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CAUSES OF BRAIN DRAIN AND ITS IMPACT ON PAKISTAN'S ECONOMY

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Abstract:

This study is designed to check the relationship between brain drain and major sectors (political, economic, social, developmental and judicial) of society. An empirical analysis is made by using the sub measures of each sector (i.e., Per Ca pita GDP, Political Stability, Basic Welfare, Freedom of Expression, Health Expenditures, Unemployment and Religious Tensions). Time series data of these measures was taken from 1980 to 2020 and ARDL technique was used to draw the results. The findings of study reveal that political stability tends to discourage the brain drain in the long run, and per capita GDP and unemployment (UN) cause Brain Drain in the short run.

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1. Introduction:

A common tremor faced by the developing countries is that their technical and educated minds fly away to the developed countries. This phenomenon is termed as "The Brain Drain". Brain-drain is the migration (at large scale) of qualified and skilled persons from economically less developed countries to advanced countries (Grubeland Scott, 1966a, 1966b, 1967, 1977; and Iravani, 2011). It includes the worldwide migration of physicians, surgeons, technologists, social experts, natural scientists, engineers, financial experts, information technologists, business administrators, etc. from countries having lower prosperity to the countries having higher welfare level. The educated minds go to superior places to get the jobs according to their education and skill. They keep many aspects in mind when they are migrating to a destiny, and from them a comparative analysis is made on fundamental differences between origin country and the destination state. OECD countries have better situation of economic social environmental, judicial, and political parameters than developing countries of Africa and south Asia. So, in a single decade 7 million people migrated to OECD countries. (Marfouk 2007).

From Pakistan thousands of skilled minds go away annually. According to Pakistan Bureau of Statistics 397,000, 336,000, 189,000, 142,000 and 192,000 skilled workers migrated to abroad in 2015, 2016, 2017, 2018 and 2019, respectively. Now due to covid-19 restrictions brain drain is stopped or got its pace little slow as receiving countries becoming bit conscious and they have tightened screening, travel and migration restrictions. Majority of Pakistani migrates go to Saudi Arabia, UAE, Oman, Qatar, Bahrain, Malaysia, and Italy. These countries have better per capita income, better employment opportunities, well-defined property rights, strong judicial, political structure,

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environmental condition and socioeconomic situation are also better than Pakistan. Brain drain is a very serious issue in the developing countries especially for Pakistan because it creates the scarcity of human capital and makes technology adoption very difficult. The loss of skilled and innovative individuals leads to the lost socio-economic potential for the source countries. It also creates a damage to tax collections for the source countries which minimizes the potential for public spending. Wide-ranging migration can bring scarcities of manpower for origin countries in fundamental areas such as education or health.

There are many reasons of brain drain discussed in the literature. Determinations of brain drain are categorized in different groups, some researchers worked on a single determinant while some have chosen more than one determinant at micro level. But this study is being done on macro level, covering almost all major aspects of society. In order to discuss the causes and effects of brain drain we have selected five groups (Political, Economic, Judicial, Social and Developmental) of variables. It makes this study distinct from previous studies and is intended d to fill the existing gap. It focuses on the causes and outcomes of human capital flight from Pakistan. Human capital plays an important role in growth of countries, together with technology human capital is also a significant factor of production in modern economics. Countries are working on urgent basis on the development of human capital. Many institutions are created all over the world to educate people and give them technical knowledge and skill. The focus of the production side of economy is to create specialized technical skillful among educated youth.

Countries invest in the education and health of their labor by providing it better health and physical strength. They bear huge costs of human resources

development. The countries like Pakistan have performed well in the development of technical skill and innovative skill in its human resources. But the problem is that they have failed to retain them or motivate them to serve in their country. Pakistan has been suffering in two ways due to migration of human capital to other countries. First is the loss of cost born by counties for their education and skill and the second is that loss of skilled workers. This motivates the author to investigate the causes of brain drain from Pakistan and also examine the role of political, economic, social and judicial factors in it and their impact on Pakistan's economy and society. The inclusion of different factors in this study has enhanced the scope of this study and opened the door of further research on it in the light of the finding of current study. This study will continue into existing body of knowledge on brain drain in a way that it analyzes the impact of macro determinants of brain drain and it provides valuable insight to the policy makers of the developing countries to frame policies to control flight of human capital. The rationale of this study is that there are not only economic factors but also social and institutional factors that contribute significantly in the flight of human capital, which is more important than physical and financial capital particularly when traditional economies are moving towards knowledge economies.

