Determinants of Enrollment at Secondary and Higher Level of Education in Pakistan

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ABSTRACT

Title of Thesis	Determinants of Enrollment at Secondary and Higher Level of Education in Pakistan
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The persistent low enrollment rate at the secondary and higher level of education in Pakistan indicates the failure of the Government to annihilate the illiteracy and ultimately reduce poverty through education. Using annual time series data from the year 1965 to 2015, the study aims to analyze the determinants of the secondary and higher level of educational enrollment of both males and females in Pakistan. The main concentration was on the impact of educational spending by government, number of institutions, GDP per capita to see the healthiness of economic wellbeing of individuals. Moreover, labor market situations have explained by the unemployment rate. Unrestricted VAR and Cointegration technique is employed to identify the relationship among variables. The Results confirms the existence of a significant relationship between the number of institutions and government spending in the long-run for secondary education for females. Besides, the impact of GDP per capita on male secondary enrollment is much stronger than female. While at a higher level of education the GDP per capita, government spending and number of institutions significantly impact the rate of enrollment. A statistically significant and inverse association observed between the unemployment rate and higher enrollment in the long run.

Keywords — Educational Enrollment, Educational Financing, Unemployment, Institutions, GDP Per Capita

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CHAPTER 1

INTRODUCTION

In the contemporary era, because of the large consensus regarding the critical and vital role of human capital in the development of any economy, great efforts are being made in less developed countries to annihilate the illiteracy and ultimately reduce poverty. Notwithstanding the boast in number of educational institutions over time and the expansion in the government spending on education in Pakistan, the performance of the educational sector in term of enrollment rate is discouraging. This indicates the failure of the government to enlist the participation of the growing population in education by providing them an adequate number of institutions and funds. Moreover, the schooling of children reflects the capacity of their parents to invest in the formation of human capital. Labor market hiring practices and availability of jobs opportunities also affect the decisions of households and individuals regarding enrollment in schools and universities. The current study aims to analyze the determinants of secondary and higher-level enrollment of males and females in Pakistan at the aggregate level from 1965 to 2015 and for this purpose, there is a need to identify the role of government and capacity to financing education by individuals.

The study would cover the role of the main agent of the economy- government at macro levels. For the role of government, the concentration will be on the effect of government expenditure, number of institutions. Some other variables such as GDP per capita which will be utilized as a proxy to see the healthiness of economic wellbeing of individuals has utilized. The labor market situations which explained by the unemployment rate, on the enrollment at a secondary and higher level of education will be examined. Lastly, we will also shed some light on the gender differences in the educational sector of Pakistan.

1.1 Country Profile

The Islamic Republic of Pakistan appeared on the World map on fourteenth August 1947. It covers the region of around 796,096 km2 and shares its borders with China, India, Iran, and Afghanistan. The Location of Pakistan is of essential significance in South Asia. It links the Eastern world with the West. It has pleasant and exchange relations with China, a growing economy and tech monster, in its north. Afghanistan and Iran are in its west. India lies in its East, which shares historical and cultural associations with Pakistan. Pakistan has 4 provinces- Punjab, Sindh, Balochistan, and Khyber Pakhtunkhwa. At present, Pakistan is the 6th most crowded nation of the world. The brave and Passionate Individuals are makeup around 207 million of this nation. It is amongst the middle-income countries with a per capita GDP 1547.853 in current US Dollar and almost 24.3% of people are living below the national poverty line. The annual population growth rate of Pakistan is 1.954% and if we compare this growth rate to the high-income countries it is only 0.56% (World Bank, 2017). The literacy rate of people aged 15 or above is 56.977% and almost 44% of people are illiterate, which affirms the troubles overlooked by its educational system are serious. So, as to reaffirm the dedication of the government to ameliorate the educational system, sequential cash-transfer policies and school feeding programs have been endorsed and implemented.

1.2 Importance of Education

Education is the basic human right irrespective of socio-economic norms. Growth of any country depends not only on physical capital but also on human capital. Investment in education enhances knowledge, competencies, and skills which improves the productivity of individuals. Education makes individuals better off by creating value for them by creating awareness regarding health issues and ultimately increases individual's workplace productivity which positively affects the GDP growth of an economy. Barro (1991) explored that the positive relationship exists between schooling and growth of real per capita GDP. He used enrollment rate as a proxy of human capital and find out that it has a positive association with the growth rate of per capita GDP. Baldacci, Clements, Gupta, & Cui (2004) elaborated that both educational and health expenditure has a positive and substantial direct effect on the accumulation of human capital, and a positive substantial indirect influence on growth.

In human capital theory, the education is regarded as an investment and the growth of any economy depend upon the human capital investment to come out from the trap of poverty (T. W. Schultz, 1961). Khalil, Khalil, Arshad, & Khalild (2018) advocate that investment in human capital leads towards competitiveness and higher productivity. Gross primary enrollment rate in Pakistan is about 97.71% and to achieve universal primary education Pakistan is near to reach its destination. At a secondary level the gross enrollment rate is 46.109%. According to World Bank survey (2016), gross enrollment rate at the secondary level, for high-income countries are 107.104%, whereas, for the low and middle-income countries gross enrollment rate is 72.647%. Thus, there is a great difference in the enrollment rates between high income and low-income countries which signals us that schooling is one of the most important factors for the growth of any economy. India and Pakistan are in the same region and considered as less developed countries, however in India the gross enrollment rate at the tertiary level of education is about 26.929% and in Pakistan, it is 9.7333% (World Bank, 2016). The performance of Pakistan in term of education required attention, although Pakistan is doing well in primary education but at the secondary and tertiary level of education the educational performance of Pakistan is alarming.

1.2.1 Educational Statistics of Pakistan: An Overview

The Pakistani education system consists of 317,323 institutions obliging 50,292,570 students and 1,836,584 teachers. The system is comprised of 120,273 private institutions and 196,998 public institutions. The public sector provided services to 28.68 million students in order to finalize their education whereas; the leftover 21.60 million students are being served by the private sector of education. Approximately 38% of private institutions are serving 43% of students which showed a slightly higher student to institution enrollment ratio in this sector compared to the public sector. From the past few decades, the interest of the general public increased in the private sector, which brings about a gradual growth in the private sector. In terms of teaching staff, 49% of teachers work in public institutions, compared to 51% in the private sector. It is evident that the public sector has a shortage of teachers as compared to the private sector. Education is considered as a crucial force for eliminating gender inequities within the community, though to cope with inequalities in the education system is a big challenge. Around 56% of male students compared to 44% of female students are enrolled in educational institutions, however, 39% of male teachers and 61% of female teachers teaching in the entire educational system.

1.2.2 The Educational System of Pakistan: A Historical Viewpoint

This section presents a brief summary of the important education policies adopted in Pakistan in the past five decades. Education contributes a great deal towards improving human capital and serves as a leading factor in socio-economic development. The education system in Pakistan inherited from the colonial era, had failed to realize the national aspirations. This awareness has led to endeavor the education system in line with the national needs.

Economic planning started in 1948 when Prime Minister Liaquat Ali Khan introduced the first Five-Year plans at the assembly of Pakistan, and the plan was considered by the Ministry of Finance (MOF). Transformation of the educational system in Pakistan has been undertaken since 1948; the national educational system was established, as a result of first reform. The second reform took place during the Second National Economic Plan in 1960-1965, in this government increased education coverage and number of institutions. In 1965 the free compulsory five years schooling were the immediate action of the government to promote education and create awareness among people.

During the Third Five-Year Plans (1965-1970) the government put more emphasis on the technical education and the second priority was the secondary education. At secondary level diversification of the curriculum carried out by providing facilities to teach science and mathematics as compulsory subjects and arts, commerce and home-economics as elective subjects. During this era the government also provided scholarships to poor students to improve the enrollment at a higher level.

The first four economic plans put emphasis on re-organization of the education system on a pattern suited to the essential needs of the country as well as giving greater prominence to the development of education and training facilities. Past efforts have undoubtedly resulted in bringing about upward shifts in the field of education. These include improvement in the quality of education at all levels, a broadened base of primary education, increased teacher-pupil ratio, and lessened overcrowding in urban institutions with great emphasis on technical education. Although improvements have taken place, the education system continued to be effect by a number of noticeable inadequacies, for example, limited inclusion of school going population, particularly in rural areas and scarcity of the required number of teachers in specific fields.

During the fifth five-year plan 1978-1983 the number of primary and secondary schools was increased. Physical improvement took place at colleges and university level by constructing additional accommodation (classrooms, laboratories, teachers and students' hostels) providing science and technical equipment, library, books, and furniture. The initiative of Allama Iqbal Open University during this era was a major step to provide education to the unprivileged group.

Over the span of the 1990s the focus was on increasing the number of primary and secondary schools as well as to increase the number of universities. In the early nineties' government realize that our existing educational system is still far behind in term of education quality in public sector institutions particularly in science and English subjects and the reasons were defective curricula, the dual medium of instruction up to the secondary level of education and overcrowding in classrooms.

Like many other least developed countries, the condition of the educational system of Pakistan was not much promising. In the early 2000s the literacy rate was 47.1% (male 59% and females 35.4%). This showed that Pakistan was facing the problem of wide disparities among genders moreover, there was a lack of qualified teachers and physical infrastructure was inadequate. During this time span, half of the education budget was apportioned for primary education. Different development and promotional projects were undertaken to achieve higher primary enrollment because the social returns to education were high at the primary level. In 1947 there were only 2 public universities in Pakistan but in the 2000s there were more than 22 public universities that were functional. Some noteworthy steps were taken by the government to improve the quality of the education system, for example, the quota system was ceased so, the most suitable and capable students can get enrolled. In the early 2000s government put more efforts into reducing the gender gap and for this purpose the government initiated some projects which were:

- Provide stipends to girls to retain them at schools
- Motivational campaign was started to promote primary education
- Under Community Model School Program free textbooks, bags and uniforms were given to poor girls in rural areas
- Primary Education Development Program was initiated in all provinces of Pakistan and 937 community model schools were established
- Under Social Action Program (SAP) II 70% new schools were allocated to only girls and 30% to boys

Government of Pakistan comprehended the significance of higher education and its contribution to socio-economic development along with poverty reduction. This recognition triggered a series of events that paved the way for instituting the Higher Education Commission (HEC), originated by Presidential mandate in 2002. Substantial advancement has been made with the establishment and implementation of a transparent system for awarding scholarships to indigenous and foreign Ph.Ds. in the initial two years of Higher Education Commission, with the aim to augmenting local research activities and creating future faculty members. National Education Assessment System (NEAS) was established to improve and assess the quality of education. By evaluating the nationalization strategy of educational institutions, the government acknowledged that the public sector single-handedly was not able to disseminate education at all levels, as a result, the government decided to promote the private sector to play its part for the promotion and development of educational opportunities. The Devolution Plan 2001 was enacted in Pakistan in 2001 by the government for decentralization of public service departments to districts, tehsils, and villages. Elected district governments and district administrations were given some authority to manage primary and high schools in the country.

