a reflection of the new economy that was more globalized and market-oriented. The R&D expenditure in recent years is given in Table 1.6 (DST 2017, Table 1).

It is worth noting that the private sector expenditure in R&D has continued to increase and has now reached 40 per cent of the total. This is perhaps an indicator of the changing nature

Table 1.6 *R&D Expenditure in ₹100 Crore (i.e., ₹1 billion)*

Sector	2005–2006	2007–2008	2009–2010	2011–2012	2013–2014	2015–2016
Central sector	178	218	316	340	388	460
State sector	23	29	38	51	59	69
Private sector	84	129	153	232	305	378
Higher education	12	16	21	35	40	36

Source: DST (2017).

of the economy, which is now far more globalized, with many global corporations having R&D centres and operations in India. Moreover, many Indian companies have become global corporations, and overall, the economy is far more innovation- and technology-dependent, like the rest of the world.

However, the total R&D expenditure in India is much lesser than in most developed countries—India spends only about 0.7 per cent of the GDP on research, whereas in most developed countries, investments in research and innovation are often more than 2 per cent of GDP (NEP 2019). It is known that return on investment for research is often substantial—much of the growth in most developed countries in the previous decades can be attributed to their investments in research and innovation.

It is also interesting to note that the total expenditure for research in universities in India is less than 10 per cent of the expenditure in the government (central and state) sector. In other words, the R&D budget of the government is largely being spent on government labs and initiatives, and very little of it goes to universities. That is, the government research funding in India is highly in favour of government labs, with universities getting a small fraction of research funding. This is contrary to what happens in some of the developed countries with a vibrant HE system—the R&D expenditure is much more in research universities than the expenditure in government R&D labs. These countries have realized that research is most efficiently done in universities, which also have an extremely valuable by-product in the form of PhDs, who form the research workforce and faculty for the next generation. This funding pattern for research has a significant impact on the nature and volume of research in universities.

Much of the government expenditure on research in India is done through a set of agencies. These agencies spend their funds mainly for three purposes: running the organization; internal R&D, which is used for supporting the research labs they run; and extramural project funding, which is used to sponsor project-based research grants to academic institutions as well as research labs. We have considered the first two together as internal R&D expenditure to study the support available to universities for research. To give an idea of the R&D expenditure of various agencies and the extramural funding available, the R&D expenditures of the top few agencies for the year 2014–2015 are given in Table 1.7 (DST 2015). The table also presents the percentage of total extramural funding given by the agency.

In mission-oriented research organizations (e.g., DRDO DAE, and CSIR), which have labs and research infrastructure of their own, most of the R&D expenditure goes for their own research; only a small portion is spent for extramural funding. In agencies which are primarily into funding research, though they also support some labs (such as DBT and Department of Science and Technology [DST]), a higher portion of the total budget is allocated to extramural funding.

The total extramural funding by all agencies in 2014–2015 (DST 2015) was about ₹2,000 crore. As seen earlier, the total R&D expenditure by the central sector was ₹43,094 crore. In other words, only 5 per cent of the total R&D expenditure by the central sector is extramural, that is, funding that is given for research projects based on their proposals and which universities can apply for.

Table 1.7 *Total and Extramural R&D Spending for a Few Agencies in 2014–2015 (₹ crores; 1 crore = 10 million)*

Agency	Total R&D Expenditure	Extramural Funding (% of total)	% of total Extramural funding
Defence R&D Organization (DRDO)	13,256	77 (0.6)	4
Department of Science and Technology (DST)	2,700	760 (28)	38
Department of Biotechnology (DBT)	1,020	570 (56)	28
Indian Council of Medical Research (ICMR)	843	90 (11)	5
Council of Scientific and Industrial Research (CSIR)	3,335	39 (1)	2
Department of Atomic Energy (DAE)	4,075	101 (3)	5
Ministry of Communication and Information Tech (MoCIT)	-	231	12

Source: DST (2015).

