FWU Journal of Social Sciences, Fall 2019, Vol.13, No.2

A Descriptive Analysis of Research Culture in Pakistan

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This study addresses evolution of research culture in Pakistan. The study is descriptive in nature. The primary analysis is related to 180 Pakistani universities and 13259 PhDs produced from these universities since 1947 till 2016 along with their different contextual ratios such as geography, gender, public, and private sectors, universities and number of produced PhDs, supervisor and number of produced PhDs ratios, era wise growth of number of universities and produced PhDs. The study accounts for benchmark changes in leadership and resources as impacting factors for change in number of universities and produced number of Doctoral Researches (PhDs). The primary source for data is HEC while respective websites of the universities (if available) are also explored for the missing data. The study documents relatively recent emergence of certain assets in terms of a research culture and anticipates an opportunity to build upon these assets in future. Public universities with more experience are taking lead in almost all domains such as increase in number of universities and PhDs produced, their geographic and gender diversity, and supervisor to PhDs ratio etc. and private and relevantly new universities lag behind. If these could also start contributing soon Pakistan could muster the fruit of a rich research culture.

***Keywords*:** research culture, evolution, Universities, Pakistan.

Contrary to the developed countries with a strong research culture, developing countries lag far behind. Instead of contributing to the development of the knowledge based economy, like in the developed world, the third world exhibits a weak research culture with firm teaching conventions (Salazar-Clemeña & Almonte-Acosta, 2007), where Pakistan stands no exception. Whereas top countries have been spending an average range of 2.5% (Germany) to 3.9% (Israel) of their GDP on research and development expenditure over the last 23 years, the South Asian countries could not reach even 1% as their expenses range from 0.1% (Sri Lanka) to 0.8% (India) whereas Pakistan stands at 0.3% of its GDP which is less than India and greater than Sri Lanka and Nepal while data for other South Asian countries are missing (see Graph 1).

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Contribution of Authors:

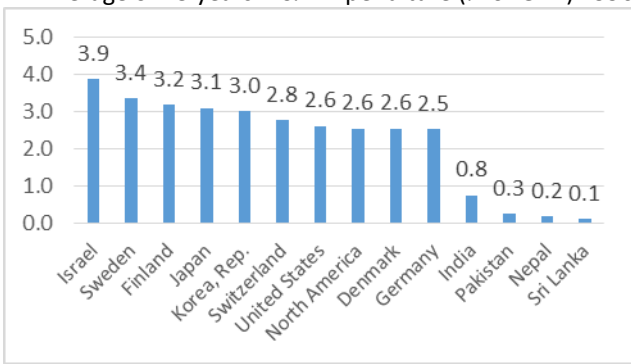
Imran Naseem has contributed in structuring and streamlining the literature.

Muhammd Tahir has identifying the thematic patterns, and variables for the study.

Asim Afridi has contributed in devising methodologies for the study. All authors also contributed in data analysis.

Bilal bin saeed has contributed in devising methodologies for the study. All authors also contributed in data analysis.

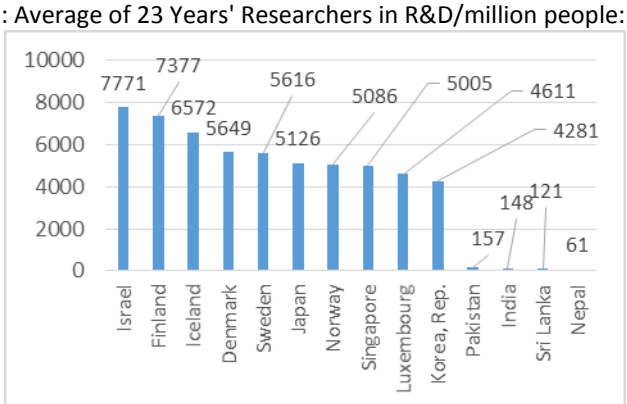
Graph 1: Average of 23 years' R&D Expenditure (% of GDP) 1996-2018



Source: (World Development Indicators, 2019)

Similarly there are 47 countries with lower middle income and data for 31 countries are available on World Bank website. Pakistan stands above 17 and below 13 countries on the list. Consequently, while Israel boasts an average of 7771 researchers in Research and Development (R&D) per million people, Pakistan stands with only 157 researchers in R&D per million people, though it is the highest in the region (see graph 2). Similarly, it stands above 17 and below 10 countries with lower middle income where data are available for 28 countries. This realization reveals that Pakistan is doing well in its respective region as well as in group of countries that fall in its relevant income group. We believe that even this figure results from the establishment of Higher Education Commission (HEC) of Pakistan in September 2002 when a task force for the improvement of higher education in Pakistan proposed an autonomous body with the task of promoting research in higher education citing ineffective administration, lack of requisite infrastructure, and incompetence of the academic staff to conduct research as the major causes of declining standards of education in Public sector universities (Akbari & Naqvi, 2008).