Until 2017 the emphasis was on providing the physical infrastructure to the growing population. Several programs were initiated until 2017 to promote enrollment at all levels and specially to lessen the gender gaps. The government exerts efforts to build a knowledgeable society through a progressive improvement and apportioning more financial resources for infrastructure, research & development, provision of access in education for low social strata children, lessening disparity, improve quality to strengthen and shrinking the dropout rate at all levels. The decline in gender disparity in human development is obligatory to improve social indicators. The development plans and policies are under consideration of the governments to enhance access, justness, and quality of the basic and higher education. In order to improve access, fairness, and quality of education, investment is being made in the infrastructure, upgrading educational institutions and inaugurating new educational facilities for boys and girls. Guidelines for appraisal and assessment system are being improved so that the current Pakistani educational system can compete with the educational system at regional and international levels.

1.2.3 Problems in Education System

1.2.3.1 Gender Disparity

As per Human Development Report 2016, Pakistan's HDI value is 0.550 upraised from low human development to the medium human development group, putting the country at 147th out of 188 nations and territories. Approximately from 1980 to 2015, Pakistan's HDI rate augmented from 0.359 to 0.538, an expansion of 43.0 percent and on an average annual increase of 1.3 percent. The extensive issue in the educational sector of Pakistan is gender disparity which required utmost attention. One of the candid principles behind a fair society is equity in access to opportunities. While characterizing what consist of fairness in opportunities is particularly difficult, there is general unanimity that access to education is a constitutional right of everyone. However, it is evident that equivalent access to only basic education is not universal in many nations and enormous differences exist in educational accomplishment, both within and across countries. In many countries including Pakistan, the level of schooling for girls is lower than from boys. Song, Appleton, & Knight(2006) advocate that in rural China return to female schooling were very less but for males the returns were modest. Females' education has been validated to have considerable positive external effects separated from favorable impacts on the woman herself. Additionally, generating private returns from participating in the labor market, females' education has resilient impacts on several other variables, such as their children's health and mortality, own fertility and reproductive wellbeing.

Following table provide the enrollment rate between male and females at the secondary and higher level from 1965 to up till now which shows the gender disparity in the educational system of Pakistan.

Table 1.1 Enrollment Proportion of Male and Females

Year	Secondary enrollment		Higher enrollment	
	Male	**Females**	**Male**	**Females**
1965-66	79.91	20.08	77.80	22.19
1975-76	78.50	21.50	77.51	22.48
1985-86	73.46	26.53	85.30	14.69
1995-96	66.82	33.17	72.14	27.85
2005-06	58.64	41.35	59.15	40.84
2015-16	56.74	43.25	55.55	44.44

Source: Ministry of Finance (Pakistan Economic Surveys)

The data given in Table 1.1 shows that large differential exists in enrollment between male and females. Moreover, in five decades the participation of females in education not much improved. The performance of government in order to create awareness among people to educate their girls is mediocre. The statistics show that from 1965 to 2015 there is a modest increase in the participation of females in education, on the contrary, the enrollment of males slightly goes on decreasing which represents the changing conditions of the labor market. Hassan & Cooray (2015) examine the impact of male and female education on growth of an economy by using panel data of Asian economies by adopting extreme bounds analysis and results showed that Asian economies need to invest more in female education relative to males, increase stipend for females and make provisions to boost female school attendance. This will assist the Asian economies to narrow the enrolment gap and attain faster growth.

Aslam (2009) analyze the reasons and factors behind the persistent gender gaps in educational enrollment in Pakistan. Author tests the labor market factor for the explanation of gender gaps in education. Results advocate that the return to schooling is noticeably lower for males than for females although aggregate earnings are radically higher for males than for females. One probable explanation of this finding is that, even if the return to girls' schooling is higher as compare to boys, but the part of the return to daughters' achievement accruing to parents may be lesser than that accruing from a son. The 2002 PIHS demonstrate that only 6% of adult daughters aged above 21 years, taken up residence in their parents' homes, signifying that the majority are married and staying with their husbands.

1.2.3.2 Large Population and Household Size

Pakistan is among the heavily populated countries, an explosion of population in conjunction with the democratic aspiration of the nation put the existing educational system under substantial strain. Educational planners and administrators have to endeavor hard to tackle these challenges. To identify the factors behind the low enrollment rate in Pakistan, one notable factor is the large household size. About 98% of Pakistanis are Muslims and according to Muslim school of thought, people did not like to take contraceptive measures to control childbirth. Memon & Jonker (2018) noticed that in developing countries the female has lesser role in family planning and the decision to have more kids or not is done by their husband's. But with an increase in education, the role of a female in family planning and taking contraceptive measures has improved.

As a result, Pakistan is amongst the countries which have the highest population. The average household size of Pakistan is 6.31 at the national level and if this size disaggregated by quintiles, then, the first quintile has the average size of 8.06 and the fifth quintile has 4.84 (HIES, 2015-16). This illustrates that the poor people of the country have the highest household size and the richer one has the lowest. From this statistic, we can understand one issue that poor people have the astounding household size and because they are poor, they might not able to send their children to school. Consequently, the poor and low-income households found it challenging to send their all kids to school. Being poor households, they must make decisions that which kid will go to school and at this moment the issue became more serious. In Pakistani culture, people get married their girls an early age and parents are not much cognizant about their education. Boys considered as a head of the family in the future so poor household sends only boys to school therefore, this phenomenon broadens the gender gap.

Table 1.2 Average Household Size by Quintiles

Year	1st	2nd	3rd	4th	5th	Total
2001-02	8.78	7.97	7.32	6.45	5.36	6.96
2004-05	8.66	7.62	6.98	6.31	5.20	6.75
2005-06	8.74	7.89	7.10	6.35	5.19	6.83
2007-08	8.57	7.61	6.83	6.08	4.99	6.58
2010-11	8.05	7.24	6.70	5.93	4.92	6.38
2011-12	8.16	7.40	6.77	5.96	4.84	6.41
2013-14	8.17	7.20	6.71	5.85	4.84	6.35
2015-16	8.06	7.21	6.51	5.84	4.84	6.31

Source: Pakistan Bureau of Statistics (Household Integrated Surveys)

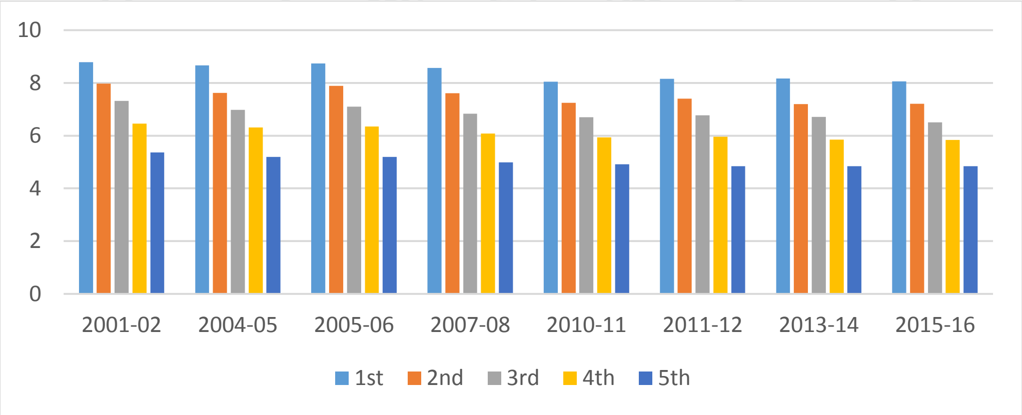

Figure 1.1 Average Household Size by Quintiles

Table 1.3 Average Household Size by Province

Province	2001-02	2004-05	2005-06	2007-08	2010-11	2011-12	2013-14	2015-16
Punjab	6.54	6.55	6.46	6.33	6.16	6.08	6.14	6.04
Sindh	7.54	6.71	7.02	6.50	6.39	6.55	6.13	6.22
KPK	7.66	7.71	7.96	7.63	7.17	7.22	7.20	7.34
Balochistan	7.37	6.88	7.51	7.75	7.08	8.53	7.90	7.84

Source: Pakistan Bureau of Statistics (Household Integrated Surveys)

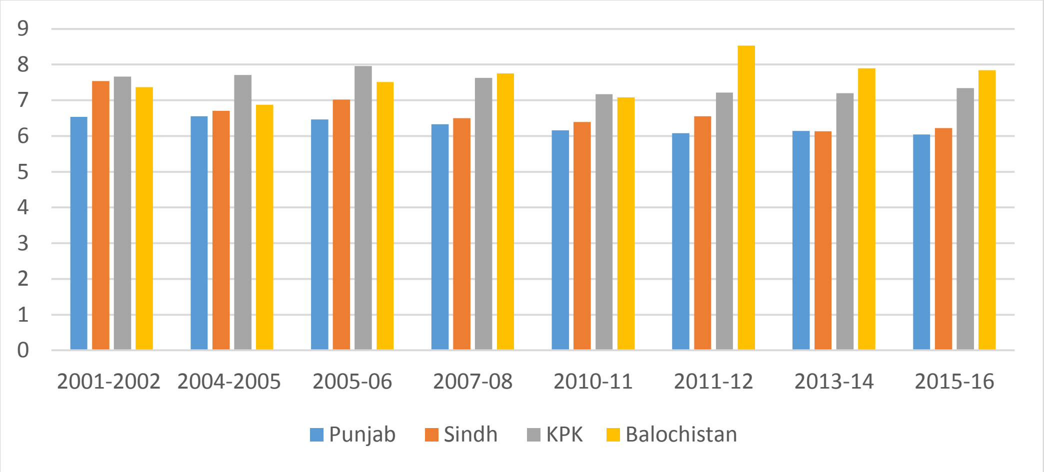

Figure 1.2 Average Household Size by Province

1.2.3.3 Low level of Government Spending

Pakistan is tackling with numerous issues on account of overpopulation, for example, large family size and poverty due to which households are incapable to send their children to school. Being poor households, they can't afford the school fees, uniforms, transportation cost, and other expenses. Being 6th largest country in term of population, Pakistan dependably confronts difficulties in term of apportioning resources for the educational sector. Public spending on education as a percentage of GDP is lowermost in Pakistan in comparison to other countries located in the South Asian region. According to official data, public spending on education indicate persistent declining trend from past years. As stated by UNESCO's EFA Global Report 2009, the public spending on education as a percentage of GDP, in other republics and kingdoms of the same region was 2.6% in Bangladesh, 3.3% in India, 3.2% in Nepal, 5.2% in Iran and 8.3% of GDP in the Maldives.

