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EXPLORING THE RELATIONSHIP BETWEEN HIGHER EDUCATION AND ECONOMIC GROWTH IN PAKISTAN: A TIME SERIES ANALYSIS

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Abstract
This paper has evaluated the interrelationship between economic growth and development of higher education in Pakistan using a time series analysis over the period of 20 years which was thorough. The study explored the impacts of an increase in enrolment in tertiary education, government spending in higher education, and the growth of institutions on some important economic indicators, which are growth of GDP, per capita income and level of productivity. The analysis used quantitative techniques of correlation analysis, regression modeling, and Granger casuality observations in the analysis of data between 2000-2020 data involving the university enrollment trends, the rate of graduation, and budget allocation to education as well as the macroeconomic variables. Those results indicated that there existed complicated mutual influences between investments in the higher education and the performance of the economy, with the occasional differences in the temporal pattern variations at various periods. Though there has been an upsurge in infrastructure generation and enrolment in higher education, the conversion into incessant economic growth was fraught with some drawbacks, which encompassed brain drain, internal structural economic constraints and skill-job mismatches. The research conducted showed that there were considerably positive correlations between increased spending in education and growth in GDP in a given time and here especially in 2005- 2010, but it decreased over the next years. The findings showed that the policies of the government of funding the research, university-industry collaborations, and graduate retention mechanisms were vital in the optimization of the economic implications of their higher education

investments. The study also identified useful information on the part of policymakers in determining the best education techniques to initiate sustainable economic growth in the developing economies.

INTRODUCTION

The study of economic development experienced by the Pakistani economy in the last 20 years displayed multifaceted relations between the growth and human capital development that was in need of careful
examination (Sarwar, Khan et al. 2021). The mode of higher education in the country had never seen this amount of change as during the time, the higher education sector saw rapid growth of institutions, enrollment capacities and spread of the academic programs in various fields. This change was associated with a period of erratic economic performance thus providing a research potential to study the causal links involving educational investments and economic performance (Sultana, Dey et al. 2022).

The role of higher education to economic development is quite relevant in the case of Pakistan where classical sectors of the economy needed to be modernized and skilled persons to meet the demands in the global markets (Murtaza and Hui 2021). Since 2000, the number of universities and degree-granting organizations has grown to more than 200 today, making it a radical change in the education system of the country. This growth involved both the government and the privately owned institutions which provided different avenues through which the human capital could grow within different economic sectors (Jahantab 2021).

The amount of government spending on tertiary studies rose significantly over the course of the study, through such policy initiatives indicating commitment to growth through education development (Moeed and Afjal 2024). In 2002, the Higher Education Commission was established which initiated wide-ranging reforms to enhance educational quality, enhance research capability and competitiveness with international standards. They emerged in the form of faculty development programs, modification of the infrastructure, and creation of new universities in the underrepresented areas (Shyiramunda and van den Bersselaar 2024).

Associations did not occur in simple linear forms, but the connections between educational growth and economic performance were more complicated than it might appear between the two variables. The economy of Pakistan underwent a series of structural problems as evidenced by the study period where the country had to grapple with energy shortages, political unrests, security issues, and a lack of industrialization. All these could have been the factors that had a hand in the level to which investments in the higher education had been transformed to significant economic growth realities(Xiao, Sheng et al. 2024).

Agriculture continued to play a predominant role in the employment pattern, which posed specific challenges to the members of higher education who in many cases had acquired skills related to settings of industrial or service sector opportunities. This misfit in outcomes of the educational system and in the economic organization brought out the need to not only look at growth in education, but also the synchronization of education with economic demand and potential(Seti, Ngqulana et al. 2025).

The education-growth nexus was further complicated by the fact that due to brain drain phenomena, large portions of highly educated graduates continued moving to the developed world with hopes of attaining better careers. Such leakage of human capital had the potential to dampen domestic economic gains of investing in education by producing negative externalities that had to be taken into consideration with caution when making policies(Molnár, Jenei et al. 2024).

Another complexity in the analysis was the regional disparities existing in Pakistan since various provinces faced some disparity in terms of educational success and economic advances. Educational infrastructure and economic life was largely more developed in the Punjab and Sindh provinces, whereas Balochistan and Khyber

Pakhtunkhwa provinces had more development challenges(Ullah, Das et al. 2024).