Graph 2: Average of 23 Years' Researchers in R&D/million people:1996-18

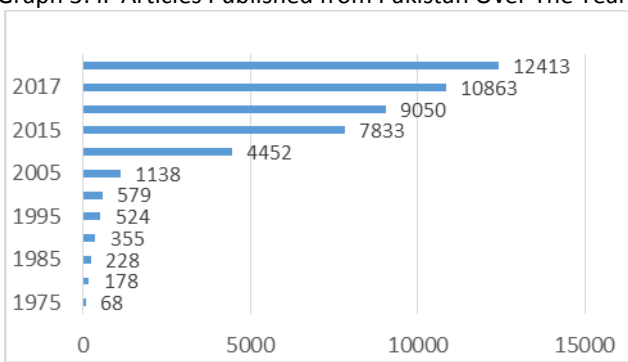


Source: Date from World Develoment Indicators 2019

The higher education budget saw an all times greatest leap of 7 times from 2002 to 2008 making it a world record (Shaukat, 2012). The country subsequently saw an increase in universities from 74 in 2001 to 145 in 2012 and students from 276 thousands to more than a million in 2012 and further increase in universities to 195 in 2019 (Higher Education Commission of Pakistan, 2019). Similarly, the country is also witnessing a remarkable increase in number of publications that jumped from 68 in 1975 to 1138, 4452, 7833, and 12413 in 2005, 2010, 2015, and 2017 respectively,

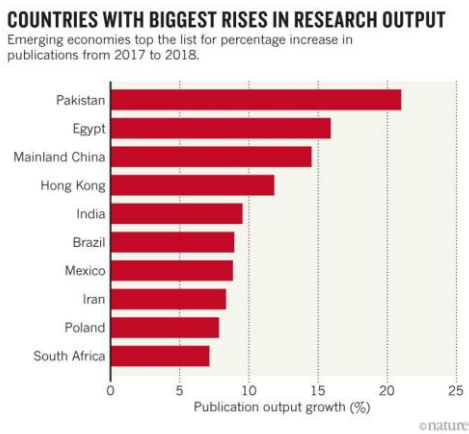
consequently becoming the top country with the biggest rise in research output from 2017 to 2018. See Graphs 3 & 4. However, mere increase in number is not enough as many universities are reported to fall short of the required faculty, though with the increased number of PhDs a reasonable resource pool is available to universities in general. Adding fuel to this, with the changes in governments HEC has been working with shrinking budget and performing poorly (Shaukat, 2012). In US 15 out of top 20 universities are reported to be private (Bridgestock, 2013). It might be useful to have a comparison of public and private universities' performance. Similarly, women with PhD have been lesser in numbers historically but have been increasing over the time (Studio & Foundation, 2009). This would also be interesting to see if the same pattern prevails in Pakistani context. Since a review of international studies reveals the predominance of the developed countries implying a limited ability of the literature to properly describe the cultural dynamics of the less developed countries (Jan-Benedict, & Steenkamp, 2001) like Pakistan, we consider it high time to have a look into the evolution of research culture in Pakistan.

Graph 3: IF Articles Published from Pakistan Over The Years



Source: Data from Word Development Indicators 2019

Graph 4



Source: Web of Science Analysis: ISI, Clarivate Analytics

Further, it also seems appropriate to study impact of leadership change in the evolution of the research culture as leadership has been identified as a key factor in fostering a research culture (Bland & Ruffin, 1992) and quite a few others that shall be discussed in literature section. Similarly

change in resource allocation has also been identified as an important ingredient to foster a research culture by (Hill, 2002) and others which also gives an avenue for research. In US 15 out of top 20 universities are reported to be private (Bridgestock, 2013). It might be useful to have a sector based comparison of public and private universities' performance. Similarly, women with PhD have been lesser in numbers historically but have been increasing over the time (Studio & Foundation, 2009). This would also be interesting to see if the same pattern prevails in Pakistani context. We would also explore geographic and gender diversity in research culture of the country.