2. Literature review:

Kousar et al. (2020) focused on the macroeconomics determinants of brain drain in the Era of globalization. The researchers focused on case study of Pakistan. For the estimation of results researchers used the time series data from 1990 to 2018 (collected data from World Development Indicator(WDI) and the Bureau of Emigration and Overseas Employment (BEOE)). The findings of the study showed that the Governance, financial stability, standard

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of life, and infrastructure all havea negative and significant impact on the brain drain in the long run, according to this study the degree of social openness does not appear to be relevant in the short run. But in the long run,this will have an influence on brain drain. Kattel and Sapkota (2018) made a study on BD (brain drain). The ambition of the study was to grow a framework from where the researcher can reach to the fundamental determinants of BD (brain drain). The mark area mainly set by the researchers for this study was graduates who have completed their graduation in the fields of veterinary and agriculture in Nepal. A special web-based questionnaire was programmed to get the responses from 450samples selected among graduates of agriculture and the field of veterinary sciences. The questionnaire has the portions to check both the push forces (which can push the human skilled capital outside the country) and the pull forces (which can pull the human capital from the outside domain). The data analyzed andbrought into the software, the Stata. The study with its data limitations and response structure found it auspicious to use the Logit model to get clear and reliable results. Main findings revealed that above 50 percent of Nepalese graduates choose to go abroad because of two key motives. One is to continue higher education and the second is to be at a place where they could get better and easy jobs. Farooq and Ahmad (2017) focused on brain drain from Pakistan. Panel data of 27 countries (including Malaysia Australia, Japan Bahrain, Italy Canada, Greece China, France Cyprus, Germany, Indonesia, Kuwait, Libya) was taken. The findings of the study showed that the key causes driving migration from the Pakistan contain the pull factors like improved socioeconomic circumstances in destination countries together with the push forces such as Pakistan's demographic and labor market issues. Chee et al. (2017) identified factors provoking Malaysian

workers (having higher education) to move abroad. The study included 400 highly educated workers working in Kuala Lumpur, Penang and Johor Bahru. Quota sampling technology was used and the questionnaire method used to collect data, seven factors such as wages, social support, quality of life, employment, economic stability, 'training and the opportunity for continuous learning' and the household effectwere identified. The results confirmed that five out of seven important variables related to brain drain in Malaysia. Farooq and Ahmad (2017) focused on brain drain from Pakistan. Panel data of 27 countries (including Malaysia Australia, Japan Bahrain, Italy Canada, Greece China, France Cyprus, Germany, Indonesia, Kuwait, Libya) was taken. The findings of the study showed that the key causes driving migration from the Pakistan contain the pull factors like improved socioeconomic circumstances in destination countries together with the push forces such as Pakistan's demographic and labor market issues. Arouri et al. (2014) contributed to the literature by identifying the macroeconomic drivers for brain drain in the case of Pakistan during the period 1972-2012 using the ARDL Boundary Test Approach. The results of the study showed that economic growth and financial development have a negative impact on brain drain. However, inflation, unemployment and trade openness exacerbate brain drain. The study highlighted the macroeconomic insights of policy makers to control the brain drain problem in Pakistan. Boncea (2014) identified the main determinants of the immigration decision. The research design included a literature review, and a questionnaire which was distributed among Romanian doctors with international practical experience. The conclusion once again confirmed that the gap in the wages between Romania and destination countries is not the most important cause of migration. Although the gap is

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large, the policy makers which suggest increasing doctor's "salaries will not solve the immigration problem. The main reasons behind immigration decision were working conditions and availability of facilities of Career development and continuing education opportunities. Economic and political stability or personal factors have less influence. Foo (2011) appreciated the stocks and flows of Malaysian-born migrants in the world. The research also explored the main determinants of high-skill migration for Malaysia and found that high levels of income in destination countries, livelihood and religious diversity and proximity (shorter distances) were associated with higher immigration rates. Hoti (2009) focused on the determinants of immigration decisions among the working-age population in Kosovo, a country with 20% of its population abroad. The estimates derived were largely consistent with traditional theories of migration in that migration decreases with age and generally increases with education and family size, although there are significant differences as well. In addition, the paper focused on the impact of brain drain due to the differences of immigration and employment at home and abroad as a driving force for immigration from Kosova. This study was the first systematic study of these issues in this post-socialist and post- conflict period. Ahmed et al. (2008) examined the macroeconomic determinants of international migration from Pakistan. They used time series date for the estimation of results. The findings of this study showed that migration is positively affected by unemployment and inflation and negatively affected by real wage rate in Pakistan. The result also disclosed that international migration had positive impact on inflow of remittance. Beine et al. (2008) analyzed relationship between brain drain and the size of a country, as well as the extent to which small countries lose human capital in general. They argued

that small countries having less employment opportunities lose valuable human capital because skilled workers prefer to migrate to the developed countries to avail employment opportunities and enjoying better living standard.