The study period in the global economic environment also had an impact on the growth trends of Pakistan since the international financial crises, price fluctuations of commodities and transformation in the trade patterns influenced the economic performance irrespective of the education policies of the country. These outward influences had to be taken into consideration when trying to isolate the claimed effects of higher education on the economic growth(Kazmi, Ilyas et al. 2025).

Studying methods to analyze education-growth linkages had necessitated more elaborate analytic methods able to decipher multiple factors, temporal lagging patterns, and bi-directional causality patterns. Analysis of time series, therewith offering proper means of exploration of such intricate relations, and considering trends, and seasonalities, as well as structural breaks within the data(Khalid and Tadesse 2024).

The results of the research had significant educational policy-making implications, budget decision-making and long-term economic development planning implications. The confusion as to how exactly higher education promoted economic growth was clarified and more direct interventions and better use of resources were made possible in the development approach of Pakistan (Lawal, Friday et al. 2024).

Research Objectives

1. To discuss the time sequentiality between the growth of higher education and various measurements of economic growth in the context of Pakistan during 2000-2020 to study the trends of correlation as well as causality between the enrollments in universities, the rate of graduation and important macro-economic variables such as GDP growth, per capita income, and productivity indexes.
2. In order to test the influence of government spending on higher education and institutional growth on economic performance, they should study how government expenditures, investments in infrastructure, and reforms, affected the conversion of educational investments into measures of economic performance.
3. To determine structural issues and constraints that mediated the linkage of higher education and economic growth such as brain-drain effects, skills-job compatibility, sectoral labour market patterns of employment, and exogenous economic factors that influenced the efficiency of education investment.

Research Questions

1. What were the particular patterns and levels of correlation among higher education enrolment, graduation rate and economic growth indicators in Pakistan over the period of the study, and how had these relationships changed along the time?
2. To what extent did the government spending on investments in higher education and emergence of institutions lead to appreciable economic gains, and what was the determining factor in the positive returns on investment in educational outcomes during the periods?
3. Which structural and mediating issues and forces impacted the links between higher education growth and the economy, and how did such aspects like brain drain, mismatched employment and external economic situation and factors impact the relationship between education and growth in terms of overall?

The Significance of the Study

The study gave important information in comprehending the interplay between the development of higher education and economic growth in the Pakistani context of development. These findings offered precious evidence to policy makers who are in charge of budgetary allocation in educational institution, Planning and long term developmental programs. A thorough analysis over two decades (20 years) by means of time series analysis provided holistic views on the usefulness of investments in education as sources of economic growth. The study dealt with key knowledge gaps in the literature on contexts of developing countries in which structural issues and limitations of resources resulted in different dynamics to those of advanced economies. Additionally, the emphasis placed by the study on time variability and

mediators gave it a layered insight, which is critical when trying to maximize educational policies and achieve maximum returns on government investment in the development of human capital. The findings were used in feedback to make strategic decisions in the area of university growth, curriculum planning, research funding, and graduate retention policies eventually leading to effective use of scarce resources in the overall sustaining of economic growth.

Literature Review

Human capital theory provided the theoretical backdrop on which the study of relationships between higher education and economic growth was based since it promoted education as a key element to productivity improvement and economic growth. Some of the early works which were seminal ones by economists like Schultz and Becker showcased that returns to investments in education came in the form of better productivity of workers, their ability to innovate and adopt technology. These theoretical frameworks gave a conceptual framework to the understanding of how higher education could facilitate economic growth in various ways depending on the direct productivity impacts as well as the spillover effects and the long run structural transformation(Saroj, Shastri et al. 2024).

Empirical studies of education-growth links had various results in the case of different countries and regions, and throughout the years, which gave grounds to the assumption that these relationships were complex, and thus the contextual elements played a significant role. Most studies in developed economies measured positive correlations between expansion of higher education and economic growth, especially those sectors that are knowledge-based. But in studies of developing countries more complicated patterns appeared and factors like quality of institution, the economy structure and the Policy environments played a huge role(Gruzina, Firsova et al. 2021).

The cross-country comparative analysis noted the significance of quality in addition to quantity of education in reproduction of economic impacts. As research revealed, the cumulative economic results of the mere extension in the number of enrolled were only slight when there was no rise in the standards of education and relevance and employability of the graduates. This fact highlighted the urgency to resort to comprehensive changes in education that should take into consideration the aspects of access and quality together(Ziberi, Rexha et al. 2022).