Literature Review

Though Evans, (2009) terms research culture as a vague concept perhaps because of different aspects arising from different studies, Hill, (1999) defines it as an environment in which research grows and multiplies. However, Rosas, (2013) sees it as "a blind date with the unknown" and Mapa, (2017) as "the way we do research round here". Interestingly, Hauter defines it in the context of an organization that "how each individual should think, act and make decisions about research", whereas Schein, (1985) defines it in six different aspects such as 1) Observed behavioral regularities, 2) the research norms, 3) the dominant research values, 4) organizational research philosophy, 5) organizational rules of the game, and 6) the research climate. The following sections present a review of the literature from different geographic perspectives.

International Studies

A review of international studies reveals significant cultural differences across countries such as income differences in rich and poor countries, differences of the countries in their Orient and the Occident, differences in countries with emerging economies, and the countries with economies in transition towards a more market-driven form. (Farley & Deshpandé, 2004) & (Dilworth-Anderson, Williams, & Gibson, 2002) and these differences in the globalized world are intermingling with other cultures and causing contamination, plurality, and hybridization(Craig & Douglas, 2006). Another study terms culture as an exogenous variable to the firm with contextual reference to comparative management approach (Deshpande & Webster, 1989)**.** The fact that a limited set cannot disclose complete dynamics of culture (Jan-Benedict & Steenkamp, 2001) also reflects a research failure to specify a holistic set of variables to encompass 'pan cultural' aspects to theorize it (Bhagat & McQuaid, 1982) & (Shalom, H. Schwartz; Maria, 1995).

Culture, owing to its definitional diversity and measurement, also poses challenge to research, be it at group, organizational, or national level (Leidner & Kayworth, 2006). Among these challenges is the adherence of the researchers to transparency, openness, and productivity which despite being held as disciplinary norms and values internationally, are not adhered in letter and spirit (VandenBos et al., 2015). However, among common attributes to develop a research culture, strong leadership (Bland & Ruffin, 1992) and management investment are the common frameworks (Slade, Philip, & Morris, 2018). These leaders are equally important at individual and institution base not only to set vivid research objectives but also to effectively communicate them. Allocation of sufficient resources for training and support of faculty, in case of an education institute like all others, is an important prerequisite in any endeavor for developing a strong research culture where the faculty is also collaborative. These resources must also be flexible to accommodate faculty's interest areas (Hanover, 2014). It is equally important to synergize strengthening and sustainability of individuals as well as organizations contrary to isolation (Bland & Ruffin, 1992) & (Slade et al., 2018) and developing national research culture would need this synergy at a greater level and commitment. Even with all the prerequisites set, a research culture may take years to evolve (Hanover, 2014). Whereas many of the international studies that we covered above are primarily conducted by

researchers in the USA, the following different sections present picture of different regions and countries i.e. UK is separately highlighted assuming its lead role in the developed world along with USA, and Pakistan specific literature is separately explained because Pakistan is the focus of this study.

UK Studies

Research studies conducted in the UK indicate that in terms of resource allocation there is proper national mechanism rightly placed and funds are available direct to the individuals or groups of teachers even at the school level (Ebbutt & Ebbutt, 2006). A study in the Sheffield University highlights 8 main indicators of research culture in the UK i.e. a) fostering quality research, b) recruitment, c) staff development, d) research discussion, e) departmental structure, f) culture, g) management, and h) doctoral researchers ("Fostering an effective research environment," 2017). However, without negating the role of competition and differential assessment, the research culture still lacks the value of team work and collaborative efforts (Sarah, 2018). It also does not encourage the activities that the researchers believe are important for high research and need of doing everything possible to ensure the culture of research support for the quality research practice(Notes, 2015).

