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ACCOUNTABILITY AND ITS IMPACT ON ECONOMIC GROWTH

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Abstract

This research paper delves into an exploration of the intricate relationships between accountability, foreign direct investment (FDI), capital formation (CF), technological advancement (TA), and economic growth (GDP) spanning the period from 1996 to 2019. The data was collected from World Development indicators, Transparency International, Asian Development Bank, Pakistan Economic Survey, and the State Bank of Pakistan. Different statistical techniques such as descriptive statistics, correlation analysis, Augmented Dickey-Fuller (ADF) unit root tests, bound tests, Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM) and Granger causality tests, were employed to navigate the intricate relationships among these pivotal variables. The empirical results of ARDL model revealed statistically significant positive effects of Accountability (ACT), Fixed Capital (FC), and Technological Advancement (TA) on GDP, underscoring their vital roles in bolstering economic growth. In contrast, Foreign Direct Investment (FDI) has no significant long-term impacts on GDP.

Key words: Accountability; Capital formation; FDI; Technological progress; Economic growth.
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1. Introduction

In the contemporary global economic landscape, the emphasis on good governance stands paramount, especially in both corporate and public sectors. Numerous developing nations confront economic and political quandaries, primarily stemming from subpar governance and an opaque handling of financial assets by senior authorities. Governance is often perceived as the capability of public bodies to render services and amenities to the people in a manner that is effective, transparent, unbiased, and accountable. Crucial elements that underpin good governance include rule of law, efficiency, transparency, effectiveness, and accountability (Shah, 2021). A multitude of studies consistently underline that transparency is a pivotal condition for effective governance, impacting positive outcomes of public expenditure on economic performance (López and Fontaine, 2019; Montes et al., 2019; Morozumi and Veiga, 2016; Phuc Canh, 2018). Furthermore, transparency and accountability in policy formulation by governments play a decisive role in sustaining long-term growth in private sector investments (Braga Tadeu and Moreira Silva, 2013).

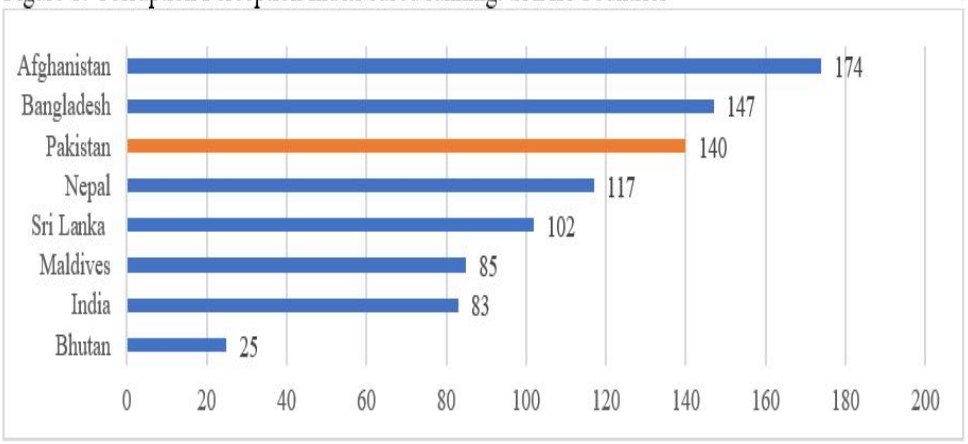
The advent of e-government technology has emerged as a beacon for developing nations, aiming to bolster the good governance capabilities of public entities. In this context, Kandhro and Parthrannarakul (2013) posit hypotheses related to the role of e-government technology in accentuating transparency and accountability within public organizations. However, despite these strides, accountability and transparency remain formidable challenges, especially in budding economies. These challenges stem from a deficit in democratic policies and institutional efficiency. The ever-evolving global scenario demands frequent introspection, rigorous analyses, and recalibration

of policies to address the dynamic challenges of governance and public administration. Transparency in accountability process is a crucial challenge in emerging market economies due to weak political system and confrontation between leadership and institutions. It causes social, economic and political stresses in these economies. (Alam,2021). All institutions must be accountable before the people for effective accountability because people because they are paid salaries and other financial benefits through the money collected from people in the form of multiple taxes. It will enhance public trust in the use of public funds which must be utilized for development projects in transparent manners. (United Nations,2015). In order to create transparency and fair transaction mechanism and improving monitoring system it is necessary to use information and communication technology and reduce contact between citizens and employees of public institutions. These objectives can be achieved through promoting e-government and not only enhance operational capacity of public institutions but also reduce the chance of corrupt practices. (Halachmi and Greiling, 2013). The effectiveness of government can be enhanced through just and fair policy frame work to promote conducive environment private and public sector interplay. The interaction between public sector institutions, employees and business firms may be reduced to generate transparency in all kinds of transactions. (Kousky et al., 2006). Many studies have emphasized that the effectiveness of government can be enhanced through transparent public spending on all development projects. (López and Fontaine, 2019; Montes et al., 2019; Morozumi and Veiga, 2016; Phuc Canh, 2018). Additionally, creating transparency in transactions and generating sense of accountability among

public servant is necessary for promoting investment and expediting growth process. (Braga Tadeu and Moreira Silva, 2013).