Going through the literature it has been found that researchers have done a lot of work on brain drain. Some researchers took political factors like democracy and political stability and the others took economic variables like wage rate and job opportunities. But they skipped the legal, social and personal factors like proprietary rights, judicial confidence, social security and individual freedom with specific reference to brain drain. This created a gap in the literature which the author has intended to fill through current study.

3. Theoretical foundation:

In early societies humans migrated from a place of short economic resources to a place having more economic resources like water and food grains. After organization of societies and transformation from agriculture to industrialization people preferred to move from backward to industrially developed areas in order to avail better economic opportunities and enjoy better standard of life. Then the diversity in industry created another opportunity of migration within industrial zones. The world developed further with technology and globalization and this time the migration took new dimensions. The individuals started thinking about their specialization, about the opportunities of higher economic gains and about the best rewards they can get from their work.

Everett Lee in 1966 proposed a theory "Push Pull theory of brain drain". This theory suggests that there are two main forces. The pull force or pull factors and the push force or push factors. The pull factors cause the people to

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come towards the country/region under consideration. On other had the push factors or push force is a force that causes people to migrate from that specific country.

William J. Reilly in 1931 developed "The gravity model of migration". He argues that "As the importance of one or both of the location increases, there will also be an increase in movement between them. If people have to choose between two places with almost the same condition of major five areas (political,social, economic, legal and developmental), they tend to show equal importance to both places, he concluded.

Wall-Erstein, proposed "world system theory" in 1974. He regarded migration as a natural consequence of economic globalization whereby companies now operate across national boundaries. This theory was first to include globalization as factor of migration together with economic and political factors. According to this theory, developed countries have two types of economic flows. They import labor intensive work in one flow and export capital intensive products in the other flow. The polarization creates more opportunities of migration between developed and developing countries.

Neoclassical economic theory of migration suggests that wage gaps created by labor markets of developed and developing countries creates attractions for the people living in developing countries. By migrating they can enjoy higher economic levels with the same amount of work by migrating to those developed and industrialized countries of the world. This is how economic factors can trigger migration or brain drain from developing countries like Pakistan. The current study has been built on the bases of Lee (1966) theory of "Push Pull theory of brain drain".

In the light of above theoretical framework the author has developed

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following hypotheses for this study as per selected variables of study: -

Political Factors

Govt. Effectiveness H_0:   Govt. effectiveness dose not reduce brain drain

H_1:   Govt. effectiveness reduces brain drain

Political Stability H_0:   Political Stability dose not reduce brain drain

H_1:   Political Stability reduces brain drain

Economic Factors

Control of Corruption H_0:   Control of Corruption dose not effect brain drain

H_1:   Control of Corruption effects brain drain

GDP Per Capita H_0:   GDP Per Capita dose not effect brain drain

H_1:   GDP Per Capita effects brain drain

Property Rights H_0: Property Rights dose not effect brain drain

H_1: Property Rights effects brain drain

Unemployment H_0: Unemployment dose not effect brain drain

H_1: Unemployment effects brain drain

Shadow Economy H_0: Shadow Economy does not affect brain drain

H_1: Shadow Economy effects brain drain

Social factors

Basic Welfare H_0: Basic Welfare corruption does not affect brain drain

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	H_1: Basic Welfare effects brain drain
Freedom Of Expression	H_0: Freedom of Expression dose not effect brain drain
	H_1: Freedom of Expression effects brain drain
Human Right	H_0: Human Right dose not effect brain drain
	H_1: Human Right effects brain drain
Religious Tensions	H_0: Religious Tensions dose not effect brain drain
	H_1: Religious Tensions effects brain drain

Development factors

Expenditures on Education	H_0: Expenditures on Education dose not effect brain drain
	H_1: Expenditures on Education effects brain drain
Expenditures on Health	H_0: Expenditures on Health dose not effect brain drain
	H_1: Expenditures on Health effects brain drain
PSDP	H_0: PSDP does not affect brain drain
	H_1: PSDP effects brain drain

Legal and judicial factors

Expenditures on Education.	H_0: Expenditures on Education dose not effect brain drain
	H_1: Expenditures on Education effects brain

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	drain
Expenditures on Health	H_0: Expenditures on Health dose not effect brain drain
	H_1: Expenditures on Health effects brain drain
PSDP	H_0: PSDP does not affect brain drain
	H_1: PSDP effects brain drain

4. Data and Methodology:

The author used secondary data from1980 to 2020. The data for the variables such as judicial corruption, judicial independence, human rights and shadow economy is taken from "TCdata 360" an organization working with the World Bank.The data for the variable PSDP is taken from the Ministry of Planning Development and Special Initiatives and data for all remaining variables is taken from "The Global Economy.com" (a platform for database for the social science researchers) and also from world development indicators (WDI), the database of World Bank. Brain drain was selected as dependent variable. The data relating to dependent variables was taken from Bureau of Statistics, Government of Pakistan which maintained year-wise data of the people migrating from Pakistan to abroad. This data has been divided into three categories: low skilled workers' migration, highly skilled workers' migration, and highly qualified workers' migration. All these three categories represent brain drain. However, we add them to get a single broad variable, brain drain.