Scandinavian Studies (Netherland, Denmark, Finland)

A bird eye view of Scandinavian countries highlights the important role of action research in cultivating a research culture (Kjerholt & Hølge-Hazelton, 2018). Another study emphasizes the enabling competencies to ensure smooth knowledge production in knowledge economy, forecasting blessings to the future elite of knowledge workers (Kessels & Keursten, 2002). The digital humanities in the region are in search of identity and creating new space for the research culture having enough attributes to take care of multitude of issues. The same can be achieved only through national collaboration and synergizing the strengths of the existing digital humanities hubs (Matres, Oiva, & Tolonen, 2018).

Asia Pacific Studies (Australia, New Zealand)

Studies in this region, like international studies (Bland & Ruffin, 1992; Slade et al., 2018; Hanover, 2014; Scandinavia, Kjerholt & Hølge-Hazelton, 2018), and UK "Fostering an effective research environment," (2017), Southeast Asia (Rosas, 2013; Schein 1985), also emphasize on the strong leadership for evolving a dynamic research culture along with decentralization of the university management structure (Pratt, Margaritis, & Coy, 2007; Marchant, 2009). A strong leadership through optimum use of resources can transform traditional teaching loaded model into a more research oriented outlook, enabling creation of new knowledge which is pivotal to the universities' mission (Marchant, 2009). In a pursuit of evolving and maintaining research culture, young researchers must be mentored by the senior researchers as mentoring network can significantly contribute to research culture (Studman, 2003). Like Scandinavian countries, action research is considered a proven means for developing the research skills (Ferguson, 1999).Research culture is nurtured at institutional and individual level. The former requires cohesion and ease in terms of knowledge sharing, research direction, research support, and resource availability while the latter requires motivation, research skills development, the parallels between the study of research culture and the organizational culture (Hill, 2002).

Southeast Asian Studies (Malaysia, Philippines, Vietnam)

Although a study reflects a stated aspiration for research (Rosas, 2013) but we also find cold response of the officials to acknowledge policy-practice gap and a less accommodating research

culture, though, with a slowly growing appreciation for moving from conventional quantitative research to qualitative one (Scott, Miller, & Lloyd, 2006). A research culture in its evolution may pass through phases like creating, growing, developing, and nurturing research (Anuar & Abdul, 2013). Mapa, (2017) identifies some important contributing factors to research culture such as research policies, budget, benefits and incentives, research committees, culture and working environment, infrastructure, and inter-institute collaboration. Similarly, Dacles et al., (2016) found that institutional support drives individual faculty to become part of the organizational culture. Their contributing factors are research unit, incentive, expertise, research programs, and institutional policies where research output stands the weakest factor. However, individually targeted external incentives are not enough to foster a research culture, it needs a holistic approach on behalf of the administrators to embed research in their culture (Teehankee, 2015).However, whereas a strong research culture would result in high research productivity, the same is not necessarily true vice versa (Anuar & Abdul, 2013) contrary to the many who believe in this bidirectional relation.

Miscellaneous

The same dilemma is true in India, outside Southeast Asia, where a tendency prevails to treat research and publication alike causing inability of the institutions to have a genuine research thrust. Since publication are the result of individual needs for its survival or promotion rather than culminating from a common zeal (Chakaraborty, 2017). There is a dire need to target research culture rather than research publication. Developing countries have been lately seen realizing the need for research orientation such as Mexico that is witnessing a predominance of research in the academic environment recently(Mendez & Cruz, 2014). Similarly, China is witnessing a research zeal where the government funds for research have been growing annually at the rate of more than 20% which is a surprise even to the most enthusiastic scientists (Shi & Rao, 2010).

Pakistan Studies

There are only a few studies found on the subject within Pakistani context. However, with the establishment of Higher Education Commission in September 2002 (Akbari & Naqvi, 2008) Pakistan has been witnessing an upward trend in IF publications since 2002 and has witnessed remarkable increase in producing PhDs (Lodhi, 2012) with an increasing number of students enrolling for Masters' and Doctoral degree. However, this does not bring the research culture any closer to being inspiring and the shortage of third party supervision and dearth of quality academic professional adversely affect it (Agha, 2015). Besides citing this trend as an indicator of acceptance of the research culture in the country, Lodhi, (2012) also cautioned for more efforts to bring balance between prevailing teaching traditions and a strong research culture in Pakistani universities. Agha, (2015) also agrees to it and indicates adverse effects of absence of third party supervision and quality academic professionals resulting in compromised caliber of Pakistani students. The study also identifies culture in three domains i.e. 1) an individual's capacity to undertake research activities, whereas this ability can be built, enhanced, and refined through training, 2) human development through unspecified medium, and 3) a set of common ideas, customs, skills etc. held by some people that are transferred to their successors. These are different but useful research culture features (Lodhi, 2012).According to Thomson Reuters, "In the last decade, Pakistan's scientific research productivity has increased by more than four times, from approximately 2,000 articles per year in 2006 to more than 9,000 articles in 2015. During this time, the number of Highly Cited Papers (HCPs) featuring Pakistan-based authors increased tenfold from 9 articles in 2006 to 98 in 2015" (Herciu, 2016). But Hoodbhoy, (2016) is sceptical to this progress as he does not see on ground many of the prerequisites for such progress and terms it 'Playing the ranking game'.