Pakistan presents a labyrinthine anti-corruption infrastructure, comprising an intricate network of laws and institutions. The nation's accountability system, for instance, delineates five distinct tiers of laws based on various societal standings ranging from the ruling elite to ordinary citizens. The surprising is that despite having multiple anti-graft institutions in Pakistan the level of corruption and malpractices and misuse of funds of funds by public sector is increasing with the passage of time. These institutions include National Accountability Bureau (NAB) and the Federal Investigation Agency (FIA), and four Anti-Corruption Establishments (ACEs) at the provincial level. But the performance of these institutions is questionable because every government use these institutions against their opponents. The targeted accountability and political victimization have spoiled the credibility of these institutions. The reason is that existing accountability system in Pakistan has different sets of rules and laws applicable to various segments of society. These sets include rules for the ruling elite, the civilian ruling elite, collaborators of the ruling elite, the rich and powerful, and ordinary citizens. (Ahmad, 2020). Since 2000 accountability has become a major political slogan in Pakistan (Mehboob, 2022). This slogan is used to victimize political opponents but not to eradicate corruption and malpractices from the country. This is the reason that Pakistan's ranking is 140 out of 180 countries as per Corruption Perception Index, 2021 in the report issued by Transparency International in 2022.

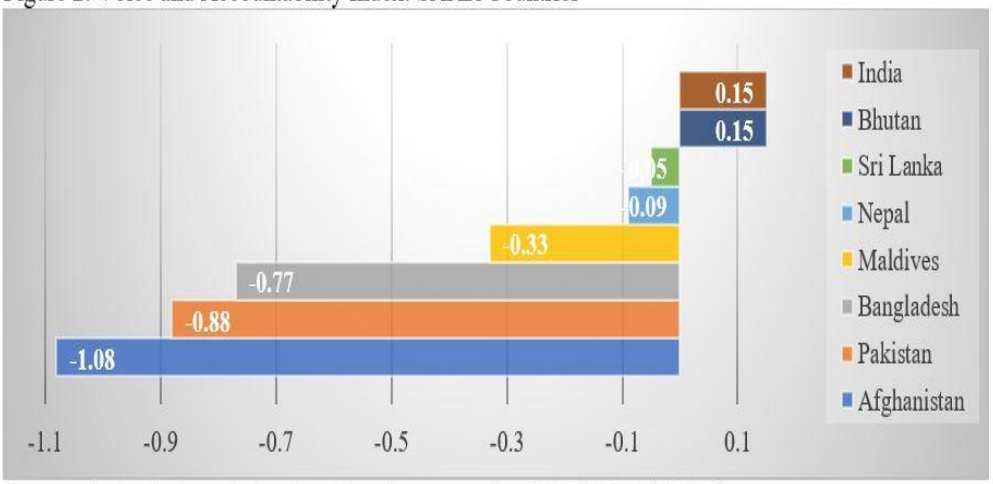
Figure 1: Corruption Perception Index based ranking: SAAR Countries



Source: Author's formulation based on data taken from TI (2022).

Similarly, the ranking of Pakistan in Voice and Accountability Index (VAI) is also poor because there are lot of restrictions on public speech either publicly or in the media. Many media personnel have been disappeared or murdered for criticizing the government or publishing its malpractices. Similarly, violence against women and children as well as sexual harassment events are prohibited to report in the media. This is the reason that Pakistan's score is not encouraging as is shown in Figure 2 The World Bank suggested vertical accountability because most of the high-ups are involved in corruption practices and misuse of public funds. But the country has failed to implement it in spirit and letter (World Bank, 2022) .

Figure 2: Voice and Accountability Index: SAAR Countries



Source: Author's formulation based on data taken from World Bank (2022).

The pattern of accountability and victimization of political opponents of target accountability have created uncertainty in the country, discouraging local and foreign investors (Iqbal & Mustafa, 2022). The agencies established for transparent environment has taken anti-investment stance and this is the reason the foreign investors even overseas Pakistanis are reluctant to invest in Pakistan.

Keeping in view of the above discussion, the objective of this study is to analyze the relationship between accountability, foreign direct investment, capital formation and technological advancement with economic growth during the study period of 1996-2019. The study seeks to identify the gaps and weaknesses within Pakistan's existing anti-corruption system that contribute to high levels of corruption in the country. Another objective is to compare Pakistan's anti-corruption framework with international best practices and standards in order to highlight areas where improvements are needed.

The novelty of this study lies in its comprehensive and multi-dimensional approach to understanding Pakistan's anti-corruption system, its detailed examination of the legal and institutional framework, its comparative analysis, and its consideration of stakeholder perspectives and practical insights. This holistic approach sets it apart from previous research in the field.

This study will contribute in the body of literature in many ways. first, the study aims to provide evidence-based policy recommendations to address the weaknesses and gaps in Pakistan's anti-corruption infrastructure, thereby contributing to the development of a more robust and efficient system. Second, this study will enhance public awareness and understanding of the challenges and opportunities in combating corruption. Third, by highlighting Pakistan's low ranking in the Corruption Perception Index (CPI) published by Transparency International, this study underscores the urgency of reform in the country's anti-corruption efforts. Fourth, the findings of this study can contribute to academic discussions on governance and corruption while also informing policy debates on anti-corruption strategies in Pakistan.

The hypotheses of this study are the followings: -

Ho: Accountability has no significant positive relationship with GDP growth rate in the long run.

H_1: Accountability has significant relationship with GDP growth rate in the long run.

Ho: Foreign Direct Investment has no significant association with GDP growth rate in the long run.