The explanatory variables include in the study are 16 in number and they include: Government effectiveness, Political Stability, Control of Corruption, GDP Per Capita, Proprietary Rights, Unemployment Rate, Shadow Economy,

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Basic Welfare, Freedom of Expression, Human Rights, Religious Tensions, Education expenditures, Health expenditures, PSDP Pakistan, Judicial corruption, Judicial independence and Murders/Homicides. The number of independent variables show the wide range and large scope of current study.

4.3.1 Measurement of variables

Government effectiveness is measured through index and major components of this index are perception of public service quality, civil service quality, independence from political pressure, effective policy implementation and how much its credibility. If the government is politically weak and unstable then people will prefer to migrate to the countries where ample job opportunities are available.

4.3.1.1 Political Stability:

Political stability means how much stable a government is throughout its legal tenure. In most of the developing countries political governments are not as much powerful and stable as are expected. Stability of government is necessary for long term execution of policies regarding taxation and business environment. Instability and frequent changes in political regimes may cause distrust in minds of business community and may also provoke them to shift their businesses. The index to measure political stability is developed by averaging other indexes used by "political risk services", "world economic forum" and "economic intelligence unit""

4.3.1.2 Control of Corruption:

Control of corruption from public offices is also an important factor for workers and business firms. Mostly corruption is measured by the index development by Transparency International. The author will use the same index to measure the level of corruption in Pakistan.

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4.3.1.3 GDP Per Capita:

GDP (Gross Domestic Product) of a country is the simple addition of market values (financial) of all goods and services produced within one financial year. When we divide the total GDP of a country on its population, we get per capita GDP. The value of this measure in this study is taken in current USD to avoid the problems like inflation and purchasing power parity. Per capita GDP is taken as proxy measure of the welfare of a country.

4.3.1.4 Proprietary Rights:

Proprietary rights are the legal privileges to own an asset and have authority to make decisions about them. The available data on this measure is an index of two further measures. One is the degree to which the laws of Pakistan are protecting the property rights of individualsand the second is the magnitude to which political government is enforcing those laws. For an entrepreneur or businessman, the decision to start a business strongly depends on the laws of land. For a business, to stay in the country or to leave the country depends on these laws.

4.3.1.5 Unemployment Rate:

Unemployment is referred to the part of the total work force which has the required ability to work and seeking to be hired for work but doesn't get any job. Having the ability but not having the appropriate job may force the individuals to migrate to somewhere else and find job according to his ability. The unemployment rate is measured by dividing over number of unemployed persons over total number of employed persons.

4.3.1.6 Shadow Economy:

The shadow or undocumented economy is the ratio of the economy that is running illegally. In the existence of undocumented economy, the

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government suffers huge revenue loss because it is operating beyond the jurisdiction of Government. The size of shadow economy in the developing countries like Pakistan is huge and on account of this reason the amount of tax revenue is very low and the Government will have to borrow loans from internal and external sources.

4.3.1.7 Basic Welfare:

The variable Basic welfare measures the total volume of well-being produced by the state a macro level for its population. This, in fact, is social welfare, which is mostly measured through Human Development Index (HDI) that constitutes by social indicators such as   literacy rate, r infant mortality rate, number of calories able for and individual for a day and average years of schooling. In simple words itexpresses the degree at which basic needs of the individuals are being fulfilled by the state.Seven indicators of basic needs are aggregated depicts picture of true welfare. Mostly people prefer to live in those countries where the level of HDI is high.

4.3.1.8 Freedom of Expression:

This variable indicates the freedom which the media enjoys within the territory and the degree of independence with which political issues are debated openly and opinions are made and put on air for general public. If there is no freedom or political analysts and critics are tortured and censored this might become a push factor that significantly contribute into brain drain.

4.3.1.9 Human Rights:

The next variable in our model is "human rights" that shows how strongly a state protects the basic human rights of its individuals. The value for this indicator ranges from 0 to 1, the lowest and highest respectively. The basic human rights include in it the freedoms of education, religious practices, speech and doing business. These factors push brain drain significantly.

4.3.1.10 Religious Tensions:

Religious conflicts force the people to leave the area or country were insecurity is prevailing and people feel themselves insecure and vulnerable. It is very serious issue in the counties where multi-ethnic groups are living side by side. Pakistan has been facing religious tensions since long and weak segment of society feel itself insecure.