1.3.2 Research Funding to Universities

The primary funding for research in a university comes through sponsored research projects, that is, from research projects funded by various research agencies in the country. It should, however, be mentioned that public universities, in India and elsewhere, also get base funding from their ministry/government for running the institute. We have assumed that much of this base funding is for paying salaries and covering standard expenditure and can be treated as the support for the teaching mission of these HEIs—which is perhaps the most important mission for HEIs in the country and the main reason for government support. However, some part of this support has dual purpose and supports research

Table 1.8 *Extramural Funding Per Year (avg) (in ₹ crore)*

Agency	1990–1995	1995–2000	2000–2005	2005–2010	2010–2015
DRDO	4.09	8.19	19.56	45.06	59.59
DST	30.66	59.68	154.86	516.05	739.35
DBT	26.73	33.61	67.4	255.52	525.74
ICMR	2.61	7.79	29.33	78.61	123.85
CSIR	5.7	12.24	18.66	35.58	60.96
DAE	3.07	8.84	19.28	31.96	68.54
MoCIT			36.43	138.19	262.89
TOTAL (from all agencies)	109.53	268.36	439.56	1266.3	2102.84

Source: DST-Extramural.

also—expenses for library, PhD scholars' stipend and so forth. Also, from time to time, some yearly budget may provide special funding for research to a couple of institutions. We focused only on the sponsored research funding, as that remains as the main source for funding research projects.

In India, universities get sponsored projects from the extramural funding of various agencies. The extramural funding per year, over the years, by the top few agencies, which accounts for more than 90 per cent of the research expenditure, is given in Table 1.8—all values are in crores of rupees (1 crore = 10,000,000; DST-Extramural).

According to a report by DST (DST 2017, Table 4), about 58 per cent of the extramural funding went to HEIs while the rest went to projects from different research labs and other bodies. However, for discussion here, we assume that all the extramural funding is potentially available for universities for research projects. A plot depicting the growth of extramural funding over the years is given in Figure 1.3 (the figures are in ₹ lakhs, 1 lakh = 100,000).

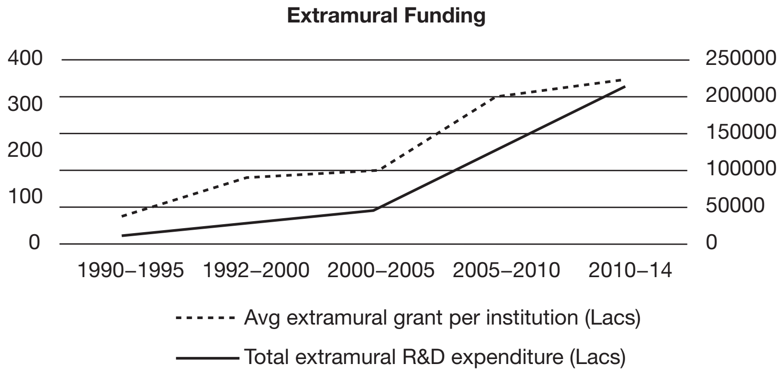

Figure 1.3 *Total and per University Extramural Funding Over the Years (in ₹ lakh)*

Source: Compiled by the author from various sources.

Given the increase in the number of research universities, it is useful to consider the extramural funding available per university. From the data on the number of universities over the years, we determined the average number of universities in the 5-year period. Using this and the data on extramural funding, we can estimate the extramural funding per university over the years. This is also given in Figure 1.3 (the scale on the left *y*-axis represents per university funding).

As we can see, the total extramural funding has continued to increase over the years. However, funding per university seems to have plateaued in the recent past at about ₹350 lakh per year. Even if we assume that 80 per cent of this research funding will go to the top 20 per cent of the universities engaged more actively in research, the average funding per research university will be around ₹1,400 lakh per year (approximately US$2 million.)

We can look at R&D funding available to universities in another way—from their own data—as reported to the NIRF. Using the data from the NIRF for 2018, we have considered the top 100 engineering institutions and the top 100 universities. We determined the average grant per institution for the top 100, as well average for the top 25 universities/engineering institutions.

Table 1.9 *Research Funding in Universities/Institutes (₹ lakh)*

	Average Per University/Institution in 2016–2017	Average Per Faculty in 2016–2017
For top 100 universities	2437.1	4.8
For top 25 universities	5568.3	9.7
For top 100 engineering institutions	1637.6	5.1
For top 25 engineering institutions	5027.9	12.7

Source: NIRF (2018).