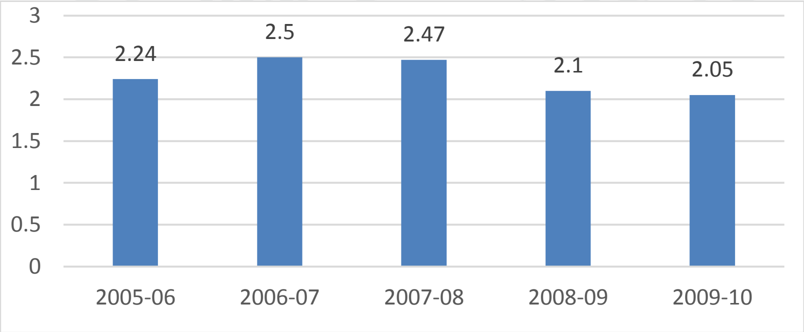

Figure 1.3 Public Expenditure (as %) of GDP

Source: Ministry of Education

1.2.3.4 Low number of Educational Institutions and Facilities

From the past two decades, the number of educational institutions went on increasing to cope with the pressure of growing population. In spite of this fact, the poor quality of the prevailing learning atmosphere is apparent from the fact that a substantial number of educational institutions were missing with basic infrastructure and other facilities. In order to increase the approachability of education, predominantly for girls in poor households, existing schools were required to be upgraded with the endowment of required infrastructure, consequently, to bring improvement, both in output and quality of education. The absence of basic facilities at educational institutions causes people to think that the perceived benefits from education are less than the opportunity cost because of this large proportion of children' and adults cannot take benefit from educational opportunities. (A. Hussain, 2003). Afzal, Rehman, Farooq, & Sarwar (2011) proposed that to accelerate the growth in Pakistan, the government spending on higher education needs to be increased.

Table 1.4 Missing Facilities in Public Educational Institutions

Pakistan	**Without Building**	**Without Boundary Wall**	**Without Drinking Water**	**Without Toilets**	**Without Electricity**
2008-09	17,764	61,274	54,996	59,846	96,769
In percentage	10.9%	37.7%	33.9%	36.9%	59.6%
2011-12	12,374	47,481	53,115	53,609	72,284
In percentage	7.6%	29.4%	32.09%	33.2%	44.7%
2016-17	8,948	47,294	32,971	31,812	31,196
In percentage	5.9%	20.81	22%	21.2%	31.5%
Source: NEMIS, Ministry of education (Compiled by Author)					

As per statistics, in 2016-17 approximately 32% public educational institutions were deprived of the facility of electricity and in the summer season, which starts from April and ends in September it is near to impossible to survive without electricity. Moreover, 22% of institutions have no facility of drinking water and according to these extreme facts, there is a greater need to escalate government budget for education. The current situation shows that the government fails to recognize the urgency of education and addressing the indispensable issues behind the persistent low enrollment which results in dire consequences and no economic opportunities for youngsters which account for 64% of the total population.

1.3 Problem Statement

In a country like Pakistan, there is a number of issues such as gender discrimination, poverty and lack of government attention towards higher education. According to the National Human Development report in 2018 stated that 29 out of 100 young people are illiterate and only 6% have more than 12 years of education. In terms of employment 39 out of 100 youngsters are employed (32 of them males and 7 females). The growing number of educational institutions and government expenditure on education proved despondent to ameliorate the enrollment of both genders. The non-correspondence of educational expenditure and institutions with the enrollment rate and the pressure of growing population insinuated that government failed to engage the large population in education and this can be barely attributed to inadequacy of institutions and government spending exclusively. The enrollment decisions mirror the financial capacity to capitalize on human capital. In addition, the situation of the labor market and opportunities for jobs affect enrollment decisions.

To identify the determinants of enrollment in the educational sector of Pakistan which embroiled in cultural issues is quite challenging. Many studies find out the factors behind the persistent low enrollment at primary level but only a few studies target secondary and higher education.

1.4 Objective of the Study:

The current study aims to examine the relationship between government spending on education, the number of institution and enrollment rate with inclusion of some other variables such as GDP per capita to examine the well-being of individuals and unemployment rate to understand the impact of labor market opportunities on enrollment of both males and females.

1.5 Significance of the Study:

The outcome of this study can assist as an advantageous reference to policymakers, educational administrators, and political leaders to be informed about the major determinants of enrollment in order to improve the human capital and productivity of the youth of Pakistan. The legislators possibly will be able to realize the potential reason behind the low enrollment and could able to make policies in accordance with these factors. It is worthwhile to note that this study is of unique significance because this study employs secondary annual time series data for 5 decades from 1965-2015 which until now never been utilized to identify the relationship among variables. Moreover, many studies find out the factors behind the persistent low enrollment at primary level but only a few studies target secondary and higher education. The current study target both secondary and higher education and elaborate the effect of government spending, number of institutions, GDP per capita and unemployment rate on enrollment of males and females at a secondary and higher level of education simultaneously.

1.6 Research Questions:

1. Does government spending and number of institutions affect the enrollment rate of males and females at a secondary and higher level of education?
2. Does economic condition explain by GDP Per Capita and unemployment rate affect the number of enrollments at a secondary and higher level of education?

CHAPTER 2

LITERATURE REVIEW

The major pitfalls in the education system which causes the enrollment rate not to grow were studied by S. R. Khan, Mahmood, & Hussain (1986) regarding the educational structure of Pakistan. Results suggest that in any education system the basic ingredients are teachers and institutions and in urban areas, the institutions are overcrowded which means there is an urgent need to increase the number of institutions.

T. P. Schultz (2002) contended and legitimize that why government ought to invest more to educate girls. Social benefits associated with investments in the human capital in the form of child health and schoolings are greater, with an augmentation in the schooling of their mother more than their father. More educated females work more long hours at the workplace, enlarging the tax base and in this manner tax distortions potentially reduced. These three conditions legitimize the disproportionate allocation of public spending headed for women's education.

An additional study carried by Shapiro and Oleko Tambashe (2001) on the impact of poverty, household size and economic betterment on enrollment and educational attainment in Kinshasa city, the capital of Congo. The main focus was on the issue of investment in education and gender differences. Results indicate that the higher the investment in education higher the economic betterment and household size has a negative effect on the enrollment and educational attainment. Devi & Devi (2014) examines the relationship between school enrollment, Government spending and the number of institutions by using time series analysis. Econometric evidence suggests that government expenditure and the number of institutions are positively correlated to student enrollment in Pakistan. Sabir & Abdullah (2002) analyzed that government spending on education proves more beneficial for males than for females which caused the gender disparity. Arif, Saqib, Zahid, & Khan (1999) attempt to observe the socioeconomic determinants of school enrollment and progression from primary to secondary and secondary to higher education. Results describe that child's age, household size, income, number of institutions and parent's characteristics are significant. Income is positively correlated to enrollment whereas household size has a negative association with enrollment.

S. M. Khan, Amjad, & Din (2005) featured a few variables which explained the growth and productivity of Pakistan by comparing the economic growth of low and middle-income countries and focuses on the quality of human capital. Results projected that accumulation of physical capital and better institutions leads towards higher growth but in spite of these factors, there are some other factors which are: investment in education and health care. If the government of Pakistan increases investment in these two areas, then Pakistan can enjoy the higher productivity. The key to growth is social spending on education and health care. Arai (1989), Huijsman, Kolek, Kodde, & Ritzen (1986) proposed that socioeconomic factors and economic factors such as income for the investment in education and availability of institutions impact the enrollment ratios of male and females.

Talking about the opportunity cost of less investment in the educational sector, Pakistan has forgone large income growth because of low investment in education. Specifically focusing on female enrollment which has higher social benefits such as higher enrollment rate of females leads towards lower infant mortality and fertility (Birdsall, Ross, & Sabot, 1993). Further, with the intention to inspect the impact of female secondary education combining with family planning and health plans in dropping fertility and infant mortality, Subbarao & Raney (1992) revealed that family planning and health programs have an impact on fertility and mortality, and the effect of expanding female secondary enrollments looks to be much bigger, particularly in nations where the female secondary enrollment is quite low. Furthermore, female education affects the family size by increasing the opportunity cost of a females' time in the economic undertaking, raising demand for family planning, and encouraging more effective contraceptive use. Z. Hussain, Khilji, Mujahid, Javed, & Khilji (2008) reported that primary education proves insignificant in improving the living standard of people in rural areas of Pakistan. Moreover, the threshold should be secondary education.

To observe the determinants of education and understand the gender differences in education, family income has a substantial impact on boasting educational investments. The extent of the magnitude is steadily higher on boys' education than girls. Males' education is more elastic than females' education, to be precise, there are larger variations in response to deviations in family income. This infers that families are more likely to spend additionally on male's education in good economic situations and take out them from school in poor economic situations and send them to the labor market to do work. Small children in the household have greater negative consequences on school attendance for females than for males, even though it is substantial for both (Parker & Pederzini, 2000). For example, an extra child in the family aged 0 to 5 lessens the likelihood of school attendance for girls more than boys. Mani, Hoddinott, and Strauss (2013) examined the impact of income on the school enrollment and suggested that income positively affect school enrollment and this effect is larger for girls than boys.

Relationship between unemployment, college enrollment, and success outcomes is different; depend upon the characteristics of the students. A positive relationship was found by Barbu (2015) between unemployment and undergraduate enrollment. When the unemployment rate increased, the enrollment of Blacks and Whites were found to increase in higher education meanwhile, a decline in the enrollments of American Indian, Asian, and Hispanics.

Research has exposed the benefits that educational investments exert on economic development and social welfare. As a result, educational investment is deemed a primary power to fight against inequality and poverty. It is assumed that if qualification gaps between residents are reduced by providing better education, it will be probable to shrink income gaps. The human capital theory states that education upturns salary because it increases the productivity of workers. From this viewpoint, education not only gives benefits to individuals with higher wages but also benefits society in general with the augmentation of productivity. Conversely, the Screening Hypothesis advocates that education has not any effect on worker productivity, it is simply a signaling device, through employers use to select the more skilled labor. Meanwhile, there is no improvement in productivity, according to this theory; the advantage of educational investment is smaller.

Psacharopoulos & Patrions (2018) features and highlights the modern trends and patterns grounded on a database from 139 countries. Information was provided according to the per capita income of countries and demonstrated how the returns on education vary among low to high income-countries, at every level of education. For middle-income countries, the private returns to education at the primary level are about 24.5%, at the secondary level, it is about 17.7% and at a higher level of education, it is 20.2%. If we compare this with high-income countries the returns at a higher level of education is only 12.8%. For low-income countries, the returns to education at a secondary and higher level are greater than high-income countries. This probably because in these two types of countries the human capital is still scarce. On the contrary, the social returns to education are lower as we move towards the secondary to a higher level of education. The reason for low social benefit is that researcher calculated all types of social costs but did not compute all relative social benefits. By considering just one externality, the social return to investment in education possibly will be 50% higher than the one conventionally estimated. For low-income countries, the investment should be made in secondary and higher education and for those countries where the problem of gender disparity exists; the priority must give to the education of girls.

Moretti (2006) argued that private returns to education are high as compare to social returns but why Government subsidized the higher education and the reason behind this is the positive externality of education which increases the productivity of individuals. Furthermore, increases investment in education can decrease criminal participation and improve voters' political behavior.