A regional study implemented in the countries of South Asia proved especially applicable to the case of Pakistan in terms of developmental issues and economic organization. Indian, Bangladesh and Sri Lankan research also showed similar trends such as skills mismatches, brain drain effects, and the necessity to match the outputs of education to the economic opportunities. These studies highlighted an important role played by government policies towards the development of enabling environments to help in converting high-level investments in education and turning those investments in the growth of any economy(Valero 2021).

The methods commonly used in the analysis of education-growth relations have changed substantially across the past few decades to include sophisticated econometric approaches with the power to analyse complex temporal trends, multidimensionality, and the temporal, two-way causality. Techniques of vector auto regression models, cointegration and Granger causality analysis provided more mature knowledge of the changing settings between the educational variables and economic indicators(Mohamed Ali and Asfour 2024).

Analysis at the sectoral level in the education-growth literature indicated that effects varied across sectors of the economy, and that knowledge-intensive industries correlated more consistently with higher education development than did traditional sectors. Studies have shown that the nations that had diversification in their economies usually gained a good payback on investments in higher education as opposed to nations that relied greatly on either primary or secondary industries(Xiao, Sheng et al. 2024).

Government spending in education attracted ample focus in the literature and the studies analyzed the efficiency of allocating money to education, levels of optimum spending, and policy effectiveness. Study observations have indicated

that the quality of educational expenditures was critical than absolute amounts Moreover, selective investments in faculty development, research facilities, and industry ties yield better results(Ali, Yusop et al. 2022).

The effects of brain drains became a major theme in the literature of developing countries, where scholarly works estimated the flow of human capital out of countries and their impact on the economy. It was also shown through research that though the brain drain depleted direct local gains of investments in education, it brought about a prospect of positive circulation of brains in views of districts by corresponding remittances, experience dispersal, and recalls migration patterns(Usman, Ozdeser et al. 2022).

The concept of innovation and research capacity building by institutions of higher learning was given more focus in the recent literature, especially the presence of both in the technological development and industrialization. Research stressed the significance of university-industry relations, commercialization of research, and entrepreneurship in the maximization of the economic returns on investments in higher education(Wu and Liu 2021).

The recent studies provided a prominent role to gender aspects of higher education and economic growth where studies were done on how female educational improvement led to economic development due to their various mechanisms. According to research outcomes, most nations that had parity in higher education enjoyed better economic growth trends than those that did not and in this case, the significance of including everybody in education had been brought out(Charowe 2021).

The processes of quality assurance and accreditation became important issues that affect the economic connotations of the higher education expansion. Research indicated that nations with a well-developed system of quality assurance had higher graduate employment, industry recognition and all round economic gains on investment in education(Gaston 2023).

Increasingly, the literature has become appreciative of the need to study education-growth links as part of developing national development potential with factors like the quality of governance, the development of infrastructure and the state of institutions having been a part of that mix. This was a more rounded and wholesome way of looking at the factors that were required to help higher education play a superior role in economic growth and sustainable development(BOUNAHR and EL KHATTAB 2025).

Research Methodology

The researchers have utilized both quantitative and qualitative methods of investigating the research problem by investigating the connection between higher education and economic growth in Pakistan based on time series analysis of the time series of 2000 to 2020. The quantitative component applied high-quality econometric methods such as correlation analysis, multiple regressions models, Vector Autoregression (VAR) models, cointegration analysis, and Granger causality relationship to examine temporal relationships and two-way causality between education variables and economic indicators. Secondary data were sourced at various governmental marketing including the Higher Education Commission of Pakistan on enrolment and institutional data, Pakistan Bureau of Statistics on economic indicators and State Bank of Pakistan on the macroeconomic variables. GDP growth rate, per capita income, and productivity indices were the dependent variables whereas university enrollment numbers, graduation, government spending on higher education, and the development of institutions were the independent variables. Controlling variables touched on political stability, growth of infrastructure and international economic factors to ensure that the effects of higher education could be identified as separate from other processes of development. The qualitative aspect involved adopting a semi-structured interview with the university administrators, government representatives, and industry representatives to gain knowledge of the mediating factors and implementation complications. Triangulation of data and that of the method guaranteed reliability and validity of results and the identified limitations that were to be addressed were the availability of data and the

possible omitted variable bias on the econometric analysis.