These are given in Table 1.9 along with the average grant per faculty.

The average sponsored research funding per institution for the top 100 universities and engineering institutions is about ₹2,000 lakhs (about US$3 million). It is useful to look at per faculty-sponsored research funding in top universities. For computing the average per faculty, we computed the average per faculty of each institution and then took the average of these averages. This is also shown in Table 1.9—the average funding per faculty per year in all institutions and universities is about ₹5 lakh (approximately US$7,000). The average funding per HEI is twice or more in the top 25 institutions as compared with the average in the top 100. This is expected, as sponsored research funding naturally gets concentrated in a few top research institutions in a country. This is also desired, as the places that do the best research get more support. As expected, the average per faculty in the top 25 HEIs is about twice as much as in the top 100.

As we can see, the average research funding even in the top 100 institutions is modest—even for the top 25 HEIs, it is just about US$8 million per institution. (Only four universities and three engineering institutions received grants of more than ₹100 crore, i.e., approximately US$15 million.) Clearly, this level of research funding is insufficient for research universities, which need much more funds to do research at an international quality level. The NEP recognizes that the research funding available to universities is very limited and proposes establishing a National Research Foundation (NRF) to fund research in universities in all the different fields (NEP 2019).

1.4 TOP INDIAN AND GLOBAL UNIVERSITIES

The universities in India have evolved very differently from those in the developed world. Although India has more than 900 universities, very few of them feature in the top 200 in global rankings—none in the Times Higher Education (THE) and Shanghai rankings and some in QS rankings.

Global university rankings depend heavily on the research performance and impact of universities. For example, THE ranking gives 30 per cent weightage to citations and 30 per cent weightage to research, and 8 per cent out of the 30 per cent weightage is given to teaching which is related to the PhD programme. Others consider awards, fellowships, papers in top journals and so forth. As a result, all these top universities are well-known research universities with a strong emphasis on research.

Here we looked at the top 200 universities globally as per the THE ranking and the top HEIs in India as per the NIRF ranking and compare them in terms of a few key features—age, size and funding. For top HEIs in India, we have considered the top 100 in the university and top 100 in the engineering categories according to the NIRF ranking for 2018 (these include IISc, JNU, BHU, Delhi University, Jadavpur, IITs, NITs, IIITs and so forth) but exclude HEIs in the field of medicine, law, pharma, management and so forth. (Much of this analysis and results were reported in Jalote [2019].)

1.4.1 Age

The evolution of research universities took shape as the Humboldt model of HE, which proposed an integration of teaching and research, spread in the 1800s. It started from Germany and was vigorously adopted in the USA after some adaptation. Many new universities were created, which had research as an important goal, and many older universities reoriented themselves to become more research-focused. Many of these universities dominate the world rankings today.

Of the top 200 universities in the THE rankings, more than 65 per cent were created in the 19th century, when the Humboldt model started spreading rapidly. Only 19 per cent were created after 1950, when the current model of research universities with a focus on the PhD programme was firmly established and around the time when India got independence.

Of the top 100 universities and the top 100 engineering institutions in India, the age profile shows that about 60 per cent of them were created after 1975 and only six were created before 1900. The age of the top global institutions and top Indian institutions is shown in Table 1.10.

Late entrants indeed have a significant challenge in reaching the elite club of global top 200. First, establishing a decent research programme takes at least a decade or more, as it may take a few years to start a PhD programme; also, after starting the programme, it takes at least 5 years for the first PhD

Table 1.10 *Year of Establishment of Global Top-Ranked Universities and Top Indian HEIs*

Date of Creation of the University	No. of Global Top 200 Universities	No. of Top 100 Universities in India	No. of Top 100 Engineering Institutes in India
Created before 1900	132	2	4
Between 1900 and 1950	30	10	7
Between 1950 and 1975	23	23	35
After 1975	15	65	54

Source: Jalote (2019).

to graduate. Second, the impact of research is fundamentally time-dependent, and often, it takes decades for the impact to be recognized. Third, the impact the graduates of a university make, through which the perception of the university is strengthened, increases with time. The longer the university has been producing graduates and research, the stronger the impact. Thus, age helps a university in making it to the league of top universities, whereas young institutions face a significant obstacle in making it to this league.

