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INFLATION MATTER FOR SECTORAL GROWTH IN PAKSITAN

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Abstract

The purpose of this study is to examine the effect of inflation on economic growth in Pakistan using annual time series data from 1981 to 2021 and employing econometric techniques, such as Bound Testing ARDL approach. Three sectors of Pakistan's economy: manufacturing, agriculture and services were selected as a sample of study. Sectoral growth, which represents manufacturing, agriculture, and services sectors growth, was chosen as a dependent variable, whereas independent variables include inflation, Per capita income, population growth annual, FDI, Exchange rate, and Export. According to the findings, the key variable, inflation, has a positive and significant impact on agriculture sector growth, but it has a negative impact on manufacturing and services sectors in the long-term. The impact of inflation on services sector is more pronounced than manufacturing sector. However, the short-term results of Error Corrector Model suggests that inflation has a positive link between three sectors of Pakistan's economy. Therefore, the study proposes that policymakers should focus on controlling inflation through effective macroeconomic policies to achieve sustainable sectoral growth and economic development.

Key Words: Inflation, FDI; per capita income; exchange rate; sectoral growth.

Type of study: Original research Article

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1.Introduction

1.1. Background of the Study:

Different academic studies have documented a negative link between inflation and economic growth. However, some other studies have found positive link between these two variables. For example, a pioneering study disclosed a positive association between inflation and economic growth in industrial countries but a negative link in seven developing countries. (Thirlwall and Barton ,1971). Inflation is always considered a harmful factor for economic growth in the long run particularly in the developing countries like Pakistan, which has small GDP, with limited exports, high imports, high population growth, and volatilize exchange rate. Inflation is the core issue in Pakistan and other developing countries due to rising demand of consumer goods and printing of money to bridge budgetary gap (Ali, et al. (2015). Inflation does not only negatively affect the purchasing power of the people but also influence saving and investment rate negatively, resulting high consumption expenditures (Ahmed, et al. (2013). Recent spike in the prices of food items and petroleum products due to rising prices in international market has made the livers of people more miserable because they are forced to spend almost all their earning on consumer goods (Farooq et al,2013). Inflation really slower growth process and real wages globally (Ha, et al. (2019).

During 1980-1990, moderate GDP growth rate was noted, and the inflation rate remained within a single digit except 11.1% and 10.4% in 1981- 1989 respectively in Pakistan, but it rose a double-digit between 9.8 to 13.0 percent in the first seven years of the 1990s. GDP growth rate remained volatile in 1990's, having diverging trends throughout this period

(Mallik & Chowdhury (2001). However, the latter two decades from 2000 to 2020 noted with low and moderate growth with high inflation and repeated devaluation of currency, causing severe volatility in Pakistan' s economy. The economic situation was so much worse that Pakistan had to approach International Monetary Funds for rescuing the country from sovereign default (Jacob, Raphael & AJINAC (2023). This brief discussion highlights the negative link between inflation and economic growth. During this period, all sectors of the economy performed negatively particularly during COVID-19 Pandemic period. Therefore, this study has intended to explore the following research questions to identify relationship between inflation along with other variables and sectoral growth in Pakistan.

RQ1: What are the main causes of inflation in Pakistan?

RQ2: What is the nature of association between inflation and sectoral growth in Pakistan?

RQ3: How do FDI, per capita income, and population growth influence the sectoral growth in Pakistan?

RQ4: How does inflation, population growth, per capita income and FDI and other selected individually impact agriculture, manufacturing and service sectors in Pakistan.

In the light of above research questions, this study aims at;

- To investigate into the causes of inflation and its impact on Pakistan's economy.
- To study the link between inflation and sectoral growth in Pakistan.
- To examine the association between population growth FDI, per capita

income, and sectoral growth in Pakistan.

Exploring these research questions and objectives of study will enable us to understand the intricate relationship between inflation and other explanatory variables with sectoral growth and will provide fresh insights to the policymakers to devise policies to for a balanced growth in different sectors of the economy.

The remaining paper is divided into the following sections; section 2 review previous relevant academic studies, identified research gap; section 3 discusses research methodology; section 4 illustrates results while the paper concludes with discussion, policy implications and theoretical contribution in section 5.