Poverty and absence of basic facilities at educational institutions cause people to think that the perceived benefits from education are less than the opportunity cost because of this large proportion of children' and adults cannot take benefit from educational opportunities. (A. Hussain, 2003). The reason behind low secondary enrollment of females in Pakistan and Bangladesh are poverty, parents' attitude towards education, early marriages of girls, lack of school facilities, long-distance school, and domestic work (Sultana & Haque, 2018). The enrollment rate of Muslims at a higher level of education is lowest in India moreover the participation rate in the labor market found low for Muslims (Singh & Butool, 2015).

Zimmerman (2001) proposed that family income is a major determinant of school enrollment and argued that the children in poor households tend to have low enrollment, on the contrary, the children in the richer household have high enrollment rate. Nidup (2016) tried to investigate the determinant of school enrollment and results indicate that income is more important for the poor household than for richer. Moreover, income has a significant impact on enrollment.

Connelly and Zheng (2003) argued that the gender, area of residence, parental characteristics and household size are the major determining factors of school enrollment. The rural residence is a negative determinant of enrollment, rural girls have lower enrollment than rural boys and additionally rural boys have lower enrollment as compared to urban boys and girls. Carsamer and Ekyem (2015) explore the impact of Government expenditure on enrollment in primary and secondary schools by using a sample of 20 countries in Africa. Results demonstrate that government spending positively influences enrollment, but the impact is much greater for secondary education. Household income, parental educational background, and tenure of being landowner positively influence the school enrollment (Burney & Irfan, 1995).

CHAPTER 3

DATA SOURCES, SPECIFICATION OF MODEL, AND RESEARCH METHODOLOGY

3.1 Sources of data

In this study, the annual time series data were used from 1965 to 2015. The paper examined the relationship between government spending, number of institutions, GDP per capita, unemployment rate and enrollment at a secondary and higher level of education in Pakistan. The data were taken from World Bank indicators and numerous issues of economic surveys of Pakistan.

3.2 Specification of the Model

Table 3.1 Description of Variables

Variables	Sources
Dependent Variable	Ministry of finance
Enrollment	
Independent Variable	
Government spending	World bank.org
Number of institutions	Ministry of finance
Unemployment rate	World bank.org
GDP per capita	World bank.org

The dependent variable Enrollment includes enrollment at a secondary and higher level of education as well as for both genders' males and females.

The stated equations for the model are as follows:

$$H.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_H_t + \beta_2 GSP\_H_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

(Model 1)

$$S.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_S_t + \beta_2 GSPS\_S_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

(Model 2)

$$S.F.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_SF_t + \beta_2 GSPS\_S_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

(Model 3)

$$S.M.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_SM_t + \beta_2 GSP\_S_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

(Model 4)

Table 3.2 Specification of the Model

Variables	Abbreviated By	Unit of Variable
Secondary Educational Enrollment	S.Edu.Enroll	In Thousands (000)
Secondary Educational Enrollment of Males	S.Edu.Enroll_M	In Thousands (000)
Secondary Educational Enrollment of Females	S.Edu.Enroll_F	In Thousands (000)
Higher Educational Enrollment	H.Edu.Enroll	In Thousands (000)
Number of Institutions at Secondary Level	INS_S	In Thousands (000)
Number of Institutions at Secondary Level for Males	INS_SM	In Thousands (000)
Number of Institutions at Secondary Level for Females	INS_SF	In Thousands (000)
Number of Institution at Higher Level	INS_H	In Thousands (000)
Government Spending at Secondary Level	GSP_S	In Percentage (%)
Government Spending at Higher Level	GSP_H	In Percentage (%)
Unemployment Rate	UNEM	In Percentage (%)
GDP per Capita	GDP_PC	In Current US dollars

3.3 Methodology

The study employed four models in order to discover the relationship between explanatory and exploratory variables at a different level of education. The first model focused on the enrollment at a higher level of education collectively for males and females. The remaining three models were used to identify the impact of independent variables on secondary enrollment separately for males, females and one model used to combine the impact of regressors for both males and females. The study organizes in this work employs time series data in evaluating the relationship between the dependent and independent variables. The time series data required to inspect its stationary. It is recognized as (ADF) Augmented-Dickey Fuller test. Dickey and Fuller (1979), supported the structure for working out on a test of non-stationarity. Hereafter, in brief, the co-integration equation is estimated by employing the test developed by Johansen Juselius (1990), known as Johansen Juselius co-integration test. Eventually, the Unrestricted VAR technique was employed for the model with no co-integration.

3.3.1 Stationarity Test

In the time series model, it is required to examine the stationary of data. Dickey and Fuller (1979), introduced the structure for working out on non-stationary of data and it is familiar as Augmented Dickey-Fuller (ADF) test. The most considerable part of this method is the testing for unit root.

Where,

$$\Delta yt = \beta_1 + \beta_2 t + \phi_{yt-1} + \chi_i \sum_{t=1}^{m} \Delta y_{t-1} + \varepsilon_t \text{ …… Eq. (1)}$$

ϕ and y_t indicates the state of stationarity and the regressors, ε_t is the White Noise and Δy_{t-1} equals $(y_{t-1} - y_{t-2}), \Delta y_{t-2} = (y_{t-2} - y_{t-3})$ and so on. If calculated statistic appears less than the critical value, *Y*, will considered as stationary.

3.3.2 Co-integration Test

To test for co-integration, the estimation technique used in this study includes the Johansen-Juselius (1990) co-integration test. If the selected variables are stationary at first difference, in that case, Johansen Juselius (1990) co-integration test can be used to examine the results. In which VAR of order *n*:

$$Y_t = A_1 Y_{t-1} + \dots\dots\dots + A_n Y_{t-n} + BX_t + \varepsilon_t \text{ ………. Eq. (2)}$$

Where ε_t representing the innovation vector, X_t used as the q-vector of the deterministic variable and Y_t is the k-vector [I(1) of time series variables].
Therefore, VAR can be written as:

$$\Delta Y_t = \rho Y_{t-1} + \sum_{i=1}^{m-1} T_i \Delta Y_{t-i} \varphi X_t + \varepsilon_t \text{ ………. Eq. (3)}$$

Here we have, $\rho = \sum_{i=1}^{n} A_i - I$ and $T_i = -\sum_{j=i+1}^{n} A_j$

If matrix ρ comprises reduce rank of ($r<k$), in that case, it would be the k x r matrices of α and β with rank of r i.e. $\rho = \alpha\beta$ and β_{Yt} is the integrated order of zero. So therefore, matrix can be verified by the mean of reduced rank from that of unrestricted VAR.

3.3.3 Error Correction Model (ECM)

Further, a category of multiple time series models is Error Correction Model (ECM) that can directly estimate the speed of adjustment of a dependent variable to its equilibrium as there is a change in an independent variable. Question retained concerning for the long-term relationship is, whether the short term effects are permitted on the dependent variable. It is explained by the following specification:

$$\Delta ENR = \gamma + \alpha\eta_{T-i} + \sum_{i=1}^{ENR} \beta_{ENR} \Delta ENR_{t-i} + \sum_{i=1}^{ENRP} \beta_{GSP} \Delta GSP_{t-i} +$$

$$\sum_{i=1}^{ENR} \beta_{INS} \Delta INS_{t-i} + \sum_{i=1}^{ENR} \beta_{GDP\_PC} \Delta GDP\_PC_{t-i} + \sum_{i=1}^{ENR} \beta_{UNEM} \Delta UNEM_{t-i} + \varepsilon_t \text{ ……. Eq. (4)}$$

Where, α representing the speed at which short run equilibrium is adjusted, γ and ε_t is coefficient and the error term.

3.3.4 Unrestricted VAR

Vector autoregression (VAR) is a stochastic process model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate autoregressive model (AR model) by allowing for more than one evolving variable. All variables in a VAR enter the model in the same way: each variable has an equation explaining its evolution based on its own lagged values, the lagged values of the other model variables, and an error term.

3.3.5 Research Process

Initially, time series procedure includes the assessment of order of integration that is a summary of statistic used to define a unit root process in time series analysis. An ideal time series has stationarity which means that a shift in time doesn't cause an alteration in the shape of the distribution. To examining the unit root problem, the Augmented Dickey-Fuller (ADF) (1979) test will be used. Henceforth, the co-integration equation is estimated by using the test developed by Johansen Juselius (1990), known as Johansen Juselius co-integration test. Ultimately, the Unrestricted VAR approach was employed to estimate the relationship among variables which were not cointegrated. The models used in the paper are double log (Log-Log) model.

3.3.6 Descriptive Statistics of Variables

Descriptive statistics of variables are provided in the following tables.

Table 3.3 Descriptive Statistics of Variables

Measure	ENR_H	ENR_S	ENR_MS	ENR_FS	INS_S	INS_MS
Mean	299114.0	1292804.	818862.7	473941.2	11003.92	7121.569
Median	68301.00	1004000.	719000.0	285000.0	8200.00	5900.00
Maximum	1594648.	3653000.	2073000.	1580000.	31700.00	18200.00
Minimum	12807.00	244000.0	195000.0	49000.00	1600.000	1300.000
Std. Dev.	457047.0	947407.3	515965.5	433976.0	9541.529	5535.786
Skewness	1.707991	0.808956	0.718716	0.898333	0.914756	0.695996
Kurtosis	4.590104	2.585081	2.495547	2.660955	2.481762	2.067661
Jarque-Bera	30.16941	5.928313	4.931456	7.103785	7.683324	5.964652
Probability	0.000000	0.051604	0.084947	0.028670	0.021458	0.050675
Sum	15254814	65933000	41762000	24171000	561200.0	363200.0
Sum Sq. Dev.	1.04E+13	4.49E+13	1.33E+13	9.42E+12	4.55E+09	1.53E+09
Observations	50	50	50	50	50	50

Continuous

Measure	*INS_FS*	*INS_H*	*UNEM*	*GDP_PC*	*GSP_H*	*GSP_S*
Mean	3882.353	52.52941	3.533184	497.1904	18.58180	30.5587
Median	2100.000	22.00000	3.570000	384.0864	18.27300	30.2649
Maximum	15600.00	163.0000	7.830000	1428.638	32.23300	37.4852
Minimum	300.0000	6.000000	0.400000	100.3003	11.88200	22.3240
Std. Dev.	4103.838	51.87383	2.011642	359.5356	3.253200	3.86438
Skewness	1.285146	0.961166	0.417153	1.156033	1.519001	-0.17704
Kurtosis	3.457324	2.358868	2.397597	3.294203	8.497922	2.47546
Jarque-Bera	14.48303	8.726119	2.250283	11.54344	73.98111	0.75098
Probability	0.000716	0.012739	0.324606	0.003114	0.000000	0.68695
Sum	198000.0	2679.000	180.1924	25356.71	836.1811	1375.14
Sum Sq.Dev.	8.42E+08	134544.7	202.3351	6463292.	465.6658	657.071
Observations	50	50	50	50	50	50

Table 3.3 represents the values of descriptive statistics. The average enrollment at a higher level of education is approximately 0.299 million and at a secondary level, the enrollment is about 0.129 million. The skewness measures the degree of asymmetry of the series. The values near to zero represent the series are symmetrical around its mean and represents normal distribution, in the second table of descriptive statistics except for ENR_H all other variables indicate the normal skewness.