The literature above highlights different indicators that help foster a healthy research culture. These include **leadership** (Bland & Ruffin, 1992), (Slade et al., 2018), (Hanover, 2014), (Kjerholt & Hølge-Hazelton, 2018), ("Fostering an effective research environment," 2017), (Rosas, 2013), (Schein, 1985), & (Marchant, 2009), **culture** (Farley & Deshpandé, 2004),(Dilworth-Anderson, Williams, & Gibson, 2002), (Craig & Douglas, 2006), (Deshpande & Webster, 1989)**,** (Jan-Benedict & Steenkamp, 2001), (Bhagat & McQuaid, 1982),(Shalom, H. Schwartz; Maria, 1995), (Leidner & Kayworth, 2006), ("Fostering an effective research environment," 2017), (Mapa, 2017), (Dacles et al., 2016), (Anuar & Abdul, 2013),(Agha, 2015), & (Lodhi, 2012), **resources** (Hanover, 2014), (Ebbutt & Ebbutt, 2006), (Marchant, 2009), & (Hill, 2002), **doctoral research** ("Fostering an effective research environment," 2017), (Lodhi, 2012), & (Agha, 2015), **management** (Deshpande & Webster, 1989)**,** (Slade, Philip, & Morris, 2018), ("Fostering an effective research environment," 2017), (Pratt, Margaritis, & Coy, 2007), & (Marchant, 2009), **collaboration** (Mapa, 2017), (Hanover, 2014), ("Fostering an effective research environment," 2017), (Sarah, 2018), & (Matres, Oiva, & Tolonen, 2018), **development** ("Fostering an effective research environment," 2017), (Ferguson, 1999), (Hill, 2002), (Scott, Miller, & Lloyd, 2006), (Anuar & Abdul, 2013), (Lodhi, 2012), & (Agha, 2015), and **Quality** ("Fostering an effective research environment," 2017), (Sarah, 2018), (Notes, 2015), 2002 (Akbari & Naqvi, 2008), (Agha, 2015), & (Lodhi, 2012) etc.

Method

To gauge the impact of **leadership**, we have taken four bench marks for leadership change i.e. 1) Till 1947 when Pakistan came into being, 2) 1948-1971 when the countries split into two separating Eat Pakistan as Bangladesh, 3) 1972-1998 when Pervez Musharraf the then Army Chief toppled the democratic government and enforced emergency, and 4) 1999-2016 the era that began after the topple. The same bench marks are used for gauging the impact of **Resources** in terms of increased number of universities and PhDs where number of **Doctoral Research** (PhDs) also serves as proxy for change in **culture.** In addition our study takes into account different demographic indicators such as geographic, gender, and sector diversity along with university and supervisor ratio with respective number of PhDs produced.

Though in our broader scope we used mixed methodologies using both quantitative (descriptive analysis) as well qualitative (thematic analysis) techniques but this paper would only elaborate descriptive approach to see through different chronological stages of the research evolution in Pakistan. Second version of this study deals with evolution of research culture with contextual reference to Management Sciences. Our third version deals with qualitative analysis of the research culture.