H_1: Foreign Direct investment has significant association with GDP growth rate in the long run.

Ho: Capital formation has no significant link with GDP growth rate in the long run.

H_1: Capital formation has significant positive link with GDO growth rate in the and long run.

Ho: Technological Advancement has no association with GDP growth rate in the long run.

H_1: Technological Advancement has significant association with GDO growth rate in the short and long run.

2. Materials and Methods

This is a quantitative study which used 23 years data from 1996 to 2019. The data was collected from World Development Indicators, Asian Development Bank, Pakistan Economic Survey and the State Bank of Pakistan. The sample of study is public sector organization and convenience sampling method was used in collection of data. The dependent variable was Economic growth (GDP) and independent variables include

The econometric model of the study is shown in the following equation

$$Y = bo+b_1ACCTt, + b_2FDI\ t+ b_3CF\ t +b_4TA) + \varepsilon$$

Where:

Y = Economic growth.

ACCT= Accountability.

FDI =Foreign Direct Investment

CF:= Capital formation.

TA= Technological Advancement

b1, b2, b3, b4= parameters.

The following statistical techniques were used to analyze the data.

- Descriptive statistics
- Correlation Analysis.
- ADF Test.
- ARDL Approach
- Bound Test
- Granger Causality Test.

3 Empirical results

3.1 Descriptive Statistics

The descriptive statistics is used to check the nature of the normality of the data and examine the value of mean, median, maximum value, minimum value, JB value and the probability of the variables

Table 1

Results of Descriptive analysis

Averages	AC	FC	FDI	TA
Mean	2.074958	15.13808	2.864833	0.307875
Median	2.500000	14.93950	2.679500	0.269000
Maximum	3.000000	17.73200	5.361000	0.633000
Minimum	0.400000	12.52100	1.325000	0.109000
Std. Dev.	0.923391	1.450065	1.011131	0.150784
Skewness	-0.732090	0.246739	0.635362	0.631140
Kurtosis	1.988799	2.174035	2.998150	2.619956
Jarque-Bera	3.166350	0.925738	1.614742	1.737782
Probability	0.205322	0.629475	0.446029	0.419416
Sum	49.79900	363.3140	68.75600	7.389000
Sum Sq. Dev.	19.61095	48.36186	23.51488	0.522923

The mean, or average, is a measure of central tendency. It provides insight into the typical or central value of each variable. In this dataset, Accountability has a mean of 2.0749, indicating that the data is relatively less spread out. Fixed Capital and FDI have means of 15.1380 and 2.8648, respectively, suggesting they have higher central values. On the other hand, Technology Advancement has a mean of 0.3078, indicating it is closer to the lower end of the scale. The median represents the middle value of the dataset and is less affected by extreme values. In this dataset, Fixed Capital has the highest median value of 14.939, indicating its central position. The other variables have median values of 2.5, 2.6795, and 0.269 for Accountability, FDI, and Technology Advancement, respectively. The maximum values represent the highest values observed in each variable, while the minimum values represent the lowest values. For instance, Technology Advancement (TA) has a maximum value of 0.633, indicating its highest level, while Accountability (AC) has a minimum value of 0.400, indicating its lowest level. These values provide insights into the range of each variable. The standard deviation measures the dispersion or spread of data points around the mean. A lower standard deviation indicates that data points are closer to the mean, while a higher standard deviation suggests greater variability. In this dataset, Accountability has a relatively low standard deviation (0.9234), indicating less variability around the mean. On the other hand, Fixed Capital has a higher standard deviation (1.4501), suggesting greater variability.

These descriptive statistics provide valuable insights into the central tendency, spread, and distribution of the variables, which can be useful for further analysis and understanding the characteristics of the dataset.

Table 2

Results of standard deviation

	Standard Deviation	Mean values	Decisions
Accountability	0.923391	2.074958	Low
Fixed capital	1.450065	15.13808	Very low
Foreign Direct Investment.	1.011131	2.864833	Good
Technology advance.	0.150784	0.307875	Excellent

3.2. Correlation Analysis

The correlation is used to check the degree of the association among the relative actions of the two variables. The range of correlation lies between -1 and +1. There was error in the measurement in correlation when the calculated value is greater than 1. There are the two types of the correlation: Negative and positive correlation.

Table 3

Results of Correlation Matrix

Accountability	1-	0.2890	0.17578	0.47641
Fixed Capital	-0.2890	1	0.20204	0.31215
Foreign Direct Investment	0.1758	0.2020	1	0.37833
Advancement of Technology	0.4764	0. 3121	0.3783	1

The results of correlation matrix show that the coefficient value of accountability and fixed capital is -0.2890 showing negative moderate correlation between these two variables. This suggests that as Accountability