The kurtosis measures the peakedness or flatness of the distribution of series and kurtosis is the measure of normality of the series. The kurtosis value near to 3 indicates the distribution is mesokurtic and normally distributed. In the second table of descriptive statistics except for ENR_H, all other variables confirm that they are normally distributed and mesokurtic, while the ENR_H is leptokurtic with a value greater than 3. Jarque-Bera test statistics measure the difference between skewness and kurtosis with those from the normal distribution. Jarque-Bera is a test of normality. With HO; Residuals are not normally distributed and H1; Residuals are normally distributed. The probability statistics show that almost all the variables are normally distributed except for some variables.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Model 1

$$H.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_H_t + \beta_2 GSP\_H_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

Statistical results from the empirical analysis are further classified into the test of stationarity of variables and its short run as well as long-run coefficient estimations.

4.1.1 Unit Root Test

Testing for the stationarity of the variables which are employed in this study, we end it up with the conclusion that the null hypothesis of non-stationary is rejected at 1% level of significance. Table A.1 in Appendix A contains the results of the ADF test.

4.1.2 Unrestricted Co-Integration Rank Test

Johansen Juselius (1990) developed one of the crucial tests for the examination of co-integration which is useful to measure the magnitude and symbols of long-run relationship between variables and to provide marginal values for the stated equation (2.2). The Johansen Juselius co-integration test starts with unrestricted VAR to select the optimal lag. This can be viewed in Table A.2 of Appendix A. After the selection of optimal lag the Johansen co-integration test was used with (1-p) lag. The lag was selected on the basis of AIC. Johansen Juselius co-integration test provides the evidence of the existence of the long-run relationship between variables, having Cointegration equation by using Trace Test and Max Eigen Statistics. The results of co-integration equation can be viewed in Table A.3 of Appendix A where the computed statistics showed the existence of two co-integration equations at a significance level of 0.05.

4.1.3 Normalized co-integrating coefficients: 1 co-integrating Equation(s)

The coefficients of ß with reference to normalized co-integrating coefficients are indicated in Table A.4 in Appendix A with the following equation ***(t-statistics in parentheses)*.**

$$LENR\_H_t = 0.1271LGDP\_PC + 1.2556LGSP\_H + 1.4592LINS\_H - 0.5041LUNEM + \varepsilon_t$$

(3.9540) (5.8520) (6.9760) (-7.7751)

The results indicate that except unemployment all other independent variables sustain a positive relationship to the enrollment at a higher level of education in Pakistan. The outcomes of the study explain that one percent increase in GDP per capita brings 0.12% percent increase in enrollment at a higher level of education. The per capita GDP is an important contributor as a determining factor of enrollment. Besides per capita GDP, the one percent increase in government spending on higher education brought 1.2% percent rise in enrollment. This indicates that income and money related variables are most important in signifying and explaining the determinants of enrollment in Pakistan. This is true because according to national poverty report 2015-16 the poverty rate in Pakistan in 2013-14 was 29.5% which shows that almost 30% of 120 million people are below the poverty line. In this manner, the monetary variables are crucial to be considered as a determinant of enrollment. Furthermore, in Pakistan, the higher education is not subsidized completely, and poor people are sensitive to monetary variables henceforth these affect the enrollment rate strongly at a higher level of education. The number of institutions also signifies a positive association with enrollment. This may because of fewer numbers of universities in the small cities and rural areas and people have to migrate to big cities for higher education, which is not possible for middle-class people.

On the other hand, the relationship of unemployment with higher education is negative and the probable reason behind this negative relationship is the fewer opportunities available in the labor market of Pakistan, adults preferred to go for self-employment rather get higher education and searching for a formal job. According to World Bank, the rate of self-employment in Pakistan in 2018 was 61.06% and from last few years, the trend is upward which shows that 62% of total employed labor force runs their own businesses without formal jobs. Moreover, the trend of unemployment with the alliance to education is going on increasing from the past few years which reflect the labor market is failed to play its role in providing jobs to graduate students. This scenario explains the limitation of the labor market in term of providing jobs to educated people.

The estimation of this model controlled against the impact of the population so that the true effect of the number of institution, government spending, unemployment and GDP per capita could be captured and we can prove that the increase in these variables are not offset by the growing population and they really affect the number of enrollment.

4.1.4 An analysis of Short run dynamism

A category of multiple time series models is Error Correction Model (ECM) that can directly estimate the speed of adjustment of a dependent variable to its equilibrium as there is a change in an independent variable. ECM is one of the ways to explain the characteristics of multivariate relationships of economic series. The Error Correction Model identifies the possibilities of short-run relationships. The results of ECM in Table A.5 in Appendix A show that value of Error Correction Co-integration's coefficient equation is 0.14. In Error Correction Model (ECM) the adjustment coefficient shows that the previous period deviation from long-run equilibrium is corrected in the current period at an adjustment speed of 14.44%.

4.1.5 Diagnostic Analysis

The model was tested against any variation and biases additionally residual diagnostic tests were employed to see whether series have the problem such as autocorrelation and heteroskedasticity or not. Serial Correlation LM Test and VEC residual heteroskedasticity tests confirm the non-existence of autocorrelation and heteroskedasticity problem in the series. The same diagnostic tests were used for the second model to ensure the credibility of the logged series against any serial correlation and heteroskedasticity. The values of these tests can be seen in Table A.7 and A.8 of Appendix A.

4.2 Model 2

$$S.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_S_t + \beta_2 GSPS\_S_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

4.2.1 Normalized co-integrating coefficients: 1 co-integrating Equation(s)

$$LENR\_S_t = 0.1324LGDP\_C + 0.4486LGSP\_S + 1.5291LINS\_S + 0.3187LUNEM + \varepsilon_t$$

(0.8788) (3.4931) (5.1010) (2.1414)

Above is the normalized co-integration equation for second model and t-statistics are shown in parentheses.

4.2.2 Unrestricted Co-Integration Rank Test

The Johansen Juselius co-integration test starts with unrestricted VAR to select optimal lag. This can be viewed in Table B.1 of Appendix B. After the selection of optimal lag the Johansen co-integration test was used with (1-p) lag. The lag was selected on the basis of AIC. Johansen Juselius co-integration test provides the evidence of the existence of the long-run relationship between variables, having Cointegration equation by using Max Eigen Statistics which are shown in Table B.2 of Appendix B where the computed statistics show two co-integration equations at a significance level of 0.05. The results of the Normalized co-integration equation can be viewed in Table B.3 of Appendix B.

The second model explained the determinants of enrollment collectively for males and females at the secondary level of education in Pakistan. Conferring to the results from the long-run model of co-integration, it is evident that at a secondary level of education the major determinant is the number of secondary schools which strongly impact the enrollment rate more than any other variable. Results advocated that if Government spending on education is increases by one percent, it proliferate the secondary enrollment by 3.49%. The GDP per capita also sustain the positive association with enrollment but the relation is insignificant and perhaps the basic reason for this is the full subsidization of school fees at the secondary level of education by the Government, so the effect of income is insignificant at a secondary level of education at a collective level (males and females). Unemployment sustains positive association with secondary enrollment, and this shows that the labor market of Pakistan is highly competitive and there are no opportunities for jobs after completing the secondary schools. So, in accordance with this fact when the unemployment increases the individual who completed their secondary schools goes for better education.

This is because on average there are least opportunities for jobs available for secondary schools' graduates. Everyone knows this phenomenon and thus the impact of labor market situations is positive to enrollment at a secondary level and opposite to higher level of education.

4.2.3 An analysis of short-run dynamism

In Error Correction Model (ECM) the adjustment coefficient demonstrates that the previous period abnormality from long-run equilibrium is adjusted in the current period at a correction speed of 30.31%. The values of the VECM model are shown in Appendix B, Table B.4.

4.2.4 Diagnostic Analysis

For diagnostic analysis, the Auto-correlation LM Test and Heteroskedasticity Test are undertaken and results are presented in Appendix B, Table B.6 and B.7. For both of the tests, the probability values were greater than 5% which indicate that we cannot reject null hypothesis, which says that there is no auto-correlation and heteroskedasticity in the residual of series.

4.3 Model 3

$$S.F.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_SF_t + \beta_2 GSPS\_S_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

The third model attempted to estimate the determinant of enrollment for females solely at a secondary level of education in Pakistan. The purpose to use the separate model for male and females was to capture the disparity effect among both genders in many ways, such as the impact of income on enrollment is same for boys and girls in determining enrollment or not? The impact of government spending can improve female enrollment more than boys or not? Lastly is the number of institutions matters a lot for females as compared to males or not?

4.3.1 Optimal Lag Selection

The procedure of Unrestricted VAR started with the selection of optimal lag and the selection of is done based on Akaike information criterion and the values are shown in Table C.1 in Appendix C.

4.3.2 Unrestricted VAR Estimation

Vector autoregression (VAR) is a stochastic process model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate autoregressive model (AR model) by allowing for more than one evolving variable. All variables in a VAR enter the model in the same way: each variable has an equation explaining its evolution based on its own lagged values, the lagged values of the other model variables, and an error term. Unrestricted Vector Autoregressive method is used for the third model because for the third model there was no evidence found for the existence of the Johansen Juselius co-integration. The results of Johansen Juselius co-integration are shown in Table C.2 in Appendix C.

The Unrestricted VAR also required to starting with the selection of optimal lag and then running the Unrestricted VAR model. VAR treat all the variables as endogenous variables and there are no exogenous variables and each variable have its own equation. VAR model only provides the t-statistics and to estimate the significance of variable the p-values are required, and VAR provides the way to measure each equation separately to see the significance of each variable by considering one variable as dependent and other as an independent. The values for unrestricted VAR estimation are given in Appendix C in Table C.3. The result from the estimated equation shown in Table C.4 of Appendix C implies that unemployment is insignificant for females in determining the enrollment of females at a secondary level. Perhaps the reason behind this result is the culture of Pakistan. In Pakistan the female participation rate is about 24.93% in 2017.

This show that female on average did not participate in the labor market rather they just serve their families at home and produce kids. The GDP per capita is more strongly and significantly explains the enrollment of females at a secondary level but the impact of income is less significant at secondary level as compared to a higher level of education because at secondary level the education is completely subsidized. Government spending and the number of institutions do influence the enrollment of females at a secondary level of education positively but the major determinant is the GDP per capita in case of females.