Hence, findings of this study are purely based on descriptive analysis. Its primary analysis evolves around 180 Pakistani universities and 13259 Doctoral Researches (PhDs) produced from these universities since 1947 till 2016 along with their different contextual ratios such as geographic and gender diversity, contribution of private and public sectors, universities and number of produced PhDs, supervisor and number of produced PhDs ratios, era wise growth of number of universities and produced PhDs as indicators to demonstrate evolution of research culture. It is a broad and general picture derived from the descriptive analysis and does not deal with the in-depth qualitative analysis. Time period starts from country's inception in 1947 and comes down to 2016. Whereas gender, public, and private sectors are obvious, geographic division needs a bit explanation as follows. It is primarily divided into 7 administrative units i.e. 4 provinces i.e. Baluchistan, Khyber Pakhtukhwa, Punjab, and Sind along with 2 semiautonomous regions i.e. Azad Jammu and Kashmir (AJK) and Gilgit Baltistan. Islamabad is the 7th unit comprising of capital city and adjacent areas. The Data source is

primarily HEC[2] , Pakistan and respective universities' websites with a few exceptions where websites were not available or updated, phone calls were made to avail required data. The graphs are taken from other sources and cited accordingly while tables are based on the data retrieved from HEC and developed during the study.

Results

We find that with each change in leadership, resources have increased and resultantly number of universities and Doctoral Researches have also increased. However this change is immensely noted in the last change of leadership i.e. 1998. Similarly these changes in leadership and resource allocation have also been impacting research culture of the country in desirable direction. Pakistan had 180 universities till the time we fetched data from the HEC website. However, these universities are not equally stretched geographically as vast areas of AJK (Azad Jammu and Kashmir), Baluchistan, and Gilgit Baltistan have only a meagre share in the universities of just 16 universities across the breadth of these regions, contrasting to this Islamabad Capital Territory being a single city has a reasonable chunk of 21 universities. Punjab, Sindh, and Khyber Pakhtunkhwa have also reasonable shares. Public universities are in greater number in all regions except Sindh where private sector surpasses its counterpart (see Table 1). Glancing over era based breakup, we witness an encouraging trend in recent years. Last 2 decades have produced more universities than the first five decades (see Table 2). Not all of 180 universities are producing PhDs. Only 76 of them are productive in that sense. About 1/3rd of private and half of the public sector universities are on the productive list. This is in line with their establishment dates as majority of private universities are relatively new (see Table 3).

HEC record shows that Pakistani universities have so far produced 13259 PhDs. There is also a pending list which we do not account for this study. Picture remains almost same as previous except that Islamabad even being lesser in number of universities has produced more than twice PhDs than KP. Similarly though there is marginal difference in number of universities in Punjab and Sindh, the gap in terms of PhDs is quite wider. Reason for this could be Quaid e Azam University in Islamabad that has produced a larger number of PhDs and the relatively older universities in Punjab than in Sindh (see Table 1).

Table1

Geographic Stretch of Universities and their Produced PhDs

Geography	Number	Total	Private	Public
Total	Universities	180	75	105
	PhDs	13259	495	12764
Azad Jammu & Kashmir	Universities	7	3	4
	PhDs	27	0	27
Balochistan	Universities	8	1	7
	PhDs	92	0	92
Gligit & Baltistan	Universities	1	0	1
	PhDs	0	0	0
Islamabad Capital Territory	Universities	21	6	15
	PhDs	2559	51	2508
Khyber Pakhtunkhwa	Universities	33	10	23

[2] http://prr.hec.gov.pk/jspui/

	PhDs	1267	120	1147
	Universities	57	25	32
Punjab	PhDs	5737	43	5694
	Universities	53	31	22
Sind	PhDs	3577	281	3296

Source: Based on data retrieved from HEC website

Era wise distribution of PhDs, which correlates with changes in leadership and allocation of resources for higher education, reveals that last two decades have produced more PhDs than the first 7 decades as the first PhD was produced in 1930 by the University of the Punjab, even before the creation of Pakistan (see Table 2). The breakup of female PhDs shows a very encouraging growth in number in last two decades that is more than 6 times than all the previous PhDs. See Table 2. Growth in male PhDs also reflects encouraging trend where more than four times increase in number in the last two decades has been recorded (see Table 2).