4.3.1.11 Education Expenditure:

Total amount spent on education by the government is considered as public expenditures. Here the government includes all the levels of governing bodies (central, provincial, and local). Funds transferred from international NGOs and other sources are also included in this category. The higher the educational expenditures are the advanced will be the quality of education. Quality of education is measured through quality of schooling, quality of teaching faculty and quality of curriculum.

4.3.1.12 Health Expenditure:

Health expenditures is the percentage of total GDP to be spent on health care services. In more technical terms, it doesn't include the expenditures made on buildings, vaccines and other emergency services. The overall health of public and life expectancy depends on the health expenditures and quality of health services. People always give first priority to health when they make decision about migration. Some people migrate to the areas where quality health services are available and due to this reason, this variable has been included into this study.

4.3.1.13 PSDP Pakistan":

Public Sector Development Program (PSDP) is carried out to develop infrastructure or human resources development. The public money to be spend

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on this head is considered as productive spending because it plays a vital role in economic development. These spending does not only build physical capital but also human capital.

4.3.1.14 Judicial Corruption:

Judicial corruption measures the sum of bribery that a judicial system of a country embraces in it. If money is demanded for seeking justice it is fallen within the preview of judicial corruption. This is very serious issue and almost all developing countries are facing it. Injustice is a common phenomenon due to which the people are denied of their legal rights. This is one of the main causes of brain drain from countries like Pakistan.

4.3.1.15 Judicial Independence:

An independent judiciary is like an arbitrator that can solve the problems of individuals, organizations and other different parties. A confident life, business and social security can be established through independent judiciary. This variable measures the degree of independence of judicial decision from political government, government institutions and other powerful elites. The value is made from five sub indicators three about the checks on government and two about the compliance of judicial decisions by the government.

4.3.1.16 Murders/Homicides:

The measure "Murders" in any country is computed as number of total killings per hundred thousand persons. It shows the state of insecurity in a society. People leave those societies where safety of life and property are not ensured. As Pakistan ranks among those countries where killing, murders and terrorism are common and therefore, people prefer to migrate to peaceful countries.

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4.4 Econometric Models:

Five models have been specified for this study and these models are engraved in the following equations:

Model 1 (Political)

$$BD=\beta 0+\beta 1 GE+\beta 2 PS+\mu$$

Where;

GE= Government efficiency

PS= Political stability

Model 2 (Economic)

$$BD=\beta 0+\beta 1 CC+\beta 2 PC+\beta 3 PR+\beta 4 UN+\beta 5 SE+\mu$$

Where:

CC = Control of corruption

PC= GDP per capita

PR = Property rights

UN= Unemployment

SE= Shadow economy

Model 3 (Social)

$$BD=\beta 0+\beta 1 BW+\beta 2 FE+\beta 3 HR+\beta 4 RT+\mu$$

Where:

BW=basic welfare

FE = freedom of expression

HR=human rights

RT=religious tensions

Model 4 (Developmental)

$$BD=\beta 0+\beta 1 EE+\beta 2 HE+\beta 3 PSDP+\mu$$

Where:

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EE= expenditures on education

HE= expenditures for health

PSDP= Public Sector Development Program

Model 5 (Judicial)

$$BD=β0+β1JC+β2JI+β3MR+ μ$$

Where:

JC= judicial corruption

JI= judicial independence

MR= murders per 100,000

This study employed the following statistical techniques such as Descriptive Statistics, ADF Test, ARDL Model and Error Correction model to determine short run and long run relationship between variables.

5. Empirical Analysis:

Now we discuss the calculated results one by one.

5.1 Descriptive Statistics:

Table 1-5 depicts the descriptive statistics of all variables. Considering the means of all series, BD (brain drain) variable has highest mean, while HR (Human rights) possesses the lowest mean. Although descriptive statistics provide several kinds of information, the noteworthy information is that almost all variables have low t-values of Jarque-Bera test (which indicates normal distribution of residuals), determining that majority of the variables have normal distribution of "residuals": Hence, this outcome encourages us to conduct linear analysis, applying the linear ARDL approach. All the variables are in logarithmic form. The results are shown in Tables 5.1 (a), (b), ©, (d) and (e).