4.3.3 Regression Analysis

This model also estimated by another method-ordinary least square method by adding two more variables which are vulnerable employment and the number of teachers at secondary higher educational institutions. These regressions are estimated just to compare with other study which utilized the OLS estimates so that our study can provide the comparison and suggests the policy implications. The results of OLS are shown in Table C.10 of Appendix C. After adding the number of teachers in regression, it can be used as proxy for government current expenditure on education, which almost comprises of teachers' salaries and number of institutions can be utilized as a proxy for government developmental expenditure on education. Afterwards, the government spending itself becomes insignificant, but the number of teachers and the number of institutions sustains positive significant relation with enrollment. The GDP per capita also shows positive association while on the other hand unemployment show positive but insignificant relation at a 5% significance level. While at a 10% level of significance the unemployment sustains the significant relationship.

4.3.4 Diagnostic Analysis

To commence the diagnostic analysis and to check the stability of the residual, stability test (AR Roots Table) was undertaken. Results indicate that probability value is greater than 5% so the null hypothesis cannot be rejected, which says residual is normally distributed, values shown in Appendix C Table C.5. Afterwards, the residual normality test was checked which is (Histogram-Normality Test) and the probability value greater than 5% represents that the residual is normally distributed (Appendix C Table C.6). The model is also checked against Autocorrelation and heteroskedasticity and probability values for Observed R square find more than 5% and we accept the null hypothesis which says there is no Autocorrelation and heteroskedasticity (Appendix C Table C.7 & C.8). Moreover, Wald test is also used to estimate the significance of joint significant variables and tests indicate that significant variable also jointly impacts the dependent variable (Appendix C Table C.9).

4.4 Model 4

$$S.M.Edu.Enroll_t = \beta_{0t} + \beta_1 INS\_SM_t + \beta_2 GSPS_t + \beta_3 UNEMP_t + \beta_4 GDP\_PC_t + \varepsilon_t$$

4.4.1 Optimal Lag Selection

The fourth model start with the selection of optimal lag and the decision is made on the basis of Akaike information criterion. The results are provided in Appendix D Table D.1. Moreover, the model was also estimated against Johansen Juselius co-integration test which is maximum Eigenvalue test and shown in Table D.2 in Appendix D and results indicate that there is no evidence of co-integration. The results for Unrestricted VAR and estimated equation are shown in Appendix D Table D.3 and D.4.

4.4.2 Vector Autoregression Equation Estimation

The results from the estimated equation show that the GDP per capita do influence the enrollment of boys at secondary level but the magnitude of influence is much lower than from females. This exactly explains the culture of Pakistan, in which boys are considered as a head of the family and the impact of change in GDP per capita is less on boys which shows the less sensitivity towards income in case of boy's enrollment. The unemployment rate shows the significant negative association with the dependent variable but for girls it was insignificant. The probable reason for this is the culture of Pakistan in which on average females are not doing any jobs but, they only manage their household activities and kept focusing on their families. But for males, the high unemployment rate provides the signals that there are fewer opportunities in the labor market and instead to get admitted in school it is better to learn some technical skill and go for self-employment. The reason is quite genuine because the statistics show that from last 5 decades the rate of enrollment of boys is decreasing every year which shows that tendency to go school in boys are lessening with every passing year.

4.4.3 Regression Analysis

Likewise, the 3rd model, this model also estimated through OLS in order to provide a comparison with other studies. This model estimated the determinants of enrollment at the secondary level of education for males only. As Pakistani society is male dominant and parents considered boys as a head of their future families, so they always put more emphasis on the education of boys as compare to females. The results of the regression analysis shown in Table D.9 of Appendix D. Results shows that except GDP per capita and the number of institutions all other variables are insignificant. We can easily understand the reason behind this by understanding the culture of Pakistan. The result of this regression are comparable to the study done by Parker & Pederzini (2000) and the results advocated that the enrollment of boys are more elastic than females to income, in good economic situation they go for the education. In the regression results of model 3 and 4, the per capita GDP is more significant for boys than girls.

4.4.4 Diagnostic Analysis

Diagnostic analysis includes the Stability test (AR Roots Table Test), Appendix D, Table D.5, the other test is Histogram Normality Test which can be seen in Appendix D, Table D.6. The Autocorrelation LM Test is in Appendix D, Table D.7 and heteroskedasticity test in Table D.8. All the diagnostic tests indicate that the residual of series is normally distributed, stable and having no problem of autocorrelation and heteroskedasticity.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

In this study, we have examined (i) relationship between enrollment rate and educational financing by government in term of educational spending and number of institutions in Pakistan, (ii) effect of per capita GDP on enrollment rate at secondary and higher level of education, (iii) impact of labor market opportunities on the enrollment rate of both genders males and females. The empirical tools used in this paper grounded on the technique of Johansen Juselius Co-integration test, Error Correction Model and Unrestricted Vector Autoregressive (VAR) method. Normalized Co-Integration Coefficient explains the long-run relationship among variables in the presence of co-integration and Unrestricted VAR affirms the significance of relationship in the absence of co-integration.

5.1 Conclusion

Previous studies have mostly dedicated its focus to explain the determinants of enrollment by utilizing primary data, based on surveys of one or two years. Those studies were lacking in dynamism because of the absence of time series data which can assist in providing the larger picture of the concerned issue. The study in this paper enhances the analysis by adding time series data and labor market situation as a key element, which has largely been ignored in the literature. Our study contributes to the empirical literature with the findings (i) that there is a positive significant relationship between government financing mechanism and enrollment at secondary and higher level of education, (ii) the analysis suggested that government spending has a stronger impact on the higher enrollment as compare to the secondary level enrollment, (iii) the GDP per capita sustain the positive relationship with enrollment at both secondary and higher level of education, in addition the impact of GDP per capita is more stronger for males as compare to females according to regressions results, (iv) outcome advocated that unemployment sustain negative association with enrollment at higher level of education, but at the secondary level of education it sustain positive association, lastly the results suggested that unemployment is insignificant for females and males at secondary level of education which shows that there are almost no formal job opportunities after the completion of secondary school in Pakistan.

5.2 Data Limitations

The data availability is a public good (Varian, 1992) and like other public goods, it is exceptionally complex. If data availability were a simple problem, it would have been resolved long ago. The current study employs time series data from 1965 to 2015 and we faced a lot of issues regarding data availability. Pakistan came into existence at the end of the 1950's and it is hard to get desirable data from the 1960's when Pakistan was just newly born. The current study attempted to examine the determinants of educational enrollment and our hypothesis was that labor market situation also affects the enrollment. So, it became crucial to examine the opportunity cost of enrollment which could be the minimum wage prevailed in Pakistan or the average wage for formal skilled workers. But unfortunately, we failed to get the data regarding these variables because data was not available for such a long-time span.

Another vital variable was the cost of education which determined the financial capacity of individuals to go for secondary and especially for higher education. Sincere effort was made to find out the data, but we failed to do so.

The third limitation of our data was the non-existence of age-related variable which can provide a clearer picture regarding the enrollment of secondary and higher level of education. We control the 1st and 2nd model against the population but in the absence of age-related population, we simply use the total number of populations. This could be improved if we could manage to get the data, but we were unable to found the data.

To recapitulate the above-mentioned factors are the limitations of our study which can be improved in the future with the availability of larger data sets regarding age-specific population, minimum wage and cost of education.

5.3 Additional variables:

In order to compensate the data limitation issue, we tried to add some other variables in order to sustain the reliability of models. For the 3rd and 4th model, we added vulnerable employment as a percentage of total employment and number of teachers in secondary schools separately for both males and females. The vulnerable employment was defined by World Bank which includes contributing family workers and own-account workers as a percentage of total employment.

5.4 Recommendations

The outcomes of this study suggest several promising directions for future research. Firstly, it would be interesting to analyze the relationship by using both secondary and primary data which can provide comprehensive results both at the macro and micro level. Lastly, it will be beneficial for literature if the relationship could find from the perspective of two major agents of economy– Government and Household.

5.5 Policy Implications

As a final point, the study offers an empirical basis for promoting education and to achieve high enrollment. The policy implication which surges as a result of our analysis is that policies should be aimed at improving female enrollment at a secondary and higher level of education by enhancing the number of institutions for females and overcome the issues of gender disparity by creating awareness among females regarding their substantial role in the economy. Secondly, the government should pay more attention towards educational financing and create a mechanism for cash transfers to poor so that the impact of low income, which ultimately leads towards low enrollment, which could be normalized for poor people.

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APPENDICES

APPENDIX A: Empirical Analysis Model 1

Table A.1 Results of Augmented Dickey-Fuller Test (ADF)

Variables	*t-Statistics*	*Probability*	*Conclusion*
LENR_SM	-5.935573**	0.0000	I (1)
LENR_H	-6.493819**	0.0000	I (1)
LENR_S	-5.371733**	0.0000	I (1)
LENR_SF	-7.198889**	0.0000	I (1)
LINS_SF	-8.115792**	0.0000	I (1)
LINS_S	-7.485587**	0.0000	I (1)
LINS_SM	-7.313950**	0.0000	I (1)
LINS_H	-5.955370**	0.0000	I (1)
LGDP_PC	-5.958891**	0.0000	I (1)
LUNEM	-6.010262**	0.0000	I (1)
LGSP_S	-4.369808**	0.0011	I (1)
LGSP_H	-7.646288**	0.0000	I (1)

Note: The null hypothesis is that the series is non-stationary or have unit root. The rejection of null hypothesis for ADF test is based on **1% level of significance by AIC criteria

Table A.2 Optimal Lag Selection

VAR Lag Order Selection Criteria

Endogenous variables: LENR_H LGSP_H LGDP_PC LINS_H LUNEM

Exogenous variables: C

Sample: 1965 2015

Included observations: 47

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-103.1392	NA	6.86e-05	4.601670	4.798494	4.67573
1	114.0245	378.8814	1.94e-08*	-3.575510	-2.3945*	-3.1311*
2	132.7406	28.67153	2.63e-08	-3.308111	-1.143045	-2.49338
3	154.1513	28.24388	3.38e-08	-3.57788*	-0.006187	-1.97031
4	189.0802	38.64476*	2.70e-08	-3.15537	0.555427	-2.02249

*** indicates lag order selected by the criterion**

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table A.3 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.506529	33.90202	33.87687	0.0497
At most 1	0.425644	26.61629	27.58434	0.0661
At most 2	0.255104	14.13654	21.13162	0.3539
At most 3	0.209264	11.26995	14.26460	0.1412
At most 4 *	0.097317	4.914449	3.841466	0.0266
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
*** denotes rejection of the hypothesis at the 0.05 level**				
****MacKinnon-Haug-Michelis (1999) p-values**				

Table A.4 Normalized co-integrating coefficients: 1 co-integrating Equation(s)

LENR_H		**1.00**	
	Coefficients	Standard error	t-statistics
LGDP_PC	0.127082	0.03241	3.954013
LGSP_H	1.255638	0.21463	5.850244
LINS_H	1.459240	0.20918	6.976001
LUNEM	-0.504135	0.06484	-7.775061