2. Literature review

2.1. Theoretical framework:

We selected four main stream theories to understand the causes of inflation and nexus between inflation and sectoral growth. These theories are briefly discussed as follows:

3.1 Wage- Price Spiral theory

This theory is directly related to this study and it was proposed which is also known as “cost Push” inflation theory Keynes (1936). This theory is based on this assumption that

when producer and workers are not agreed on relative price of goods and labor then compete each other in determining nominal wages, and prices and this results in inflation. This theory works in the situation where the level of disagreement is related to the distance of aggregate output from its natural level. Lorenzoni and Werning (2023) identified how different shocks translate into various degrees of inflation on the goods and the labor market

and concluded that it depends upon the relative drivers of these pressures, real wages may rise or fall and the direction in which the wage moves does not provide a clear picture of how effective the wage price spiral is. They further argue if the economy depends on a rare non-labor input, with relatively flexible prices, the extra demand is deemed by an initial rise in the input prices, resulting in the persistent high prices, and also a more persistent rise in wages. They concluded that wage-spiral is a conflict between firm and workers where firm increases prices to meet its rising input cost, while the workers seek increase wages to bear the cost of living due to rising prices Barth & Bennett, (1975); (Oliver,1986).

2.2 Quantity Theory of money

Another notable theory is the quantity theory of money, which also directly relates to this study. This is a core theory of monetary economics that describe a stable long-term relationship between the quantity of money and prices. It implies that money supply is a key factor of inflation in the long-term. Irvin Fisher (1926) argued that quantity of money is the main determinants of the price level or the value of money. Any change in the quantity of money exactly causes proportionate change in the price level. But Keynes (1936 opposed this theory, arguing that the link between quantity of money and the prices is not direct, but indirect via the rate of interest, investment, output, employment and income. Therefore, the monetary authorities should keep money supply in balanced to avoid inflation. Milton, Friedman, (1961, 1970) opined that inflation is a monetary phenomenon and the strategies of monetary authorities can influence economic condition only after some lags that may be long and variable.

Lucas (2006) argues that money tools can only effectively work to curb inflation when it is too much high. Today most of central banks in advanced countries and emerging markets rather than money supply target inflation or exchange rates (Jung, (2012).

3.3 Structuralist Theory of Inflation

Myrdal and Straiten (1960) presented this theory to analyzed the effects of inflation in the term in the context of structural weakness in the developing countries. This theory considered mainly considered the nexus among four factors, such as food prices, wages, import prices and administration cost that are the sources of inflation (Kim, 2023). Myrdal and Streeton have pleaded that the aggregative-demand-supply model cannot be applied for illustrating inflationary pressure in the developing economies, where there is no balance in the allocation of resources in different sectors of the economy. They further argued that the nature of price inflation in agriculture sector is different from manufacturing sector and the developing countries are structurally fragmented due to monopoly, market imperfection and various types of structural rigidities (Prebisch Bernanke 2005).

2.4 Modern Theory of inflation

This theory is also related to the current study and it postulates that the governments need not to worry about rising debt because they pay principal debt and interest on it by printing money. In another way, the monopoly over printing of money is one of the main causes of high quantity of money and results inflation. This theory suggests to imposes taxes on private spending in order to control inflation and excessive spending. Governments' control of money supply leads to inflation and sometimes hyperinflation (Randall, 2015). Many modern economists fear

if the governments print money to pay its bills, hyperinflation will occur (Mankiw, 2020).

The above four main stream theories highlighted the causes of inflation in developed and underdeveloped economies and diverging views how it influences sectoral growth. Different approaches of these theories provide space for further investigation into the relationship between inflation and sectoral growth in order to understand the intricate link between these two variables in the context of Pakistan's economy. Therefore, this study has developed hypothesis to test this relationship empirically.

These theories provide foundation for current studies. Theoretical framework consisted of the above-mentioned theories is presented in Figure 1.