increases, Fixed Capital tends to decrease, and vice versa. However, the strength of this relationship is not very strong. The correlation coefficient value of Accountability and foreign direct investment (FDI) is 0.1758, showing weak positive correlation between these two variables. This indicates that there is a slight tendency for Accountability and FDI to increase together, but the relationship is not strong. The correlation coefficient value of accountability and advancement of technology is 0.4764, indicating a moderate positive correlation between these two variables. This suggests that as Accountability increases, Advancement of Technology tends to increase as well, and vice versa. This is a relatively stronger relationship between these two variables as compared to the others. In other world, technological progress has significant positive impact on the process of accountability. The correlation coefficient of fixed capital and FDI is 0.2020, indicating a weak positive correlation between these variables. This implies that there is a slight tendency for Fixed Capital and FDI to increase together, but the relationship is not very strong. The correlation coefficient of fixed capital and advancement of technology is 0.3121, suggesting a moderate positive correlation between these variables. This indicates that as Fixed Capital increases, there is a tendency for Advancement of Technology to increase as well, and vice versa. This is a relatively stronger relationship compared to the others involving Fixed Capital. The correlation coefficient value of FDI and advancement of technology is 0.3783, showing a moderate positive correlation between these two variables. This suggests that as FDI increases, there is a tendency for Advancement of Technology to increase as well, and vice versa. This is a relatively stronger relationship compared to the others involving FDI. In short, the correlation matrix shows varying degrees of correlation between these

variables. Accountability has a moderate positive correlation with Advancement of Technology, but it has weaker correlations with the other variables. Fixed Capital, on the other hand, has a moderate positive correlation with both Advancement of Technology and FDI, but a weaker negative correlation with Accountability. FDI has weak correlations with the other variables except for a moderate positive correlation with Advancement of Technology. These correlations provide insights into the relationships between these variables, which can be useful for further analysis and decision-making.

3.3 Augmented Dickey Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) unit root test is a statistical tool used in econometrics and time series analysis to determine whether a time series dataset has a unit root. A unit root implies that a time series variable is non-stationary, which means its statistical properties change over time and it may exhibit trends or have a long-term memory. Understanding whether a variable has a unit root is crucial in various economic analysis. ADF test is used to check stationarity in the time series dataset. Stationary time series data have statistical properties that remain constant over time. This makes them easier to work with in many statistical models and allows us to make more reliable forecasts. Unit root tests, like the ADF test, help determine if differencing the data is necessary to achieve stationarity because working with non-stationary time series data generate problem known as "spurious regression." This occurs when two non-stationary variables appear to be correlated, even though they have no meaningful relationship. Using unit root tests can help avoid making incorrect conclusions based on spurious correlations. Moreover, in time series analysis, long-term relationship between non-stationary variables is

determined. Identifying cointegration is important in cases where two or more variables are linked in the long run.

Table 4

Results of ADF' Unit Root test:

Variables	1ST Difference			Conclusion	Prob
Level	Intercept	Trend & Intercept	None		
Inter Trend					
Accountability	-5.268590*	-5.675**	-1.0663	L (1)	0.0003* 0.0008* 0.2475
Foreign Direct Investment	-4.2920*	-4.1636	-0.6574	L(0)	0.003* 0.017 0.4213
Fixed Assets	-4.1579	-3.9290**	- 4.2259*	L(1)	0.0004* 0.0253 0.0002*
Technology Advancement	-3.771*	-3.8863	-3.8632**	L(1)	0.0009 0.0003 0.0005

According to the test, the results are showing the stationarity between variables. The variables are based on supposition that are lie between I (1) or I (0) not on I (2) so for that reason we calculated it first. Accountability has a relationship with all variables at the level 1 on the basis of first difference in which the point at intercept is 5.26859 with 0.0003 probability difference while trend and intercept condition is representing the very low lack of difference with 5.675 with the probability of 0.0008 those are less than 0.05 of p value mean these are suitable or useful but not accurate for further process

at the same accountability at none is showing above the cluster of given p that value is 0.2475 with value of 1.0663 at the same level of 1 but other side factor FDI mean foreign direct investment of GDP is representing three results at level 4.2920, 4.1636, 0.6574 at intercept, trend and intercept and none respectively with 0.0003,0.017,0.4213 probability those are less than 0.09 but most critical value is 4.2920** with 0.0003** p value at the L(0) while at first difference fixed assets and advancement of technology both are lie down in L(1) with 4.1579, 3.929,4.2259 these are value of statistics with 0.0042*, 0.0253, 0.0002** and 3.771*, 3.8863, 3.8632** with 0.009*,0.030,0.0005** p values, hence the absolute t-statistics value is greater than critical all values at different levels but less than from the actual probability value that is 0.09. Thus, according to the mixture unit root test is suitable that is showing the stationarity of observations and rejected the null hypothesis that there is no relationship between variables in the long run and accept alternate hypothesis that states that there is a long run association between variables. As the result of ADF test are mixed, we can used ARDL model for analysis of data.

3.4. Bound Test

We now apply Bound test of ARDL to determine long run association between variables. The bound test is used to check the long run association between variables. Persian (2001) was the first one who introduced the bound test to examine the presence of the co integration. In the bound test the F statistics is used to compare with the tabulated f statistics critical values. There are the two set of critical values which are given below

- Upper value bound (1)
- Lowe bound value (o)

Table 5:

Results Bound test

F statistics Value:	3.5274		Decision
Critical Value	Upper bound	Lower bound	Co-integration
5%	4.35	3.23	
10%	3.77	2.72	

The results in the table show that F Statistics Value is 3.5274 while critical values for upper and lower bound at f5% significance level are 4.35 and 3.23 respectively while at a 10% significance level the critical values of upper bound and lower bound are 3.77, 2.72 respectively. The critical values represent the thresholds beyond which the F statistics value must exceed to establish cointegration. These thresholds are determined based on the significance level chosen (5% or 10%) and the number of observations in the dataset. The overall results suggest that when comparing critical values at a 5% significance level, the F statistics value (3.5274) is less than the upper bound critical value (4.35) but greater than the lower bound critical value (3.23). This means that the F statistics value falls within the range of the critical values for the 5% significance level. At a 10% significance level, the F statistics value is less than both the upper bound critical value (3.77) and the lower bound critical value (2.72). We can conclude that since the F statistics value falls between the upper and lower bound critical values at 5% significance level, we do not have enough evidence to reject the null hypothesis of no cointegration. This suggests that, at the 5% significance level, there may be a long-run association (cointegration) between the variables.