Table A.5 Error Correction Model

Independent Variable	Coefficients	t-statistics
CointEq1	-0.144431	-1.27569
D(LENR_H(-1))	0.134552	0.70145
D(LENR_H(-2))	0.204091	1.05023
D(LGDP_PC(-1))	0.210534	0.91601
D(LGDP_PC(-2))	-0.115161	-0.50045
D(LUNEM(-1))	0.043295	0.69775
D(LUNEM(-2))	-0.035055	-0.60699
D(LGSP_H(-1))	-0.149073	-1.08532
D(LGSP_H(-2))	0.243596	2.17771
D(LINS_H(-1))	-0.083239	-0.20435
D(LINS_H(-2))	0.224207	0.69082
C	-1.992458	-1.41052
LPOP	0.110308	1.44059
	R^2 =0.2439	
	F-Statistics=0.9904 Adjusted R^2 = 0.1953	

Table A.6 Summary of Correlation of Variables

Lags	Positively correlated to LENR_H	Negatively correlated to LENR_H
At lag one	LGDP_PC, LUNEM	LINS_H, LGSP_H
At lag two	LINS_H, LGSP_H	LGDP_PC,LUNEM,

Table A.7 Results of Auto-Correlation LM Test

VEC Residual Serial Correlation LM Tests	
Sample: 1965 2015	
Included observations: 48	
Null Hypothesis: no serial correlation at lag order h	
Lag	Prob.
1	0.2395
2	0.3239

Table A.8 Heteroskedasticity Tests

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)	
Sample: 1965 2015	
Included observations: 48	
Joint Test	
Chi Square	**Prob**
304.2536	0.8422

APPENDIX B: Empirical Analysis Model 2

Table B.1 Optimal Lag Selection

VAR Lag Order Selection Criteria

Endogenous variables: LENR_S LGDP_PC LGSP_S LINS_S LUNEM

Exogenous variables: C

Sample: 1965 2015

Included observations: 43

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-11.00930	NA	1.45e-06	0.744619	0.94940	0.820139
1	218.0515	34.34264	3.71e-10	-7.671289	-6.44462*	-7.22024*
2	194.9775	14.26421	3.23e-10*	-7.67337*	-5.331091	-6.75306
3	229.4100	354.4889*	7.96e-10	-6.94930	-3.67265	-5.74097

*** indicates lag order selected by the criterion**

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table B.2 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.719157	53.33835	33.87687	0.0001
At most 1	0.452383	25.29155	27.58434	0.0955
At most 2	0.335970	17.19597	21.13162	0.1629
At most 3 *	0.305644	15.32038	14.26460	0.0339
At most 4	0.001684	0.070772	3.841466	0.7902

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table B.3 Normalized co-integrating Equation(s)

LENR_S	1.00		
	Coefficients	Standard error	t-statistics
LGDP_PC	0.132465	0.15072	0.878881
LGSP_S	0.448582	0.12842	3.493085
LINS_S	1.529027	0.29975	5.101007
LUNEM	0.318665	0.14881	2.141421

Table B.4 Error Correction Model (VECM)

Independent Variable	Coefficient	t-statistics
CointEq1	-0.303147	-0.45542
D(LENR_S(-1))	0.372241	1.88397
D(LENR_S(-2))	0.057419	0.28021
D(LGDP_PC(-1))	-0.029379	-0.38277
D(LGDP_PC(-2))	0.034917	0.43666
D(LUNEM(-1))	-0.005864	-0.24781
D(LUNEM(-2))	0.018253	0.99559
D(LGSP_S(-1))	0.027012	0.26887
D(LGSP_S(-2))	-0.014445	-0.15522
D(LINS_S(-1))	0.028448	0.18314
D(LINS_S(-2))	-0.113684	-0.68776
C	0.606444	0.38348
LPOPT	-0.030652	-0.35993

Table B.5 Summary of Correlation of Variables

Lags	Positively correlated to LENR_H	Negatively correlated to LENR_H
At lag one	LGSP_S, LINS_S	LGDP_PC, LUNEM
At lag two	LGDP_PC, LUNEM	LGSP_S, LINS_S

Table B.6 Results of Auto-Correlation LM Test

VEC Residual Serial Correlation LM Tests	
Sample: 1965 2015	
Included observations: 44	
Null Hypothesis: no serial correlation at lag order h	
Lag	Prob.
1	0.9120

Table B.7 Heteroskedasticity Tests

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Sample: 1965 2015

Chi Square	**Prob**
227.4809	0.5623

APPENDIX C: Empirical Analysis Model 3

Table C.1 Optimal Lag Selection

VAR Lag Order Selection Criteria

Endogenous variables: LENR_FS LGDP_PC LGSP_S LUNEM LINS_FS

Exogenous variables: C

Sample: 1965 2015

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-35.01062	NA	4.24e-06	1.818665	2.021413	1.893854
1	159.7710	336.441*	1.90e-09*	-5.89868*	-4.68219*	-5.44754*
2	177.0490	25.91697	2.83e-09	-5.547683	-3.317446	-4.720603

*** indicates lag order selected by the criterion**

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table C.2 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.473362	28.21464	33.87687	0.2038
At most 1	0.287056	14.88752	27.58434	0.7571
At most 2	0.125920	5.921662	21.13162	0.9844
At most 3	0.077950	3.570852	14.26460	0.9016
At most 4	7.80E-05	0.003430	3.841466	0.9515

Max-eigenvalue test indicates no cointegration at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

****MacKinnon-Haug-Michelis (1999) p-values**

Table C.3 Unrestricted Vector Autoregressive Model

Vector Autoregression Estimates

Sample (adjusted): 1971 2015

Included observations: 45 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	LENR_FS	LGDP_PC	LGSP_S	LUNEM	LINS_FS
LENR_FS	0.834449	0.082771	-0.308052	0.918962	0.077963
	(0.08385)	(0.14017)	(0.16506)	(0.60826)	(0.16480)
	[9.95181]	[0.59052]	[-1.86633]	[1.51081]	[0.47307]
LGDP_PC	0.141451	0.716403	0.183151	0.587737	0.146721
	(0.053506)	(0.08944)	(0.10533)	(0.38815)	(0.10516)
	[2.700818]	[8.00952]	[1.73887]	[1.51422]	[1.39516]
LGSP_S	0.180081	0.356192	0.107100	-0.658949	-0.199181
	(0.08682)	(0.14514)	(0.17091)	(0.62983)	(0.17065)
	[2.074140]	[2.45417]	[0.62664]	[-1.04624]	[-1.16722]
LUNEM	0.019841	-0.000404	0.016556	0.682573	0.006612
	(0.01464)	(0.02448)	(0.02882)	(0.10621)	(0.02878)
	[1.355259]	[-0.01650]	[0.57442]	[6.42638]	[0.22976]
LINS_FS	0.189694	0.103559	0.187654	-1.304909	0.835570
	(0.08415)	(0.14067)	(0.16566)	(0.61046)	(0.16540)
	[2.25415]	[0.73616]	[1.13279]	[-2.13757]	[5.05182]
C	0.966520	-1.317466	4.373266	-2.424320	0.159597
	(0.59914)	(1.00156)	(1.17942)	(4.34631)	(1.17759)
	[1.61317]	[-1.31541]	[3.70798]	[-0.55779]	[0.13553]
R-squared	0.996252	0.977567	0.236626	0.721373	0.986662
Adj. R-squared	0.995771	0.974691	0.138757	0.685652	0.984952
Sum sq. resids	0.149071	0.416570	0.577657	7.844677	0.575869
S.E. equation	0.061825	0.103350	0.121703	0.448493	0.121515
F-statistic	2073.262	339.8977	2.417792	20.19446	577.0104
Log likelihood	64.62259	41.50096	34.14511	-24.54862	34.21485

Akaike AIC	-2.605448	-1.577820	-1.250894	1.357716	-1.253993
Schwarz SC	-2.364560	-1.336932	-1.010005	1.598605	-1.013105
Mean dependent	12.78720	6.099456	3.418253	1.042980	7.915183
S.D. dependent	0.950750	0.649637	0.131141	0.799926	0.990594
Determinant resid covariance (dof adj.)			1.04E-09		
Determinant resid covariance			5.10E-10		
Log likelihood			162.1468		
Akaike information criterion			-5.873189		
Schwarz criterion			-4.668748		

Table C.4 Equation Estimation

Dependent Variable: LENR_FS

Method: Least Squares

LENR_FS = C(1)*LENR_FS(-1) + C(2)*LGDP_PC(-1) + C(3) *LGSP_S(-1) + C(4)*LUNEM(-1) + C(5)*LINS_FS(-1) + C(6)

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C(1)	0.834449	0.083849	9.951811	0.0000
C(2)	0.141451	0.053506	2.700818	0.0098
C(3)	0.180081	0.086822	2.074140	0.0439
C(4)	0.019841	0.014642	1.355259	0.1823
C(5)	0.189694	0.084153	2.254154	0.0299
C(6)	0.966520	0.599143	1.613172	0.1148

R-squared	0.996252	Mean dependent var	12.78720
Adjusted R-squared	0.995771	S.D. dependent var	0.950750
S.E. of regression	0.061825	Akaike info criterion	-2.605448
Sum squared resid	0.149071	Schwarz criterion	-2.364560
Log likelihood	64.62259	Hannan-Quinn criter.	-2.515648
F-statistic	2073.262	Durbin-Watson stat	2.115834
Prob(F-statistic)	0.000000		

Table C.5 Stability Test (AR Roots Table)

Roots of Characteristic Polynomial

Endogenous variables: LENR_FS LGDP_PC LGSP_S LUNEM LINS_FS

Exogenous variables: C

Lag specification: 1 1

Root	**Modulus**
0.997034	0.997034
0.906750	0.906750
0.772624	0.772624
0.249844 - 0.118950i	0.276715
0.249844 + 0.118950i	0.276715

No root lies outside the unit circle.

VAR satisfies the stability condition.