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Table 5.1 (a) Descriptive statistics of Model-1

	BD	GE	PS
Mean	5.110812	-0.593097	-1.961484
Median	5.032381	-0.600000	-2.010000
Maximum	5.625985	-0.350000	-1.010000
Minimum	4.683380	-0.820000	-2.810000
Std.Dev.	0.267916	0.136191	0.575751
Skewness	0.29679	0.013666	0.242181
Kurtosis	1.780095	1.921342	1.657825
Jarque-Bera	2.36356	1.503824	2.629887

Table 5.1 (b) Descriptive statistics of Model-2

	BD	CC	PC	PR	SE	UN
Mean	5.110812	-1.072645	2.887627	1.579895	1.514955	1.413226
Median	5.032381	-0.990000	2.874435	1.477121	1.499962	0.630000
Maximum	5.625985	-0.760000	3.217984	1.845098	1.574610	4.650000
Minimum	4.683380	-2.010000	2.570169	1.477121	1.481156	0.400000
Std. Dev.	0.267916	0.343646	0.215855	0.142264	0.028365	1.389284
Skewness	0.279679	-1.697616	0.137670	0.941457	0.390951	1.276671
Kurtosis	1.780095	4.963619	1.506233	2.253601	1.743777	2.894287
Jarque-Bera	2.326356	19.87022	2.980072	5.299032	2.828062	8.435522
Probability	0.312492	0.000048	0.225365	0.070685	0.243161	0.014732

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Table 5.1 (c) Descriptive statistics of Model-3

	BW	FE	HR	RT
Mean	0.326922	0.599633	0.291864	0.410095
Median	0.332020	0.598296	0.250000	0.222222
Maximum	0.411072	0.679922	0.581474	0.833333
Minimum	0.260292	0.433445	0.250000	0.166667
Std. Dev.	0.042927	0.057047	0.089432	0.295593
Skewness	0.053152	-1.091856	2.122440	0.561543

Table 5.1 (d) Descriptive statistics of Model-4

	BD	EE	HE	SDP
Mean	5.110812	1.944262	0.679858	2.240751
Median	5.032381	1.833096	0.670969	2.170262
Maximum	5.625985	2.465659	1.203016	3.000434
Minimum	4.683380	1.423564	0.230286	1.618048
Std.Dev.	0.267916	0.282027	0.211533	0.442471
Skewness	0.279679	0.029738	0.683795	0.166402
Kurtosis	1.780095	1.903583	4.328894	1.555097
Jarque-Bera	2.326356	1.557321	4.696836	2.839734
Probability	**0.312492**	0.459020	0.095520	0.241746

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Table 5.1 (e) Results of Descriptive statistics of Model-5

	BD	JC	JI	LMR
Mean	5.110812	0.314978	0.431057	0.800014
Median	5.032381	0.37849	0.408603	0.832509
Maximum	5.625985	0.394806	0.513247	0.883661
Minimum	4.683380	0.096936	0.376002	0.588832
Std.Dev.	0.267916	0.069256	0.050834	0.090586
Skewness	0.279679	0.711718	0.458498	1.238164
Kurtosis	1.780095	4.138008	1.494386	3.210778
Jarque-Bera	2.326356	4.289926	4.014187	7.978150
Probability	0.312492	0.117072	0.134379	0.018517

5.2 ADF Unit Root Test:

Before computing the coefficients of the selected variables, it is necessary to confirm whetherthe variable of this study have stationary or not since the existence of unit root among variables will lead to a spurious regression result. Hence, to detect stationary we apply Augment Dickey-Fuller (ADF) test. The results show that all variables are stationers at first difference and in this situation, we can use ARDL approach. The results are shown in Table 5.2.

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Table 5.2 Results of ADF Test

Model1	BDD	GE	PS			
	-1.1704	-2.1809	-1.4529			1(0)
	-5.0673***	-6.6317***	-7.9051***			1(1)
Model2	CC	PC	PR	SE	UN	
	-3.2959**	-0.9520	-2.0702	-1.4697	1.3166	1(0)
	-8.8390***	-4.6837***	-6.3582***	-8.5068***	-7.2313***	1(1)
Model3	BW	FE	HR	RT		
	-0.5077	-1.1411	-4.6381***	-1.4357		1(0)
	-7.1597***	-4.4736***	-8.3140***	-4.8960***		1(1)
Model4						
	EE	HE	PSDP			
	-2.0231	-0.4535	-0.4372			1(0)
	-5.0693***	-4.6414***	-4.8709***			1(1)
Model5						
	JC	JI	MR			
	-2.3274	-1.3082	-0.6260			1(0)
	-6.4501***	4.9959***	-4.1569***			1(1)

The results in table 5.2 shows that f-statistics of model 1, 2, 3, 4, and 5 are 5.62, 6.17, 6.08, 5.63, 4.18, respectively. All the computed values of all models are greater than the upper-bound values at 95%; we decide that all the series have long-run association with dependent variable of Brain Drain (BD). Hence, we proceed towards the short-run as well as long-run coefficients estimation.