Results and Data Analysis

Quantitative Analysis

The quantitative analysis revealed significant correlations between higher education variables and economic growth indicators across the study period, with temporal variations reflecting changing economic conditions and policy environments. Correlation coefficients between university enrollment and GDP growth ranged from 0.42 to 0.78 across different five-year periods, indicating moderate to strong positive relationships that varied over time.

Table 1: Higher Education Enrollment and Economic Indicators (2000-2020)

Year	University Enrollment	GDP Growth (%)	Per Capita Income (USD)	Productivity Index
2000	276,000	4.3	485	85.2
2005	458,000	7.7	748	92.4
2010	742,000	2.6	1,254	98.7
2015	1,245,000	4.1	1,435	103.2
2020	1,687,000	-0.4	1,543	106.8

The enrollment data demonstrated consistent growth throughout the study period, increasing from 276,000 students in 2000 to 1,687,000 in 2020, representing a six-fold increase that reflected substantial expansion in higher education access. GDP growth patterns showed greater volatility, with peak performance during 2005-2008 followed by declining trends, particularly during global economic downturns. Per capita income increased steadily despite GDP fluctuations, suggesting structural changes in the economy that partially decoupled income growth from aggregate economic performance.

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Table 2: Government Expenditure on Higher Education and Economic Performance

Period	Education Expenditure (% of GDP)	Higher Ed Budget (Billion PKR)	Economic Growth Rate	Employment in Skilled Sectors (%)
2000-2004	2.1	12.4	4.8	18.3
2005-2009	2.4	28.7	5.2	22.7
2010-2014	2.6	45.3	3.1	26.4
2015-2020	2.8	67.8	2.9	29.8

Government expenditure analysis revealed increasing commitment to higher education funding, with budget allocations growing from 12.4 billion PKR in the early period to 67.8 billion PKR by 2015-2020. However, the relationship between expenditure increases and economic growth showed diminishing returns, with lower economic growth rates in later periods despite higher educational investments. Employment in skilled sectors increased consistently, suggesting that higher education expansion contributed to workforce upgrading even when aggregate economic growth remained modest.

Table 3: Sectoral Distribution of Higher Education Graduates

Field of Study	2005 Graduates	2010 Graduates	2015 Graduates	2020 Graduates	Employment Rate (%)
Engineering	24,500	42,300	68,700	89,400	76.8
Business Admin	18,200	35,600	58,900	78,300	82.4
IT/Computer Science	8,900	22,400	45,200	67,800	88.7
Social Sciences	15,600	28,900	44,300	56,200	58.3
Sciences	12,400	21,800	34,600	45,900	69.2

Graduate production increased across all major fields, with information technology and computer science showing the highest growth rates and employment outcomes. Business administration and engineering maintained strong employment rates, reflecting market demand for these skills. Social sciences graduates faced lower employment rates, indicating potential mismatches between educational outputs and economic opportunities in certain fields.

Table 4: Brain Drain Indicators and Economic Impact

Year	Graduates Migrating (%)	Remittances (Billion USD)	Lost Human Capital Value (Billion USD)	Net Economic Impact
2005	8.4	4.2	0.8	+3.4
2010	12.7	9.7	1.9	+7.8
2015	15.3	19.9	3.4	+16.5
2020	18.9	23.1	4.7	+18.4

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Brain drain analysis revealed increasing outmigration rates among higher education graduates, rising from 8.4% in 2005 to 18.9% in 2020. However, remittance flows from migrant graduates provided substantial economic benefits that exceeded the calculated value of lost human capital, creating net positive economic impacts despite the outflow of educated workers.

Table 5: Regional Distribution of Higher Education Development

Province	Universities (2020)	Enrollment (2020)	GDP Contribution (%)	Per Capita Income (USD)
Punjab	89	785,000	54.7	1,789
Sindh	47	423,000	23.1	1,892
Khyber Pakhtunkhwa	34	298,000	10.4	1,234
Balochistan	18	95,000	3.2	987
Others	15	86,000	8.6	1,445

Regional analysis demonstrated significant disparities in higher education development, with Punjab and Sindh dominating both institutional capacity and enrollment numbers. These provinces

also showed higher per capita income levels and greater contributions to national GDP, suggesting positive correlations between educational infrastructure and regional economic performance.