Moreover, since the F statistics value is less than both the upper and lower bound critical values at 10% significance value, we also do not have enough evidence to reject the null hypothesis of no cointegration at the 10% significance level. Thus, the results of bound test indicate that there is no strong evidence to suggest the presence of cointegration between the variables being examined at both the 5% and 10% significance levels. However, further analysis and interpretation may be needed to understand the relationship between these variables in the long run.

3.4 ARDL Model-Long Run Association

ARDL is often employed to test for cointegration between two or more variables. Cointegration implies a long-term relationship between the variables, which means that they move together over time. This is important in cases where you want to understand the equilibrium relationship between variables, such as analyzing the relationship between GDP and other variables. This model is used in policy analysis to assess the impact of policy changes or external shocks on the economy. By estimating an ARDL model, you can evaluate the short-term and long-term effects of policy interventions on various economic indicators. The model assists for forecasting future values of a variable based on its historical relationship with other variables. This is especially useful when you have a good reason to believe that the variables are cointegrated. This model is appropriate when dealing with time series data, where observations are collected over time at regular intervals. In short, the ARDL model is a versatile tool for analyzing the relationships between time series variables in both the short term and the long term. It is particularly valuable in economics and finance for understanding how various factors

affect each other over time and for making informed policy decisions and forecasts.

Table 7

ARDL Long run approach

Long Run Coefficients				
Variables	Coefficients	Std. Error	t-statistic	Prob.
ACT	0. 503608	0.056500	4.122046	0.0025
FC	0.192508	0.046600	4.131046	0.0145
FDI	-0.050409	0.055464	-0.908857	0.4148
TA	2.705712	0.650572	4.158977	0.0142
C	-0.163586	0.609894	-0.268221	0.8018

* GDP Is dependent variable.

The above results show the long-run results of an ARDL (Auto Regressive Distributed Lag) model in which GDP is dependent variable while accountability (ACT), fixed capital, foreign direct investment and technology advancement are independent variables. The C is constant term. The coefficient value of Accountability is 0.503608, its standard Error is 0.056500, t-statistic is 4.122046 and probability (p-value) is 0.0025. It means if one-unit changes in accountability there will likely be increased in GDP growth rate by 50.36% in the long run. These relationships are significant statistically at 0.5 level, suggesting that these two variables have strong positive association in the long run. It highlights the importance of accountability in Pakistan. Thus, the null hypothesis which states that there is no association between accountability and GDP growth is rejected and alternate hypothesis which states that there is strong association between

accountability and GDP growth rate in the long run. The coefficient value of FC (Fixed Capital) is 0.192508, its std. Error is 0.046600, t-statistic is 4.131046 and probability (p-value): is 0.0145. It means if one-unit changes in fixed capital there will likely to be increased in GDP growth rate by 19.25 percent, holding rest of variable constant. This coefficient is also statistically significant at the 0.05 level. The null hypothesis that states there is no positive and significant relationship between fixed capital and GDP growth is also rejected and alternate hypothesis, which states that there is long run association between fixed capital and GDP growth rate in the long run, is accepted. The coefficient value of FDI (Foreign Direct Investment):is -0.050409, its Std. Error is 0.055464, t-statistic is-0.908857 and probability (p-value) is 0.4148. It means that FDI has a negative coefficient, but it is not statistically significant at the 0.05 level. This suggests that FDI may not have a significant long-term impact on GDP. These results reveals that null hypothesis, which states that there is no long run relationship between FDI and economic growth, is accepted. The reason for negative link between FDI and GDP growth is that most of the FDI is invested in speculative activities, which bring negative impact on the economy. They are not invested in fixed capital assets on long term basis. The coefficient value of TA (Technology Advancement) is 2.705712, its Std. Error is 0.650572, its t-statistic value is 4.158977 and probability (p-value) 0.0142. It reveals if one unit increases in technology advancement the GDP growth will likely to be increased by 27.05 percent, if all other variables in the model remains constant. It indicates a strong positive relationship between technology advancement and GDP growth. The null hypothesis, which states that there is no long run relationship

between technological advancement and economic growth is rejected and alternate hypothesis, which states that technological advancement has significant impact on GDP growth rate in the long run is accepted. The coefficient value of foreign direct investment is negative which means if one unit increases in foreign direct investment the GDP growth will likely to be decreased by 5.05 percent in the long run, holding all other variables constant. In this case, null hypothesis, which states that there is no relationship between FDI and GDP in the long run, is accepted. The apparent reason of these negative relationship is that most of the foreign direct investment is made on short term basis and promptly withdrawn if political situation of the country changes. It shows lack of trust of foreign investors in Pakistan's economy.