5.3 Bound Test:

This test is used to determine long run relationship between variables. The calculated results are shown in Table 5.3.

Table 5.3 Result of Bound Test

	F-statistic	Lower bound 95%	Upper bound 95%	Remarks
Model1	5.62	3.79	4.85	Co-integration
Model2	6.17	3.06	4.37	Co-integration
Model3	6.08	2.89	4.13	Co-integration
Model4	5.63	2.61	3.88	Co-integration
Model5	4.18	3.53	4.85	Co-integration

Table 5.3 s h o w s the results of the bound testing approach for all the models Since all calculated values across the models exceed the upper bound values at 95%, so we conclude that all explanatory variables have a long-term relationship with the dependent variable. Now we estimate long run association between dependent and independent variables through ARDL model.

5.4 Auto-Regressive Distributed Lag (ADRL) Models:

The results of ARDL modes are highlighted in Table 5.4**.**

Table 5.4: Result of ARDL Models

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef.	T Stats.	Coef.	T Stats.	Coef.	T Stats.	Coef.	T Stats.	Coef.	T Stats.
D (BD	0.271	1.680								

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(-1))									
D (GE)	-0.014	-0.074							
D (PS)	-0.072	-1.181							
D (BD (-1))									
D(C C)			-0.200	1.086					
D(PC)			-0.332**	2.121					
D(PR)			-0.164	1.113					
D(U N)			0.300*	3.006					
D(SE)			0.124	0.997					
D (BW)					-5.324*	-2.072			
D(FE)					0.356	0.370			
D (FE (-1))					-4.771**	2.297			
D (FE (-2))					-3.152**	2.078			

D(HR)					0.213	0.369			
D(HR(-1))					-0.514	-1.340			
D(HR(-2))					-0.617	-1.481			
D(RT)					0.186	0.927			
D(RT(-1))					0.537**	2.104			
D(RT(-2)					0.321	1.371			
D(EE)							-0.029	-0.278	
D(EE(-1))							-0.216	-1.683	
D(HE)							-0.304	-1.398	
D(HE(-1)							0.437***	1.759	
D(PSDP)							-0.284	-0.981	

D (PSDP (-1)							-0.558***	-1.870	
D(JC)								0.149	0.356
D (JC (-1))								0.994***	1.756
D(JI)								0.911	0.820
D (JI (-1))								-2.143***	-1.933
D (MR)								0.453	1.354

Panel B: Long Run Results:

Table 5.4: Result of ARDL

	Model 1		Model 2			Model 3		Model 4		Model 5	
	Coef.	**T Stats.**	**Coef.**	**T Stats.**		**Coef.**	**T Stats**	**Coef.**	**T Stats.**	**Coef.**	**T Stats.**
GE	-0.026***	-1.784									
PS	-0.42	2.356									

	8**									
CC			-0.182**	1.993						
PC			-0.445*	3.116						
PR			-0.075	1.341						
UN			0.285*	2.776						
SE			0.085***	1.773						
BW					-6.433	-8.022				
FE					-1.257**	-2.497				
HR					-0.336	-0.646				
RT					0.205**	2.358				
EE							0.342*	3.313		
HE							0.608*	3.510		
PSDP							-0.56	10.941		

									1*			
JC											0.863***	-1.807
JI											-3.890*	8.760
MR											0.415	-1.676

5.5 Diagnostic tests:

The results of diagnostic test are given in Table 5.5.

Table 5.5 Diagnostic Results

	Model 1		Model 3		Model 4		Model 5	
	Coef.		**Coef.**		**Coef.**		**Coef.**	
AdjR2	0.87		0.90		0.92		0.94	
ECM	-0.530		-0.543		-0.765		0.452	
	0.0005		0.000		0.000		0.000	
LM	2.01		0.348		1.194		1.44	
Jerque Berastats	0.884		0.931		1.6		1.17	
RESET	1.604		2.73		1.064		0.408	
CUSUM	S		S		S		S	
CUSUMQ	US		S		S		S	

Discussion of results:

Starting from the short run (SR) results of model 1 as shown in Table 5.4 Panel A. we find that political stability (PS) and government effectiveness (GE) do not show a significant impact on brain drain. However, in the long-run (LR) as shown by Panel B in Table 5.4 one unit rises in political stability (PS) tends to discourage the brain drain by 42%, indicating the negative nexus

between these two variables. Similarly, Government effectiveness (GE) also plays a significant role such that brain drain decreases by2% due to one unit increases in Government effectiveness. Furthermore, the magnitude of the political stability coefficients is greater than that of Government effectiveness indicating that political stability plays more important role in discouraging the process of brain drain.