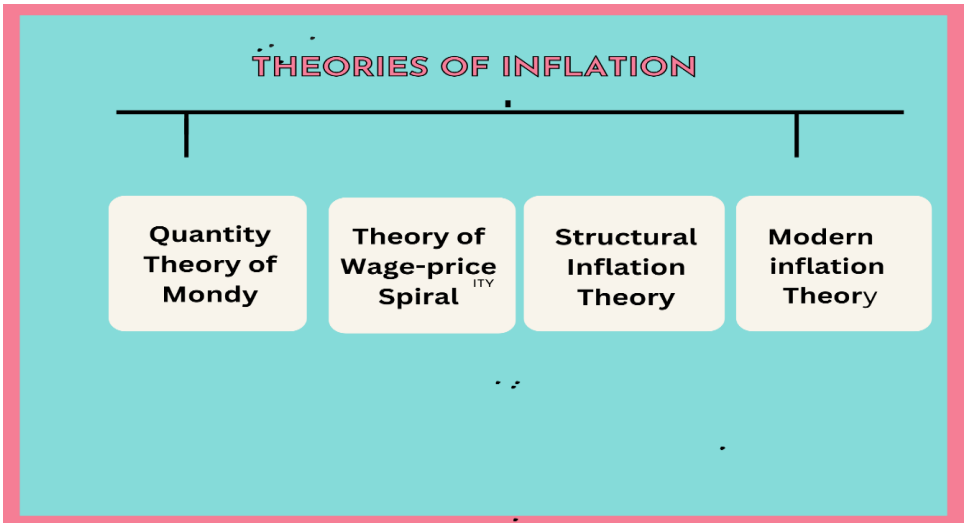


Fig 1: Theoretical framework

Now we discuss some empirical studies to understand the empirical relationship between inflation and sectoral growth.

Imran and Fatima (2011) conducted the research titled "Does inflation impact the financial development in Pakistan." Their result demonstrated that GDP growth rate and consumer price index (CPI) was negatively correlated with each other. It means that there is negative link between CPI and growth. This study suggests further investigation into this relationship. This produces a research gap for further analysis. In another study, Abdullah et al (2012) examined relationship between food price spiral and money supply. The study concluded that food inflation is not a monetary issue, suggesting to take policy action to streamline credit system in agriculture sector and stop exploitation of the farmers by private lenders. It implies that discriminatory credit system causes price differential in agriculture sector. This needs further research that credit differential has similar impact on the manufacturing and services sectors growth. Ahmad et al (2011) analyzed the contribution of service sector in the economy and concluded that the service sector is rapidly expanding and providing employment opportunities but its growth is hampering due to high inflation. They emphasized on the need of effective policy reform to make this sector more dynamic. This study suggests to investigate further to re-examine into the relationship between inflation and service sector growth. Imran et al (2013) examined the impact of inflation on sectoral growth in Pakistan and identified that low inflation rate is not accelerate growth in agriculture and service sectors. It implies that moderate inflation is beneficial for agriculture and services sector growth. This study also suggests empirical enquiry into the impact of inflation on agriculture and

service sector. Contrary to the above studies, Ajmair et al (2018) examined the impact of external and internal shocks on different sectors of the economy in Pakistan. This study predicted that external shocks exert more pressure on manufacturing sector than agriculture and services sectors. Usman (2016) identified key role of agriculture sector in the Pakistan's economy because it is the largest sector, providing employment opportunities to labor force and also supplying raw mater to industry, besides producing food for the whole population. He concluded that inflation has significant impact on agriculture sector, suggesting to further investigation into the impact of inflation on other sectors of Pakistan's economy. Waqas et al (2015) noted that key macroeconomic variables have significant influence on GDP growth in Pakistan. Similarly. Yasir Ali (2005) diagnosed that high inflation is detrimental to economic growth while very low inflation also harmful for the economy like Pakistan. They suggested that moderate inflation should be allowed to operate to keep the wheel of growth moving ahead through inflation-growth nexus policies. The brief review of relevant studies highlights that most of the studies identified nexus between inflation and economic growth. There are very few studies which have examined the influence of inflation on sectoral growth. In this way, the current research is a unique in a sense that if has examined the influence of inflation along with other variables like population growth, per capita income and exchange rate on sectoral growth in Pakistan.

2.4 Formation of Hypothesis

H_o: Inflation negatively correlates to agriculture sector growth in Pakistan.

H_1: Inflation positively correlates to agriculture sector growth in Pakistan.

Ho: Inflation negatively correlates to manufacturing sector growth in Pakistan.

H_1: Inflation positively correlates to manufacturing sector growth in Pakistan.

Ho: Inflation negatively correlates to service sector growth in Pakistan.

H_1: Inflation positively correlates to service sector growth in Pakistan.