The age distribution of all the HEIs in India is even more skewed towards youth. As of 2019, there were about 900 universities and about 90 HEIs which were listed as institutions of national importance. Of these, only eight HEIs were created before 1900. More than 80 per cent of the current HEIs were created after 1975 and about 70 per cent (670) of the HEIs were created in this century. It is clear that modern India is a late starter in the world of HE (ancient India was a leader with great universities such as Nalanda and Takshashila); much of the expansion in HE, including adding institutions with focus and potential for research, is very recent.

1.4.2 Size and Scope

Another factor that plays a significant role in being a top-class research university is the size of the university. Of the top 200 universities, the size in terms of the number of students is as follows: more than 90 per cent have student strength of more than 10,000 students (more than 60% have actually more than 20,000 students) and just about 2 per cent have a student population of less than 5,000. This distribution is shown in Table 1.11.

In India, in terms of student size, only seven engineering institutions have more than 10,000 students, and only two of them are public institutions. The two engineering institutions with the student population of more than 20,000 are both private universities. (It is important to recognize that in India, most private HEIs, particularly in engineering, are teaching-led and their primary

Table 1.11 *Student Strength in Global Top-Ranked Universities and Top Indian HEIs*

Size in Terms of No. of Students	No. of Global top 200 Universities	No. of Top 100 Universities in India	No. of Top 100 Engineering Institutes in India
Size <5000	5	50	68
Size between 5000 and 10,000	13	27	25
Size >10,000	182	23	7
Size >20,000	125	8	2

Source: Jalote (2019).

aim is to meet the needs of education.) The universities tend to be larger; still half of them have a student strength of less than 5,000, and only two of the eight that have a student strength of more than 20,000 are public universities. The student strength distribution of global top-ranked universities and top Indian HEIs is shown in Table 1.11.

In terms of faculty size, of the global top 200 universities, only 6 per cent have faculty members less than 500 and about 70 per cent have more than 1,000. In India, however, only three HEIs (less than 2%) have more than 1,000 faculty members; the overwhelming majority—more than 80 per cent—of the top-ranked HEIs have less than 500 faculty members. The faculty size distribution of global top-ranked universities and top Indian HEIs is shown in Table 1.12.

In other words, more than 90 per cent in the top 200 universities in the world have a student strength of more than 10,000 as against 15 per cent universities in India. Further, about 70 per cent of the top world universities have a faculty size of more than 1,000 and only 6 per cent have a faculty size of less than 500, as against about 2 per cent with a faculty size of more than 1,000 and about 80 per cent with a faculty size of less than 500 in India.

Table 1.12 *Faculty Size in Global Top-Ranked Universities and Top Indian HEIs*

Size in Terms of No. of Faculty Members	No. of Global top 200 Universities	No. of Top 100 Universities in India	No. of Top 100 Engineering Institutes in India
Size <500	12	79	94
Size between 500 and 1000	49	18	5
Size >1000	139	3	1

Source: Jalote (2019).

A large size will naturally imply that the university has faculty and departments in more disciplines, leading to broader research contribution and scope, as well as interdisciplinary research. A large faculty will also lead to more research, which also increases the chances of high-impact research. Moreover, a larger population of students graduating each year implies their contribution, impact and influence on society are greater. Both of these are important in building the stature and perception of a university.

In India, the approach for HE has been to develop specialized institutions imparting education in a few focused disciplines. Consequently, most universities tend to have a relatively narrow scope. For example, most universities (using the NIRF classification) have UG programmes in social sciences, humanities, natural sciences, arts, commerce and so forth, but do not have UG programmes in engineering. Similarly, most engineering institutions have UG programmes in engineering (e.g., BTech, BE) but generally do not have UG programmes in social sciences, humanities or natural sciences. Most universities or engineering institutions do not have medical schools, most of these being independent universities. A few may have law programmes at the UG level, but these are often offered by specialized law universities.