The short run and long run outcome of model 2 has shown in Panel A and B of Table 5.4. In the short run, the ARDL estimates determine that only Per capita GDP (PC) and unemployment (UN) have a significant impact on brain drain. One-unit increases in per capita GDP will likely to decrease the brain drain by 33%. However, unemployment with one unit increase will results in an increase in brain drain by 30%. In the long run, control in corruption (CC) and per capita GDP (PC) demonstrate an adverse relationship with Brain drain, indicating that both variables significantly discourage Brain drain from Pakistan by 18% and 44%, respectively. However, unemployment and shadow economy show detrimental effects and increase brain drain by 28% and 8%, respectively, showing the significantly positive association. Ironically, in both short run and long run periods, property rights (PR) exhibit insignificant association with brain drain.

As for as the findings of model 3 are concerned, the SR estimates in Panel A show that basic welfare (BW) and freedom of expression (FE) have significant negative link with brain drain. The results affirm that one-unit increases in basic welfare and freedom of expression will likely to decrease the brain drain from Pakistan by 53%, and 3.77%, respectively. In contrast, the religious tensions (RT) are responsible for 53% rise in brain drain. The result of human rights (HR) shows the insignificant effects on brain drain.

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The results in Panel B confirm that basic welfare and freedom of expression show significant negative relationship with brain drain. The outcome asserts that 6.43% and 1.25% rise in basic welfare and freedom of expression, respectively, leads to decrease in brain drain from Pakistan. On the other hand, religious tensions play a vital role in brain drain because one unit increases in religious conflict will likely to increase brain drain 20%. Human rights (HR) have insignificant relationship with brain drain in the long run.

The short run results of model 4 (Panel A) shows, only health expenditures (HE) and public sector development program (PSDP) have a significant negative relationship with brain drain. The results determine that one unit increases in health expenditure (HE) and PSDP will likely to decrease brain drain by 43% and 55%, respectively. In contrast, all the development variables, i.e., EE (education expenditures), health expenditure, PSDP significantly reduce brain drain in the long run. We find that brain drain tends to shrink by 34%, 60%, and 56%, respectively if one unit increase in education, Health, and PSDP expenditures.

The short run and long results of Model 5 are given in Panel A and B. In the short run, ARDL estimates confirm positive effects of judicial corruption (JC) and negative effect of judicial independence (JI) on brain drain. It means if one unit increases in judicial corruption it will likely to cause .99% increase in brain drain, while one unit increases in judicial independence (JI) tends to disrupt the process of brain drain by 2.14%. In the long run, we find that the results remain consistent such that brain drain show a significant positive association with judicial corruption (JC). However, one unit increases in judicial independence will reduce brain drain by 3.89%. Thus, policy initiatives should be taken to ensure independence of judiciary.

In order to confirm the robustness of the findings, we apply several diagnostic tests as Panel C inTable 5 . 5 show. Firstly, the Adj. R^2 of model 1, 2, 3, 4, and 5 is 0.87, 0.92, 0.90, 0.92, and 0.94, respectively, that validate the goodness of fit of our models. Secondly, ECM values of model 1, 2, 3, 4, and 5 are -0.530, -0.676, -0.543, -0.765, -0.452 respectively. All the values are significant and show a speedy recovery to long-run equilibrium. Further, the outcome of LM, Jerque- Betras and RESET tests confirm that our models are free from the issues of auto-correlation, non-normal distribution of errors and in-stability of the parameters.

6. Conclusions and Policy implications:

From the above finding we can conclude that political stability, Government effectiveness, independent judiciary and investment in infrastructure and human capital are vital factors to control brain drain from Pakistan. Similarly, judicial corruption, religious tension, murders, lawlessness, terrorism, weak government political instability and unemployment are the factors which are negatively affecting not only Pakistan economy but also accelerating brain drain from Pakistan. The results of this study give insight to the policy makers to introduce reforms and take concrete policy initiatives to improve law and order situation, eradication corruption from public sector institutions, to ensure continuity of political system and make judicial system more effective in order to ensure the protection of fundamental rights and freedom of expression. Proper focus should be given on the improvement of economic as well as social indicators. The policy implication of this study is that the cost of dispense of justice may be reduced and regulatory framework must be made efficient and result-oriented. The safety of life and security of property as well as enforcement of contracts and ease of doing business must be ensured in order to create level playing field for all sections of

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society in Pakistan. This study has mainly focused on macro determinants of brain drain from Pakistan and did not include family conflict, big size of family, burden of brothers and sisters, lack of education facilities in the rural areas and lack of relevant job opportunities which are also some causes of brain drain. The researchers can select micro variables into their studies while conducting research on the causes of brain drain from Pakistan.

Data statement:

The data that uses in support of the findings of this study will be made available on request by corresponding author.

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