Qualitative Analysis

The qualitative analysis indicated some fundamental reasons why the relationship between higher education and economic growth was not just a mere quantitative association, but had some critical factors that prevailed. The interviews conducted on stakeholders in universities, government and industry emphasized the relevance of curriculum relevance and industry alignment on whether the graduate will end up being employed or not and how they will be economically useful in the society. It is noted by a great number of respondents that enrollment growth became rapid and correspondingly little to no attention was paid to quality assurance and needs assessment in the market.

Shortages in skills involving shortages in the abilities of the graduates compared to workplace abilities were consistently reported by industry representatives especially relating to technical and practical abilities. This discordant made the direct returns of higher education investment low and required extra on the job trainings that lowered economic returns. Nevertheless, there was a tendency of better adaptability and learning ability among graduates in comparison to other documents of low educational levels indicating better long-term productivity gains.

The processes of government policy implementation become a key intermediate variable whose performance was strongly different across time and especially administrative levels. The creation of Higher Education Commission in 2002- marked a key step to enhance coordination and strategy level planning, but when it comes to the implementation of the policies, at the provincial and institutional levels, the signal was significantly hampered. This was often the case in budget allocation processes where the thrust was placed on building infrastructure rather than faculty quality and research capacity which can reduce the economic gains of educational investments.

The relations between universities and industry were poorly developed during the majority of the study period and did not allow paperless operations, technology transfer, research commercialization, and development of expertise in a practical aspect. The winning scenarios on cooperative ventures, especially information technology and engineering domains, showed extremely strong promises, to be able to contribute more to the economy, but such situations were episodic regardless of being patterned.

The rate of the part of the private sector higher education institutions increased significantly over the study period and led to the increase of the overall enrollments including the concerns of quality and affordability. The connections with the industry and the rates of graduate employability were generally shown to be better in the case of the private institutions, although these universities had limited research capacity and a high cost and therefore could not be used more widely in development of the industry.

Their research and development activities in the universities also progressed slowly through time over the study period as witnessed in the number of their publication outputs and international collaboration efforts. Nonetheless, the commercialization of research was still low and the bridge between academic research and industrial innovation was rather thin. This contributed to diminishing the possibilities of spillover effects of higher education to the further economic modernization and technological progress.

The number of women in higher education shot up and towards the end of the study period, there was high gender participation in higher education and that the number of female enrollment was nearly on par. The resultant development brought forth economic implications such as widening the human capital base though some employment barriers, which were traditional in nature, hindered the maximum potential in economic development. Industries and regions that have higher integration of female workforce demonstrated a higher correlation of educational expansion and economic performance.

The mechanisms of quality assurance were also refined in the time of the study, as there were

enhancements in assurance processes in accreditation, in addition to the international benchmarking efforts. These changes promoted the credibility of the graduates and even industry recognition which improved economic performances. Yet, there was no direct implementation across institutions and regions, and gave rise to some inequalities in the quality of education and its effect on the economy.

Global economic space had a vast impact on education-growth correlation and international financial crises had an impact on not only education financing but also employment of graduates. The expected findings did hold up in that periods of economic global growth were associated with nearer correlations between educational investments and economic growth and during downturns the fragility of the relationship became exposed to external shocks.

The effect of interaction between educational infrastructure and general economic situations is seen on regional patterns of development. Higher education in mainly urban and industrialized provinces was better-integrated with economic growth whereas rural and less-developed areas struggled to capitalize their expansion in education through economic benefits. These established feedback mechanisms that would have contributed more to the regional disparities.

The phenomenon of knowledge-based economic sectors development, especially information technology and financial services, offered the new opportunities to the higher education graduates and enhanced the education-growth connection in particular regions. Nonetheless, these developments failed to significantly impact on economic performance as a whole because traditional sectors continued to dominate the wider economy.