3. Material and methods

This research used time series data from 1981 to 2021 sourced from World Development Indicators, IMF, Handbook of Statistics of Pakistan, the State Bank of Pakistan, Pakistan Economic survey and International Labor Organization (ILO) to determine long-term association between dependent and intendent variables. The dependent variable was sectoral growth, which represent manufacturing, agriculture and services sectors growth, while independent variables include inflation, foreign direct investment (FDI), per capita income (PCI), Population growth (PG), Exchange rate (ER), Exports (EXR). The variables and their expected signs (paths) with sectoral growth is presented in Table 1.

Table 1

Variables and their expected signs

Variable	Description of variable	Expected sig
AGR	Agriculture sector growth	(+)
SVG	Service sector growth	(-)
MSG	Manufacturing sector growth	(-)
FDI	Foreign direct Investment	(+)

PCI	Per capita income	(+)
PG	Population Growth	(+)
ER	Exchange rate	(+)
EXR	Exports	(+)

Three econometric models were constructed to determine relationships between explanatory variables and explained variable. These models are shown in three equations given below: -

3.1 Agriculture Sector Growth Model

The agriculture sector growth model is shown in the following equation:

$$AGR=\pi0+\pi1\ (AL)\ \pi2(FDI)\pi3(INF)+\pi4(POP)+\pi5(ER)+\pi6(EXR)+\mu \quad (2)$$

AGR=Agriculture sector growth rate

AL=Irrigated land area (in Million Hectors)

FDI= Foreign direct Investment

INF=Inflation

PG= Population growth

ER= Exchange rate

EXR=Exports

μ= Error Term

3.2 Manufacturing Sector Growth Model

The Manufacturing sector growth model is engraved as follow.

$$MSG=a_0+a_1\,(CPI)+a_2\,(FDI)+a_3(ER)+a_4+(EXR)+a_6(PG)+a_7(PCI)+\mu \quad (3)$$

Where:

MSG= Manufacturing Sector Growth Rate

INF= inflation rate

FDI= Investment

ER= Exchange Rate

EXR= Export Rate

PG= Population growth Rate annual

PCI= Per Capita Income

μ= Error term

3. 3 Service Sector growth Model

The Service sector growth model is presented in the following equation:

$$SVG=Ø_0+Ø_1\,(CPI)+Ø_2(FDI)+Ø_3(EXR)+Ø_4+Ø_5(PCI)+Ø\,(PG)+\mu \quad (4)$$

LSVG= Log of service sector growth

CPI=Inflation rate

FDI=Foreign direct investment

EXR=Exports

PG= Population growth rate annual.

PCI= per capita income

ER= Exchange rate.

μ= Error term

In order to determine causal relationship, we used various econometric tools, such as ARDL Bound Testing approach (Pesaran et al. 2001). These techniques are relevant and widely used by the researchers to estimate empirical relationships between explanatory and explained variables. The empirical results were computed through E-view software.

4. Results

4.1 Descriptive analysis

The results of Descriptive analysis are shown in Table 2

Table 2:

Descriptive Analysis results

Variables	CPI	AGRG	MSG	SV
Mean	9.3	25.7	5.90	5.
Median	8.1	25.6	5.91	4.
Maximum	24.8	31.5	15.5	9.
Minimum	0.4	21.4	-4.18	1.
Std. Dev.	5.3	2.26	4.18	1.
Skewness	1.09	0.63	0.23	0.
Kurtosis	4.04	3.46	3.38	3.
Jarque-Bera	8.7	25.71	0.22	0.
Probability	0.011	0.74	0.89	0.
Observations	36	36	36	3

The results in Table 2 exhibit the average (mean) and standard deviation of variable. According to the results, the average inflation (CPI) is 9.3 percent and, *ARG*, SM and *SVG* are 25.7% 5.90% and 5.22%, respectively, whereas the standard deviations are 2.26,4.18,1.75 for these variables. These deviations from means show stability in the agriculture sector growth. The results show that all the selected variables are positively skewed. Jarque-Bera test highlights that both dependent and independent variables are normally distributed. Therefore, we can proceed further.

4.2 ADF Unit Root Test:

The Augmented Dickey fuller (ADF) test is used to check the stationary in time series data from (1981-2021). The level of stationarity at level is I (0) and at I (1), which is First difference. The unit root test guides us as to which technique is best or appropriate to find out correct result. If all variable is stationary at level and differences (intercept and trend and intercept) then auto regressive distributed lag (ARDL) model is used to check cause and effect. If all variables are stationary at the same level, then we will have to use Ordinary Lease Square (OLS) method to analyze data. However, Table.3 results demonstrate that all variables are stationary at level and first difference, therefore, we can use ARDL approach to find long-term association between independent and dependent variables.