Table 2

Era wise Distribution of Universities, Their Produced PhDs and Their Gender Ratio

Era	Number	Total	Private	Public
Till 1947	Universities	1	0	1
	PhDs	29	0	29
	Female PhDs	1	0	1
	Male PhDs	28	0	28
1948-71	Universities	5	0	5
	PhDs	282	0	282
	Female PhDs	20	0	20
	Male PhDs	262	0	262
1972-98	Universities	58	28	30
	PhDs	2258	2	2256
	Female PhDs	412	1	411
	Male PhDs	1846	1	1845
1999-2016	Universities	116	47	69
	PhDs	10690	493	10197
	Female PhDs	3252	108	3144
	Male PhDs	7438	385	7053

Source: Based on data retrieved from HEC website

Twenty six (26) out of 76 PhD producing universities are private and 50 are public sector universities. Seventy four (74) PhDs per university is the ratio considering all 180 universities. Segregation reveals that this ratio sharply declines to 8 PhD per university in private sector universities and goes up to 102 PhDs per university in public sector. If we exclude non-PhD producing universities, ratio for overall PhD producing universities goes up from 74 to 174 PhDs per university. Similarly, ratio for private and public sector universities also goes up from 8 and 102 to 23 and 214 respectively (see Table 3).

Table 3

Segmentation on PhDs Producing & Nom-Producing Universities

Category	Total	Private	Public
Universities	180	75	105
PhDs Producing Universities	76	26	50
Non-PhDs Producing Universities	104	49	55
Uni:PhDs (180 Universities)	74	8	102
Uni:PhDs (180 Universities)	174	23	214

Source: Based on data retrieved from HEC website

University of Karachi has produced most number of PhDs among all the universities. This number is almost about 2500 PhDs. University of the Punjab stands second for producing about 2200 PhDs. University of Agriculture Faisalabad and Quaid e Azam University are the other two universities that have produced more than 1000 PhDs. University of Peshawar and University of Sindh have produced more than 500 PhDs each. While top 21 universities have produced 11909 PhDs altogether, rest of the 55 universities collectively have produced only 1350 PhDs. All these 21 universities come from public sector (see Table 4). Hamdard University tops the list of private universities with 96 PhDs. Followed by Ghulam Ishaq Khan Institute of Technology, Muhammad Ali Jinnah University, and Qurtuba University of Information Science with 54, 51, and 44 PhDs respectively As highlighted in Table 4.Four universities have produced major chunk of 7361 PhDs which is more than half of the total number of PhDs. If we include two other universities producing more than 500 PhDs make this share even bigger to the proportion of 2/3rd of the total PhDs. Fifteen universities have produced 100 or more PhDs each. None of these 21 universities are from private sector. Private universities come to scene where universities have produced less than 100 PhDs. Hamdard University tops the list with 96 PhDs as shown earlier. There are two other private and seven public universities that have produced more than 50 PhDs. Eleven private and 13 public universities have produced 10 or more PhDs. Whereas 21 universities have produced less than 10 PhDs each, needless to mention 104 universities with no PhD output (see Table 5).

Table 4

Top Universities With Respect To Producing PhDs

13259 PhDs Produced By 76 Universities		**496 PhDs Produced By 26 Private Universities**	
Name (All Top Universities Come from Public Sector)	**PhDs**	**Name**	**PhDs**
University of Karachi, Karachi	2443	Hamdard University, Karachi	96
University of the Punjab, Lahore	2188	Ishaq Khan Institute of Engineering Sciences and Technology, Swabi	54
University of Agriculture, Faisalabad	1392	Mohammed Ali Jinnah University, Karachi	51
Quaid e Azam University, Islamabad	1338	Qurtuba University of Science and Information Technology, DIK	44
University of Peshawar, Peshawar	778	Foundation University, Islamabad	41
University of Sind, Jamshoro	655	Baqai Medical University, Karachi	34
Bahauddin Zakaria University, Multan	495	Preston University, Kohat	26
Islamia University, Bahawalpur	342	Lahore University of Management Sciences, Lahore	25