3. 5 Error Correction Model

This model is typically applied when the variables of interest are cointegrated. Cointegration is a statistical property that indicates a long-term equilibrium relationship between non-stationary variables. An ECM is used to examine both short-run and long-run relationships between variables. It consists of two main components: the short-run dynamics represented by the lagged values of variables and the long-run equilibrium represented by the error correction term. This enables us to understand how variables adjust in the short run to deviations from their long-run equilibrium relationship. The error correction term in the ECM captures the speed at which the variables adjust back to their long-run equilibrium when they deviate from it in the short run. This term is crucial for modeling the correction mechanism and helps improve the accuracy of forecasts and policy analysis. An Error Correction Model is applied when dealing with non-stationary time series data where there are long-term equilibrium relationships (cointegration) among the variables of

interest. It is a valuable tool for understanding the dynamics between these variables, both in the short run and in terms of their long-run equilibrium, and for making more reliable forecasts and policy recommendations in economic and financial analysis.

Table 8

Results of Error Correction Model

Co-integrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ACT(-1)) -	1.190630	0.274134 -	4.343235	0.0122
D(ACT(-2)) -	1.533281	0.428797	- 3.575778	0.0233
D(ACT(-3)) -	1.474407	0.429659	-3.431577	0.0265
D(ACT(-4)) -	1.651484	0.367551	-4.493205	0.0109
D(ACT(-5)) -	1.021418	0.359008	-2.845111	0.0466
D(FC)	0.133753	0.032589	4.104275	0.0148
D(FC (-1))	0.121468	0.044689	2.718089	0.0531
D(FDI) -	0.044216	0.050191	0.880950	0.4281
D(TA)	1.095510	0.949529	1.153740	0.3129
D(TA(-1)) -	2.150578	0.692329	-3.106294	0.0360
Co-int. Eq. (-1) -	0.877139	0.150987	-5.809370	0.0044

The results of Error Correction Model (ECM) exhibit the short-run dynamics and co-integrating relationships between the economic growth (dependent variable) and several lagged values of itself (D (ACT (-1)), D (AC (-2)), etc.),

as well as several independent variables (D(FC), D(FDI), D(TA), etc.). The results reveal that D (ACT (-1)), D (AC (-2)), D (ACCT (-3)), D (ACT (-4)), D (ACT (-5)): These are lagged differences of the dependent variable Economic growth. Each coefficient represents the short-run impact of a one-unit change in the respective lagged difference of ACT on the current value of ACT. All these coefficients are negative, which indicates a tendency for ACCT to revert to its long-run equilibrium after any deviations. For example, D (ACT (-1)) has a coefficient of -1.190630, suggesting that a one-unit increase in the lagged difference of ACT in the previous period leads to a decrease of approximately 1.190630 units in the current value of ACT. The t-statistics and p-values indicate that these lagged differences are statistically significant at conventional levels (5% or 1%), indicating short-run relationships between these lagged values and the current value of ACT.

D(FC), D (FC (-1)), D(FDI), D(TA), D(TA (-1)): These are differences in the independent variables ACCT FC, FDI, and TA, as well as their lagged values. The coefficients represent the short-run impact of a one-unit change in these variables on the current value of ACT. D(FC) has a positive coefficient of 0.133753, indicating that a one-unit increases in FC leads to an increase of approximately 0.133753 units in the current value of ACT in the short run. D (FC (-1)) also has a positive coefficient but is statistically significant at a slightly higher p-value (5.31%), suggesting a slightly weaker short-run relationship. D(FDI) has a coefficient of 0.044216, indicating a weak positive short-run relationship that is not statistically significant. D(TA) and D (TA (-1)) have coefficients of 1.095510 and -2.150578, respectively, suggesting a mixed short-run relationship with the current value of ACT, but neither is statistically significant. The Co-int. Eq. (-1) shows the association with

lagged error correction term (-1). The error correction term represents the speed of adjustment of ACCT towards its long-run equilibrium after any deviations. The coefficient of -0.877139 indicates that in the short run, if there is a deviation from the long-run equilibrium, ACCT adjusts by approximately -0.877139 units in the current period to correct for this deviation. This coefficient is statistically significant at a very low p-value (0.44%), suggesting a strong short-run relationship between Accountability and economic growth. The short-run results of this ECM indicate that lagged differences in ACT and the error correction term (-1) have statistically significant short-run relationships with the current value of ACCT. Additionally, some independent variables, such as D(FC) and D (FC (-1)), show significant short-run relationships, while others like D(FDI) and D(TA) do not exhibit statistically significant short-run effects on Economic growth. These findings help explain how ACT adjusts in the short run to deviations from its long-run equilibrium.

3.6 Granger causality test

A causality test is used in statistics and econometrics to determine whether a change in one variable can predict a change in another variable. The concept of causality is central to many areas of research, as it helps us understand the relationships between variables and the potential mechanisms that underlie those relationships. This test It helps us understand which variable might be causing changes in another. Once a causal relationship is established, it can be used to predict future outcomes. If A causes B, and we know how A is going to change, we can predict changes in B. Without establishing causality, we might make incorrect inferences based on mere correlations. Just because two variables move together doesn't mean one causes the other. Several tests

and methods, such as the Granger causality test, instrumental variable methods, and randomized controlled trials, are used to ascertain causality. However, here, we have applied Granger causality test to determine causality between variables.