Table 3

ADF Unit Root Test Results:

Variable	**Level**		**First Difference**	
	Intercept	**Intercept And Trend**	**Intercept**	**Interc And T**

	Cal	Pro	Cal	Pro	Cal	Pro	Cal	
AGR							-4.41	
SM					-6.9	0.0000	-	
LSVG					-7.1	0.0000		
CPI					-6.0	0.0000		
AL			-5.9	0.0000				
TN					-5.3	0.0001		
FDI							-4.2	
PG					-4.4	0.001		
ER							-4.5	
EXR					-5.6	0.0000		
PCI							-3.6	

4.3Auto regressive distributed lag (ARDL) Model

ARDL model is dynamic approach to identify the effect of explanatory variables on explained variable over in the long-term. Simple linear regression model, showing linear relationship between independent and dependent variable is as follows:

$$Y_t = B_1 + \square B_2 Y_{t-1} + e_t$$

$$Z_t = B_1 + B_2 X_t + B_3 Z_{t-1} + e_t$$

This model is ideal for dataset that include variables with mixed levels of integration, a combination of 1 (0) and 1(1) variables. It provides reliable estimates for both short-run and long-run relationships.

4.3.1 Bound Test for ARDL:

Bound Test is an integral part of ARDL approach to identify long-term relationships between variables. There are two sets of critical bound values; one is value of lower bound represented by I (0) and other is upper bound value represented by I (1). Lower bound value shows that variables have no cointegration and value of upper bound shows that variables have co-integration. F-statistics computed value should be above to the upper value I (1) and lower value I (0). If F-statistics critical value lies in between upper I (1) and lower I (0) bound, then the findings of analysis are not correct (Pesaran, Narayan et al. (2001 ,2005). Table 4 highlights the estimated results of Bound test relating to Agriculture sector.

Model 1: Agriculture sector growth

Table 4:

Bound Test Results

Test Statistic	Values	Significance	I (0)	I (
F-statistic K	5.117	10%	2.03	3.
		5%	2.32	3
		2.5%	2.6	3.
		1%	2.96	4.

The results in table 4 shows that upper and low bound values are less than the calculated value of F-statistics and it confirms long-term association between independent and dependent variables.

4.3.2 ARDL Model

Table 5

Long-term impact on agriculture sector growth

Variable	Coefficient	Std. Error	t-Statistic	Prob
AL	0.033	0.00	4.66	0.00
FDI	0.011	0.00	2.85	0.01
CPI	0.022	0.04	4.45	0.00
PG	0.011	0.01	8.19	0.00
ER	0.09	0.03	2.60	0.01
EXR	0.24	0.11	2.05	0.00
C	29.05	4.28	6.77	0.00

- Dependent variable: Agriculture sector growth.

Source: Author owns calculation by E-views Software

The variable inflation rate in Table 5 depicts a positive and significant association with agriculture growth (AL), which implies that a one unit increase in inflation rate is associated with an increase in agriculture sector growth by 20%. The coefficient value of FDI also shows the positive relation between foreign direct investment and agriculture output, suggesting that a one unit increase in FDI is associated with an increase in the agriculture output by 0.11% in the long-term if all other factors remain unchanged-statistic value is 2.8 which are greater than 2, and it indicates the significant relation. The probability value is 0.001, less than 0.05 which also is significant. The coefficient value for CPI also indicates the positive association between inflation and agriculture output. It suggests that a one unit increases in inflation rate is associated with an increase in agriculture

production by 20%. T-statistic value is 4.4, which is greater than 2, showing the significant relationship between these two variables. The probability value is 0.0003, less than 0.05 which is also significant.

The coefficient for population is (0.011) also indicates positive link between population growth rate per annum with agriculture sector growth, suggesting a one unit increases in population growth rate is associated with an increase in agriculture output by 11%. The p-value is 0.000 indicates significant relationship between population growth rate and agriculture output in the long-term. The coefficient value of EAT shows the positive relation between employment and agriculture sector growth, which means a one unit increases in employment is associated with an increase in the agriculture output by 56% in the long-term. The coefficient for exchange rate (ER) indicates positive relationship between exchange rate and agriculture output, indicating a one unit increase in exchange rate is associated with an increase in agriculture output by 9% if all other factors remain unchanged. T-test value is 2.6 which is greater than 2 and the probability value is 0.01, less than 0.05, show that the relationship between two variables is significant. The coefficient for Export (EXR) indicates positive relation between exports and agriculture sector growth. The coefficient value 0.24 implies that a one unit increase in export will likely to increase agriculture sector growth by 24% in the long-term. The outcomes of ARDL model confirm long-term positive relationship between all independent and dependent variables. These results provide a fresh insight to the policymakers to devise long-term policies to accelerate growth in agriculture sector. These results confirm the findings of

(Atesoglu & Sonmez ,1997); Usman M (2016); Smithin, (2018), who identified positive link between inflation and agriculture output.