Table C.6 Histogram- Normality Test

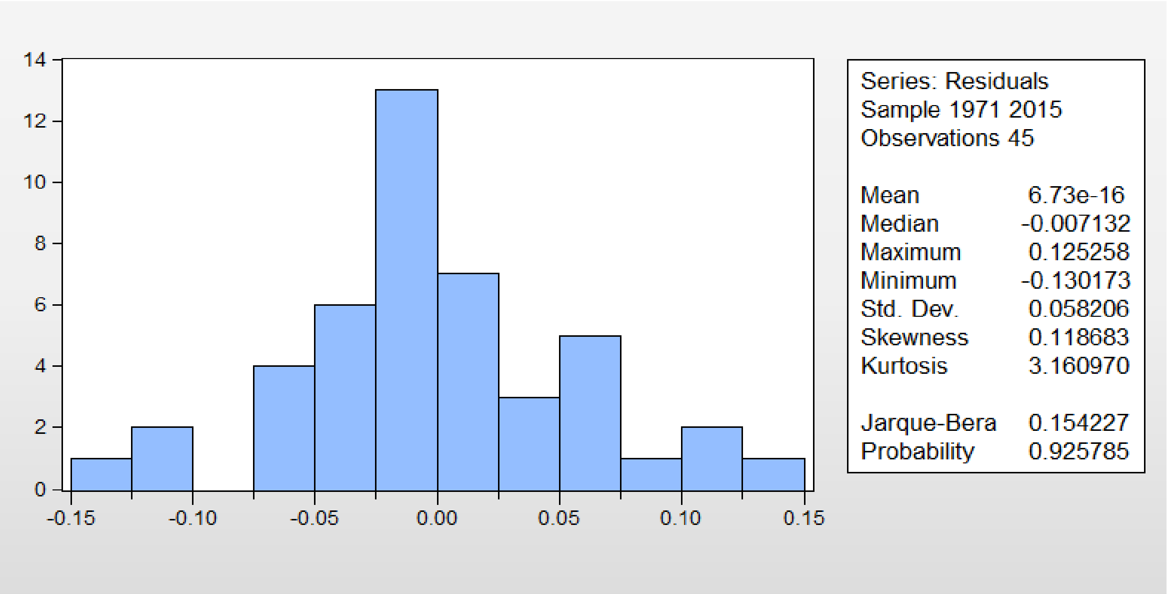

Table C.7 Breusch-Godfrey Serial Correlation LM Test

F-statistic	**0.132270**	**Prob. F(1,38)**	**0.7181**
Obs*R-squared	0.156092	Prob. Chi-Square(1)	0.6928

Table C.8 Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.229398	Prob. F(5,39)	0.0706
Obs*R-squared	10.00289	Prob. Chi-Square(5)	0.0752
Scaled explained SS	8.117986	Prob. Chi-Square(5)	0.1499

Table C.9 Wald Test

Wald Test:			
Test Statistic	Value	df	Probability
Chi-square	6.036862	2	0.0489
Null Hypothesis: C(4)=C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(4)		0.029841	0.014642
C(5)		0.189694	0.084153
Restrictions are linear in coefficients.			

Table C.10 Ordinary Least Square

Dependent Variable: LENR_FS

Method: Least Squares

Sample: 1991 2015

Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.322713	3.428511	0.385798	0.7042
LGDP_PC	0.193304	0.093005	2.078425	0.0485
LGSP_S	0.155057	0.114928	1.349169	0.1940
LINS_FS	0.402027	0.094673	4.246471	0.0005
LTECH_FS	0.542202	0.067431	8.040795	0.0000
LVUL_EMP	0.824116	0.694981	1.185810	0.2511
LUNEM	0.039588	0.020331	1.947181	0.0673
R-squared	0.988284	Mean dependent var		13.54385
Adjusted R-squared	0.984379	S.D. dependent var		0.443995
S.E. of regression	0.055492	Akaike info criterion		-2.713646
Sum squared resid	0.055429	Schwarz criterion		-2.372361
Log likelihood	40.92058	Hannan-Quinn criter.		-2.618988
F-statistic	253.0646	Durbin-Watson stat		1.889079
Prob(F-statistic)	0.000000			

APPENDIX D: Empirical Analysis Model 4

Table D.1 Optimal Lag Selection

VAR Lag Order Selection Criteria

Endogenous variables: LENR_MS LGDP_PC LINS_MS LUNEM LGSP_S

Exogenous variables: C

Sample: 1965 2015

Included observations: 44

Lag	LogL	LR	FPE	AIC	SC
0	-24.86149	NA	2.67e-06	1.357340	1.560089
1	174.5602	344.4556*	9.72e-10*	-6.570916*	-5.354423*
2	194.9828	30.63399	1.25e-09	-6.362856	-4.132618

*** indicates lag order selected by the criterion**

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table D.2 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.445295	25.93003	33.87687	0.3250
At most 1	0.179793	8.720737	27.58434	0.9963
At most 2	0.118329	5.541207	21.13162	0.9904
At most 3	0.091065	4.201198	14.26460	0.8375
At most 4	0.032379	1.448265	3.841466	0.2288

Max-eigenvalue test indicates no cointegration at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

****MacKinnon-Haug-Michelis (1999) p-values**

Table D.3 Unrestricted Vector Autoregressive Model

Vector Autoregression Estimates

Sample (adjusted): 1971 2015

Included observations: 45 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	LENR_MS	LGDP_PC	LINS_MS	LUNEM	LGSP_S
LENR_MS(-1)	0.847490	0.123199	0.058257	0.530662	-0.322709
	(0.08859)	(0.16265)	(0.11994)	(0.72351)	(0.19005)
	[9.56642]	[0.75744]	[0.48572]	[0.73345]	[-1.69798]
LGDP_PC(-1)	0.100407	0.742957	0.040411	0.444807	0.202851
	(0.04620)	(0.08482)	(0.06255)	(0.37729)	(0.09911)
	[2.173452]	[8.75938]	[0.64611]	[1.17895]	[2.04678]
LINS_MS(-1)	0.136685	0.117631	0.912081	-0.772525	0.078082
	(0.06512)	(0.11957)	(0.08817)	(0.53185)	(0.13971)
	[2.098906]	[0.98381]	[10.3448]	[-1.45251]	[0.55889]
LUNEM(-1)	-0.027324	-0.003578	0.009957	0.808654	-0.009811
	(0.01126)	(0.02067)	(0.01524)	(0.09194)	(0.02415)
	[-2.42729]	[-0.17310]	[0.65328]	[8.79561]	[-0.40626]
LGSP_S(-1)	0.071892	0.367511	-0.135441	-1.017244	0.160891
	(0.07487)	(0.13747)	(0.10137)	(0.61148)	(0.16063)
	[0.96020]	[2.67345]	[-1.33614]	[-1.66357]	[1.00165]
C	0.891271	-2.330182	0.233281	0.511340	5.332300
	(0.75659)	(1.38912)	(1.02433)	(6.17907)	(1.62313)
	[1.17801]	[-1.67746]	[0.22774]	[0.08275]	[3.28519]

Table D.4 Vector Autoregression Equation Estimation

Dependent Variable: LENR_MS

Method: Least Squares

Date: 03/25/19 Time: 04:00

Sample (adjusted): 1971 2015

Included observations: 45 after adjustments

LENR_MS = C(1)*LENR_MS(-1) + C(2)*LGDP_PC(-1) + C(3) *LINS_MS(-1) + C(4)*LUNEM(-1) + C(5)*LGSP_S(-1) + C(6)

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
C(1)	0.847490	0.088590	9.566419	0.0000
C(2)	0.100407	0.046197	2.173452	0.0325
C(3)	0.136685	0.065122	2.098906	0.0416
C(4)	-0.027324	0.011257	-2.427289	0.0194
C(5)	0.071892	0.074872	0.960200	0.3429
C(6)	0.891271	0.756591	1.178008	0.2459
R-squared	0.991609	Mean dependent var		13.54635
Adjusted R-squared	0.990533	S.D. dependent var		0.583371
S.E. of regression	0.056760	Akaike info criterion		-2.776397
Sum squared resid	0.125647	Schwarz criterion		-2.535509
Log likelihood	68.46893	Hannan-Quinn criter.		-2.686596
F-statistic	921.7744	Durbin-Watson stat		1.402357
Prob(F-statistic)	0.000000			

Table D.5 Stability Test (Table Roots)

Roots of Characteristic Polynomial

Endogenous variables: LENR_MS LGDP_PC LINS_MS LUNEM LGSP_S

Exogenous variables: C

Lag specification: 1 1

Root	**Modulus**
0.993751	0.993751
0.833326 - 0.094615i	0.838680
0.833326 + 0.094615i	0.838680
0.730285	0.730285
0.081385	0.081385

No root lies outside the unit circle.

VAR satisfies the stability condition.

Table D.6 Histogram-Normality Test

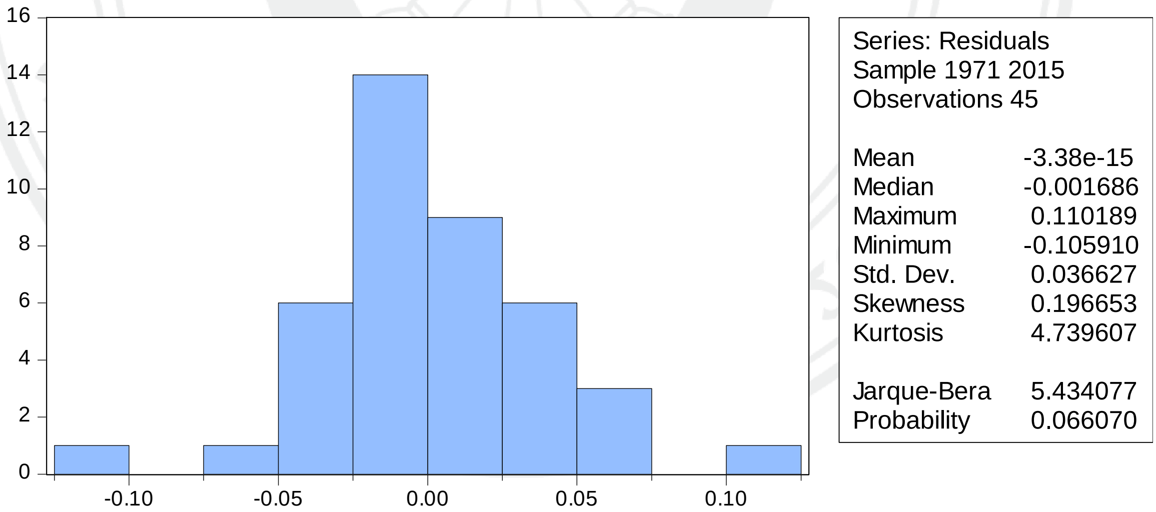

Table D.7 LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.382479	Prob. F(2,31)	0.2660
Obs*R-squared	3.603090	Prob. Chi-Square(2)	0.1650

Table D.8 Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.596208	Prob. F(10,33)	0.1512
Obs*R-squared	14.34440	Prob. Chi-Square(10)	0.1579

Table D.9 Ordinary Least Square

Dependent Variable: LENR_MS
Method: Least Squares
Sample: 1991 2015
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.415714	6.139626	1.533597	0.1425
LGDP_PC	0.631883	0.116423	5.427491	0.0000
LGSP_S	0.160729	0.157415	1.021053	0.3208
LINS_MS	0.131558	0.057812	2.275617	0.0321
LUNEM	-0.032009	0.039751	-0.805243	0.4312
LTECH_MS	0.299782	0.270281	1.109149	0.2820
LVUL_EMP	0.336813	1.003122	0.335765	0.7409

R-squared	0.942680	Mean dependent var	14.00628
Adjusted R-squared	0.923574	S.D. dependent var	0.285168
S.E. of regression	0.078835	Akaike info criterion	-2.011414
Sum squared resid	0.111870	Schwarz criterion	-1.670129
Log likelihood	32.14268	Hannan-Quinn criter.	-1.916756
F-statistic	49.33817	Durbin-Watson stat	2.081914
Prob(F-statistic)	0.000000		

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