There is also a regulatory challenge. An engineering degree at the UG level (e.g., BTech, BE and so forth) is stipulated to be of 4-year duration, while the UG degrees in sciences, humanities and commerce (e.g., BA, BSc, BCom and so forth) are stipulated to be of 3-year duration.

Hence, the scope of most universities remains limited. As an example, let us consider a typical IIT—these institutions were created to impart education and conduct research in engineering and technology. A typical IIT has about a dozen or so departments and offers fewer than 10 UG degrees—mostly in engineering disciplines. Let us compare it with the Georgia Institute of Technology in the USA, another technology institution, which started with a single degree in mechanical engineering and then started degree programmes in a few other engineering disciplines such as electrical, civil, textile and chemical. Today, it has 6 colleges with 28 schools, most offering UG programmes. Nanyang Technological University (NTU) is another example, which is currently the second largest university in Singapore with more than 33,000 students and 10,000 faculty. It started in the 1980s with a charter to train engineers and programmes in three engineering disciplines—civil and structural, electrical and electronic and mechanical. It is now a broad-based university with colleges in engineering; business communication and information; education; biological sciences; humanities; social sciences; physical and mathematical sciences; and art, design and media. It offers more than 60 UG programmes in disciplines as diverse as business, art and design, communication, education, engineering, humanities, medicine, natural sciences, social sciences and sport science.

The NEP recognizes that having small and narrowly focused universities is not always conducive to a thriving research environment and proposes to have multidisciplinary research universities of decent size. It envisages that initially about 100 institutions can be converted to multidisciplinary research universities, and over a period of two decades, this number can increase to 150–300, each having 5,000–25,000 or more students (NEP 2019). The importance of multidisciplinary universities is also stressed in (Hatakenaka 2017).

1.4.3 Funding

Research universities are extremely expensive. There are a host of reasons for this (Altbach 2003). The faculty is expensive because these are the best brains who have to be compensated well. This cost is further increased, as such faculty members in these institutions teach fewer courses compared with their counterparts in teaching-focused institutions, thereby requiring more faculty members. These universities have a large doctorate programme, which is highly expensive (as PhD students are mostly paid) and is often missing in teaching-focused institutions. For conducting research, these universities need to have cutting-edge facilities and equipment, suitable library resources and support for travel to attend conferences, meetings etc. for the faculty and PhD students. All these add to substantial costs.

As discussed earlier, regarding R&D funding, the level of research funding available to Indian universities is modest. An analysis of data of the top universities and the engineering institutions (using the 2018 NIRF data) shows that the average research grant per HEI is about ₹24 crore (less than US$4 million) for the top 100 universities and about ₹16 crore for the top 100 engineering institutions. The average per faculty research grant in these HEIs in India is about ₹5 lakh (about US$7,000). While the human resources and some other costs are lower in India, many other costs associated with research such as equipment, international travel and digital library subscriptions, are the same as in other countries. As mentioned earlier, the NEP recognizes that this level of funding is insufficient for research universities to thrive and has proposed to substantially increase research funding for universities by setting up a research foundation.

To put this in a global context, let us look at the data from the Carnegie classification for US universities. For about 330 universities classified as research universities (as per 2015 results and data [Carnegie 2015]), about one-third are in each of the three subcategories—R1, R2 and R3. The average R&D funding per faculty for R1, R2 and R3 is US$300,000, US$150,000 and US$30,000, respectively. Also, research funding in top universities globally is often in hundreds of million USD. We can safely say that R&D expenditure in top universities in India is modest and significantly lower than even the research universities in the R3 subcategory in the USA.

1.5. SUMMARY

The Indian HE system is complex. It has evolved mostly for education, and research has not been given due importance. As a result, research universities of India are mostly quite young, small, often narrow and not adequately funded, compared with their global counterparts.

In this chapter we have briefly looked at the structure and evolution of the Indian HE system and the evolution of research universities in it. It then discussed two important aspects of research universities: PhD production and research funding. To put the Indian research universities in a global perspective, a comparison of the age, size and funding of top Indian universities and the global top universities has been presented.

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