These results are illuminated in Figure 2.

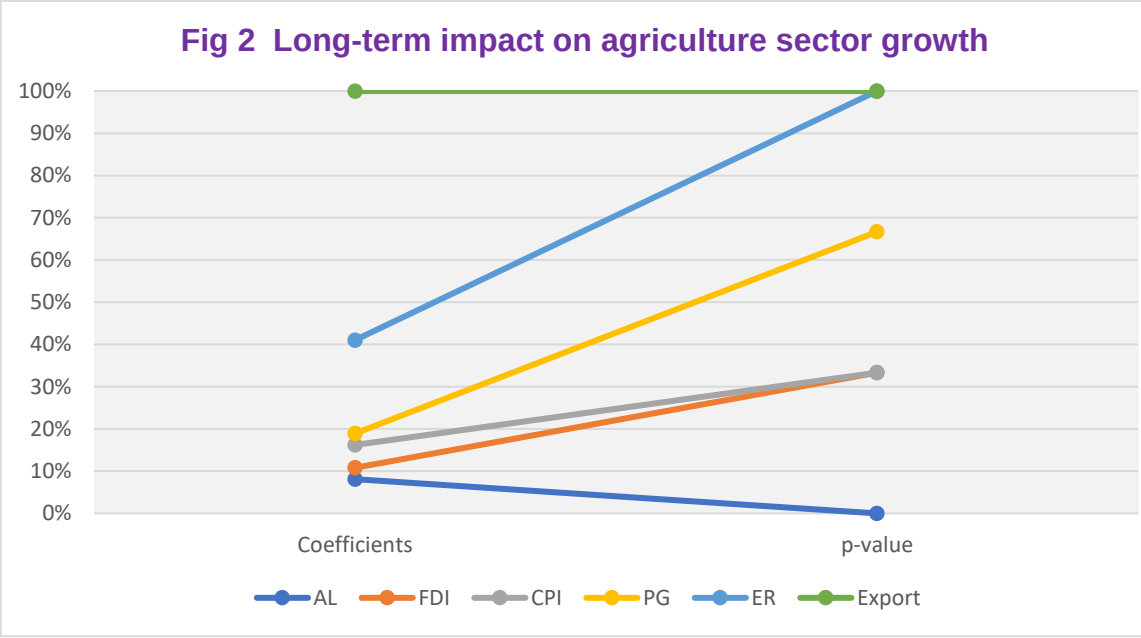


Fig 2: Long-term relative impact of variables on agriculture output.

Source: Author owns drawing by Excel.

4.3.3 Error Correction Model

The estimated results of ECM model are presented in Table 6.

Table 6

Short-term impact on agriculture sector growth

Variable	Coefficient	Std. Error	t-Statistic	Pro
AL	3.72	6.41	5.81	0.
FDI	-4.14	3.18	-1.29	0.
FDI (-1)	1.68	2.84	5.92	0.

CPI	0.07	0.03	1.90	0.
CPI (-1)	0.01	0.44	0.34	0.
CPI (-2)	0.013	0.41	3.27	0.
PG	-2.97	7.25	-4.09	0.
ER	0.09	0.05	1.88	0.
EXR	-0.04	0.12	-0.32	0.
EXR (-1)	-0.03	0.15	-0.24	0.
EXR (-2)	0.34	0.11	2.96	0.
Coint Eq (-1)	-0.08	0.22	-4.89	0.
R-Square	**0.95**		**D.W**	**2.70**
Adj-R-Square	**0.92**		**F-Statistic**	**2 7.11**

The outcomes of ECM model shown in Table 6 indicates that all variables except FDI, population growth per annum and exports have positive association with agriculture output in the short-term. It implies that in the short-term, population growth rate per annum, exports and FDI have negative relationship with agriculture output while all other variables including inflation, agriculture land, CPI, Employment, and exchange rate have positive link with agriculture sector growth in the short term. The R-squared value 0.95 shows the predictive power of the model, suggesting that 95% of fluctuation in the dependent variables is explained by the total changes in all explanatory variables. The Adjusted R-squared value 0.92 shows that the goodness of fit of the model to data. These outcomes align

with Faria, et al. (2001); Mubarik & Yasir (2005); Chaudhry, et al. (2013), who identified the similar results in their studies. The pattern of short-term relationships between variables are presented in Figure 3.