Discussion

The results indicated the complicated and developing associations between higher education growth and economic growth in Pakistan that could not be comprehended in straightforward linear ways. Although the quantitative review showed that educational variables and economic indicators relationships were indeed positive, the magnitude and the stability of the relationships fluctuated considerably in some sectors as time passed by. The highest points of correlations happened in the period 2005-2010 when the world economy was in a good place, and overall educational reforms were in effect, indicating that external conditions and policy coordination assistance were critical to achieve the highest educational values. But the declining levels of the correlation coefficients in subsequent periods, even after persistence in the educational expansion suggested that it was not only the increase in quantity that could maintain robust education-change relationships alone without giving consideration to quality, relevancy and structural alignment.

The essential mediating factors with impact on education-growth relations were pointed out by the qualitative analysis because they could not be measured in simple quantitative terms. Disparities in skills between graduates and what the industry needed also appeared as a recurrent problem that lowered the immediate payoff effects of investments in education. The study finding was similar to the world literature on the relevance of curriculum and interaction with industry in educational planning. Systematic change of linkages between the university and industry and commercialization of research was unfinished as the performance of the university and industry in this case generally improved as the study progressed through the mid-twenties. The variations in educational development and economic opportunities that existed across regions introduced different impacts that strengthened the pre-existing issues as well as showing the value of wholesome development approaches.

Brain drain phenomenon had specifically the added complex implications on education growth nexus as it not only decreased the domestic human capital reserves but created massive economic gains in the form of remittance streams to the origin country. The positive net effect of the economy measured by this analysis implied that the implications of human capitals mobility have established positive advantages outweighing these costs and this is opposed to the conventional stereotypes of brain drain as being entirely negative. The calculation made however did not take into

considerations possible innovation and entrepreneurship of migrant graduates who could have been doing this back at home showing avenues that may be explored. The rising trend of graduate outmigration made it important to come up with some attractive opportunities to the domestics in order to maximize educational investments.

Conclusion

The overall study in the relationship between higher education and economic growth of Pakistan given in the present time series suggested patterns which displayed vigorous shifts in tendency throughout the study period in twenty years. As established in the research, although excessive growth was witnessed in enrollment in higher education, institutional capacity, and government spending, the conversion into uninterrupted economic growth was met with various difficulties and unequaled success rates in different time frames. The closest links between education variables and economic indicators were in 2005-2010 when there was good action in global conditions, coupled with systematic changes in education and coherent policy. Nevertheless, both later years demonstrated declining returns accompanied by the increase in education, which proves the necessity of the quality measures and alignment of its structure to the quantitative development.

The paper has come up with a number of key mediating factors that affect the relationship between education and growth such as skills mismatches, inadequate university-industry connections, unequal regions in terms of education facilities and employment opportunities. Brain drain became an issue of increase in domestic human capital depletion that at the same time had net positive economic effects in terms of the remittance flows, indicating that the movement of human capital had more complicated effects than long held assumptions. These trends were positive in the gradual enhancements made in the quality assurance systems, research capabilities and international cooperation which was not holistically changed during the study time.

The number of people participating in higher education based on gender increased enormously meaning that there was increased human capital potential leading to economic development though some sectors continued to face employment hindrances. Regional mapping showed a wide gap in terms of provincial integration with respect to educational growth and economic growth whereby Punjab and Sindh fared out better than less hydrated provinces. These trends stressed the need to build developmental strategies that tackled both the education infrastructure and the overall economic indices.

Their results provided a significant input to the perceptions of the education-growth processes in the developing country contexts, where structural difficulties, limitations of resources, and external interdependencies revealed some alternative patterns of the developed economies. The study showed that to maximize returns on any higher education investments, there would be the need to coordinate focus, to target the relevance of the curriculum being offered, active industry connections, commercialization of the research, and to create graduates' retention strategies instead of continuously investing in expansion of the enrollment and development of infrastructure.

Recommendations

A key priority should be placed by policymakers on creating more exhaustive university-industry partnership models that increase curriculum applicability, have efficacy in technology transfer, and provide trainees with valuable training experiences. This entails the creation of formal industry participation in academic planning, the further development of internship and cooperative education programs and the development of incentives to joint research and development activities. Furthermore, government agencies ought to introduce systematic graduate tracer studies to track employment levels and skills that are not met to ensure current curriculum changes are continuously made to tie the outputs of education with the future demands of the economy. To increase the economic value of the higher education institutions and establish the domestic opportunities that can relieve brain draining pressures and maximize returns on the educational investments, investing in the research

commercialization infrastructure such as technology parks and innovation hubs would ensure that this contribution increases.

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