Table 9

Results of Granger Causality

Variables	F-STATISTICS			
Direction				
Ln(ACCT)	Ln(FC)	Ln(FDI)	Ln(TA)	
Ln(ACCT}	0.32627	0.14930	0.76559	ACCT FC
Ln(FC)	1.20590	3.41078	0.6612	FDI→TA
Ln(FDI)	0.15254	0.97133	1.0859	ACT→FC
Ln(TA)	0.15944	0.1977	0.2380	
ACT→FDI				

The results based on the F-statistics and the direction of causality show that the F-statistic for the relationship between Ln (ACC) and Ln (FC) is 0.32627. Since this F-statistic is associated with a p-value greater than the significance level (usually 0.05), it suggests that past values of Ln (ACC) do not Granger cause Ln (FC). In other words, there is no evidence to suggest that changes in Ln (AC) help predict future changes in Ln (FC). The F-statistic for the relationship between Ln (FC) and Ln (FDI) is 3.41078. This F-statistic is associated with a p-value less than the significance level (usually 0.05), indicating that past values of Ln (FC) Granger cause Ln (FDI). In other words, changes in Ln (FC) help predict future changes in Ln (FDI). The F-statistic for the relationship between Ln (ACCT) and Ln (FDI) is 0.15254. Since this F-

statistic is associated with a p-value greater than the significance level, it suggests that past values of Ln (ACCT) do not Granger cause Ln (FDI). There is no evidence to suggest that changes in Ln (ACCT) help predict future changes in Ln (FDI). The F-statistic for the relationship between Ln (FC) and Ln (TA) is 0.6612. Since this F-statistic is associated with a p-value greater than the significance level, it suggests that past values of Ln (FC) do not Granger cause Ln (TA). There is no evidence to suggest that changes in Ln (FC) help predict future changes in Ln (TA). The F-statistic for the relationship between Ln (FDI) and Ln (TA) is 1.0859. Since this F-statistic is associated with a p-value greater than the significance level, it suggests that past values of Ln (FDI) do not Granger cause Ln (TA). There is no evidence to suggest that changes in Ln (FDI) help predict future changes in Ln (TA). Thus, based on the F-statistics and directions of causality provided in the table, it appears that there is Granger causality between Ln (FC) and Ln (FDI), with Ln (FC) Granger causing Ln (FDI). However, there is no Granger causality between the other variable pairs tested.

4. Discussion

The objective of this study was to examine the relationship between accountability, foreign direct investment (FDI), capital formation (CF), technological advancement (TA), and economic growth (GDP) over the study period spanning from 1996 to 2019. The data used in the analysis was collected from various sources, including World Development indicators, Transparency International, Asian Development Bank, Pakistan Economic Survey, and State Bank of Pakistan. Several statistical methods were employed, including descriptive statistics, correlation analysis, ADF unit root test, bound test,

ARDL and ECM models, and Granger causality test, to explore the relationships among these variables.

The descriptive statistics indicate that the data is normally distributed, which is essential for conducting meaningful statistical analyses. However, the ADF unit root test revealed mixed stationarity of the variables, suggesting that some variables may require differencing to achieve stationarity. This finding highlights the importance of addressing non-stationarity when analyzing time series data. The correlation analysis provided valuable insights into the relationships between the variables. Accountability (ACCT) displayed a moderate positive correlation with Technological Advancement (TA), but weaker correlations with other variables. Fixed Capital (FC) exhibited a moderate positive correlation with both TA and FDI but had a weaker negative correlation with ACCT. FDI had relatively weak correlations with the other variables, except for a moderate positive correlation with TA. These correlations offer preliminary insights into the interplay among these variables, which can guide further investigation and decision-making. The results of the bound test did not provide strong evidence to suggest the presence of cointegration between the examined variables at both the 5% and 10% significance levels. While this finding does not conclusively establish long-term relationships between the variables, it does not rule out the possibility of relationships that may become evident through more in-depth analysis or over a longer time frame. The long run results of the ARDL model revealed that Accountability (ACCT), Fixed Capital (FC), and Technological Advancement (TA) had statistically significant positive effects on GDP, indicating that these factors contribute positively to economic growth. In contrast, Foreign Direct Investment (FDI) and the constant term did not appear to have statistically significant long-term impacts on GDP. The short run

results of Error Correction Model (ECM) identified lagged differences in Accountability (ACT) and the error correction term (-1) as having statistically significant short-run relationships with the current value of Accountability. Furthermore, some independent variables, such as D(FC) and D (FC(-1)), exhibited significant short-run relationships, while others like D(FDI) and D(TA) did not demonstrate statistically significant short-run effects on economic growth. These findings shed light on how Accountability adjusts in response to deviations from its long-run equilibrium and the role of lagged differences in explaining short-term dynamics. The Granger causality test results indicated Granger causality between the natural logarithms of Fixed Capital (Ln (FC)) and Foreign Direct Investment (Ln (FDI)), with Ln (FC) Granger causing Ln (FDI). However, no Granger causality was detected between the other variable pairs tested. This implies a unidirectional causal relationship from Fixed Capital to Foreign Direct Investment, suggesting that changes in Fixed Capital may lead to changes in FDI.

The Null hypothesis which related to FDI and GDP growth is accepted while all other three hypotheses that are related to Accountability, Capital formation and Technological Advancement are rejected because there is positive relationship between these independent and dependent variables. These results are consistent with the findings of Koreio, , Erum , Rajamanickam, (2022), (Iqbal & Mustafa, 2022), .Mehbood (2022), Ejaz (2020), Javed,. (2021), Shah, (2021) and Samaram (2021) who found in their studies that accountability has strong association with economic growth and proposed that it must be strengthen through fair and transparent implementation of accountability process. They also concluded that target

accountability and political opponents' victimization is not fair and just accountability.