PMAS-Arid Agriculture University, Rawalpindi	314	Iqra University, Karachi	22
National University of Modern Languages, Islamabad	278	Jinnah University for Women, Karachi	19
Government College University, Lahore	247	Shaheed Zulfiqar Ali Bhutto Institute of Sciences and Technology, Karachi	12
The University of Agriculture, Peshawar	189	Northern University, Nowshera	12
COMSATS Institute of Information Technology, Islamabad	165	Riphah International University, Islamabad	10
Allama Iqbal Open University, Islamabad	164	Isra University, Hyderabad	10
Pakistan Institute of Engineering and Applied Sciences, Islamabad	147	Sarhad University of Science and Information Technology, Peshawar	8
University of Veterinary and Animal Science, Lahore	142	Zia-ud-din Medical University, Karachi	7
National University of Science and Technology, Islamabad	137	The University of Faisalabad, Faisalabad	6
International Islamic University, Islamabad	132	University of Management and Technology, Lahore	4
University of Engineering and Technology, Lahore	126	Sind Institute of Medical Sciences, SIUT, Karachi	4
Gomal University, DIK	123	The University of Lahore, Lahore	3
University of Engineering and Technology, Taxila	114	University of Central Punjab, Lahore	2
55 Other Universities	1350	The Superior College, Lahore	2
Total	13259	Iqra National University, Peshawar	1
		City University of Science & Information Technology, Peshawar	1
		Preston University, Karachi	1
		Lahore School of Economic, Lahore	1
		Total	496

Source: Based on data retrieved from HEC website

Table 5

Major Segments of Universities with Number of PhDs

	>=1000	>=500&<1000	>=100&<500	>=50&<100	>=10&<50	<10
No. of Universities	4	2	15	10	24	21
PhDs	7361	1433	3115	708	581	61
Private	0	0	0	3	11	12
Public	4	2	15	7	13	9

Source: Based on data retrieved from HEC website

Similarly, if we explore number of supervisors with number of PhDs produced, we realise that 100 supervisors have produced 10 or more PhDs each. Dr. Atta Ur Rehman tops the list with over 50 PhDs. Further, 360 supervisors have produced 5 or more PhDs. Similarly, 223, 448, and 1030 supervisors have produced 4, 3, and 2 PhDs each respectively. Whereas 4060 supervisors have only

produced one PhD each. We can see that fewer supervisors have produced more than 5 PhDs each. A huge number of supervisors have so far only produced one PhD each and this does not include a vast majority of the faculty who have produced no PhD so far (see Table 6).

Table 6

Segmentation of Supervisors according to PhDs Produced

Number of PhDs Supervised	Number of Supervisors	Number of PhDs
1	4060	4060
2	1030	2060
3	448	1344
4	223	892
>=5	360	2241
>=10	100	1610

Source: Based on data retrieved from HEC website

Conclusion

We can safely conclude that with each change in leadership, resources have increased and resultantly number of universities and Doctoral Researches have also increased. However this change is immensely noted in the last change of leadership i.e. 1998. Similarly we also conclude that these changes in leadership and resource allocation have also been impacting research culture of the country in desirable direction and speed of evolution has increased in last two decades. We also conclude that recent years have been more productive in all spheres. Number of universities have increased many folds in comparison to previous eras. Number of PhDs also tremendously increased. However, this increase has not come from broad range of universities as bulk of PhDs has come from older and public universities. This clearly credits the leadership change and increase in allocation of resources for higher education and confirms literature (Bland & Ruffin, 1992), (Pratt et al., 2007), (Marchant, 2009) that leadership is an important ingredient in cultivating research culture. However, there is room for improvement as if new and private universities also start contributing, our research culture would have increased cultural depth. Further not all public sector universities are equally contributing. Their stronger contribution would also add to this evolution. Similarly, a vast geography has very limited educational facilities. Equity based policies would surely benefit whole of the society. Gender equity also bears benefits for all. Stronger contribution from private sector would also add to the length and breadth of this evolving research culture in coming years, *in shaa Allah (God willing)*. Similarly, increased efficiency of supervisors could also add to the improvement. However, recent trends are encouraging and we hope their continuity and further improvement.

Limitations and Future Course of Action

There are many indicators of the research culture but the study merely focused on number of universities and their output in terms of PhDs based on the leadership and resource allocation benchmarks. The study does not explore characteristics of the respective leaderships. Further, the study also does not cater for political atmosphere of the country in terms of its priorities regarding education. Similarly, HEC also provided numerous foreign PhD scholarships and many of the scholars have returned back with their degrees but that was also out of our scope. Future researches can focus, among others, on PhDs produced and their respective publications and a comparison of performance between foreign and indigenous PhDs. Though this paper presents quantitative outlook,

future researches may also go qualitative. This also remains unanswered whether this improvement results from change in leadership or resources alone or it results from combination of the both.

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Received: Feb 14, 2019
Revisions Received: August, 2019