5. Conclusions

The findings of this study provide valuable insights into the intricate relationships among accountability, foreign direct investment (FDI), capital formation (CF), technological advancement (TA), and economic growth (GDP) during the period from 1996 to 2019. Several key conclusions can be drawn from the analysis:

The study commenced by examining the data's characteristics. It was noted that the data is normally distributed, which is essential for robust statistical analyses. However, the ADF unit root test indicated mixed stationarity among the variables, suggesting the need for differencing to achieve stationarity. This underscores the importance of addressing non-stationarity when analyzing time series data, as it can affect the reliability of empirical results. The correlation analysis unveiled valuable insights into the relationships between the variables. Accountability (ACCT) exhibited a moderate positive correlation with Technological Advancement (TA), indicating a potential synergy between governance and technological progress. Fixed Capital (FC) displayed moderate positive correlations with both TA and FDI, emphasizing its significance in economic dynamics. However, FDI showed relatively weak correlations with other variables, except for a moderate positive association with TA. These correlations provide a foundation for further exploration and decision-making. The results of the bound test did not provide strong evidence of cointegration among the examined variables at conventional significance levels. While this finding does not conclusively establish long-term relationships between the variables, it suggests the need for further investigation, potentially over an extended time frame or with additional

variables, to fully comprehend their long-term dynamics. In the long run, the ARDL model demonstrated that Accountability (ACCT), Fixed Capital (FC), and Technological Advancement (TA) had statistically significant positive effects on GDP, implying their substantial contributions to economic growth. Conversely, Foreign Direct Investment (FDI) and the constant term did not appear to exert statistically significant long-term impacts on GDP. These insights shed light on the factors that play pivotal roles in shaping economic growth over an extended period. In the short run, the Error Correction Model (ECM) uncovered short-term relationships, with lagged differences in Accountability (ACT) and the error correction term (-1) showing statistically significant associations with the current value of Accountability. Additionally, certain independent variables, such as D(FC) and D(FC(-1)), exhibited significant short-run relationships, while others like D(FDI) and D(TA) did not display statistically significant short-term effects on economic growth. These findings elucidate how Accountability adapts to deviations from its long-term equilibrium and the role of lagged differences in explaining short-term dynamics. The Granger causality test indicated a unidirectional causal relationship from the natural logarithms of Fixed Capital (Ln(FC)) to Foreign Direct Investment (Ln(FDI)), with Ln(FC) Granger causing Ln(FDI). However, no Granger causality was observed between the other pairs of variables tested. This suggests that changes in Fixed Capital may lead to changes in FDI but not vice versa. In conclusion, this study's findings provide valuable insights for policymakers, indicating the significance of accountability, capital formation, and technological advancement in driving economic growth. Policymakers should consider these relationships when

formulating strategies for sustainable economic development and growth over the short and long term.

5.1 Policy implications

Policy Implications of this study emphasizes that the accountability process and governance sericulture must be strengthened to drive economic growth and technological progress. The foreign direct investment expedites economic growth and the policy makers should create a conducive environment for investment in physical and human capital to stimulate economic growth. Additionally, understanding the causality from Fixed Capital to FDI suggests that investments in infrastructure and fixed assets may attract foreign investors. The absence of strong evidence for cointegration between variables indicates that policymakers should adopt a long-term perspective when designing economic policies. Initiatives aimed at improving accountability, capital formation, and technological advancement may take time to yield significant results. The Short-run dynamics, as highlighted by the ECM, suggest that accountability and certain economic variables may respond to deviations from their long-term equilibrium. Policymakers should be prepared to adapt to short-term fluctuations while maintaining a focus on long-term economic goals.

5.2 Limitations and suggestions for further research

There are certain limitations of this study. For example, the mixed stationarity among the variables, as revealed by the ADF unit root test, presents a limitation. The presence of non-stationary variables can lead to spurious regression results. Even though differencing can address this, it might alter the original nature of the data. Additionally, there is absence of cointegration among variables which suggests that the long-term equilibrium relationship between the variables was not firmly established. Third

limitations of this study are that the study found correlations between various variables but it does not imply causation. Moreover, the study includes some specific variables which restrict the scope of study. Another constraint of this study is the selection of 23 years' time period which is not sufficient to capture long run dynamics. While Granger causality suggests a predictive relationship, it does not provide a true causal relationship. Thus, interpretations need to be made cautiously. Therefore, this study suggests further research by opting a longer time frame or taking latest data to understand evolving relationships between validates. Similarly, the inclusion of more variables such as such as labor force participation, education levels, or political stability, could provide a comprehensive understanding of the dynamics of economic growth. The mixed granger results emphasize the use of alternative econometric techniques like the Johansen cointegration test or other advanced time-series models to explore more robust findings. Finally, moving beyond associative results, more in-depth causative analyses can be pursued to understand the real drivers behind observed relationships. In Pakistan, the implementation of accountability laws is not fair and it is used to target political opponents or the people who raise voice against Government's unjust and oppressive policies. To sum up, the study provides valuable findings, there are inherent limitations that future research can address to offer more comprehensive and actionable insights into the dynamics of economic growth.

Data Statement

The data that used in this analysis can be made available by corresponding author on strong request.

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