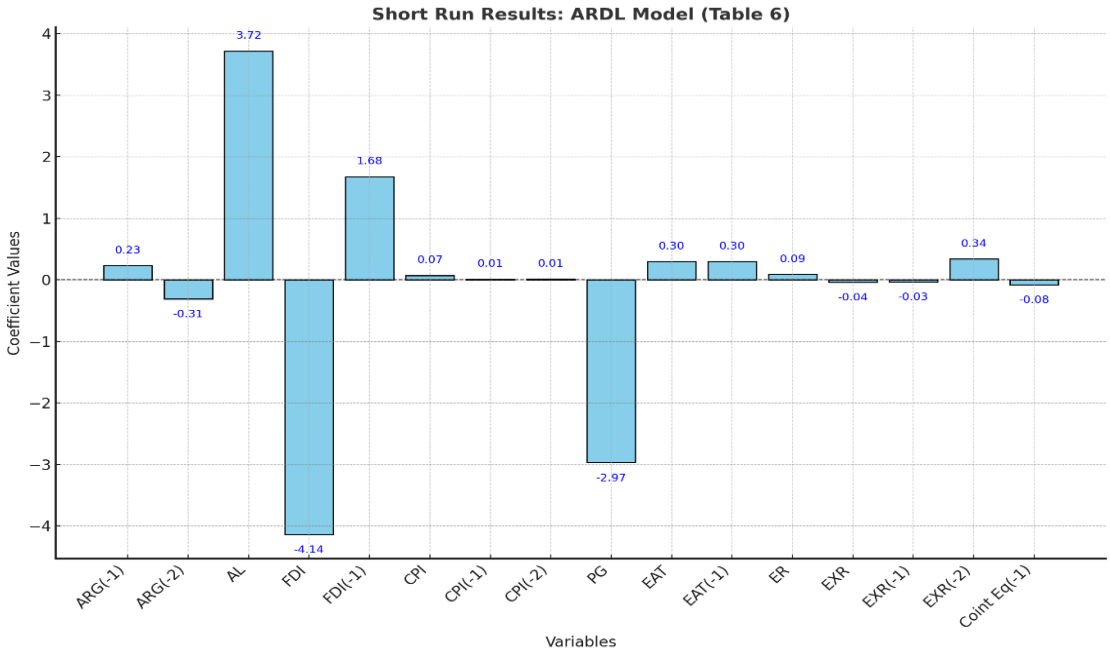


Fig 3: Sort-term impact on agriculture sector growth.

Source: Author owns drawing by Excel

5.2: Model 2: Manufacturing sector growth

5.2.1 Bound Test

Next step is that find out the long-term impact of variables on manufacturing sector. For this purpose, we used Bound Test to estimate

long-term relationship between variables. Table 7 shows the outcomes of Bound Test.

Table 7
Bound Test Result:

Test Statistic	Values	Significance	I (0)	I (
F-statistic K	**5.51 7**	**10%**	**2.03**	**3.**
		5%	**2.32**	**3**
		2.5%	**2.6**	**3.**
		1%	**2.96**	**4.**

Source: Author owns calculation by E-view software.

The above results illuminate critical value of upper I (1) and lower bound value I (0), which are lower than the calculated value F-Statistics (5.51). This is higher than value of both upper and lower bounds, confirming the existence of long-term association between variables.

5.2.2 ARDL Model (Manufacturing sector growth)

Table 8
Long-term impact on manufacturing sector growth

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	0.30	0.17	1.77	0.102
PG	0.20	0.02	4.60	0.000
FDI	0.26	0.05	4.88	0.000
ER	0.09	0.03	3.16	0.008
PCI	0.25	0.46	5.56	0.001
CPI	-0.53	0.09	-5.63	0.000

C	-61.59	20.69	-2.97	0.011

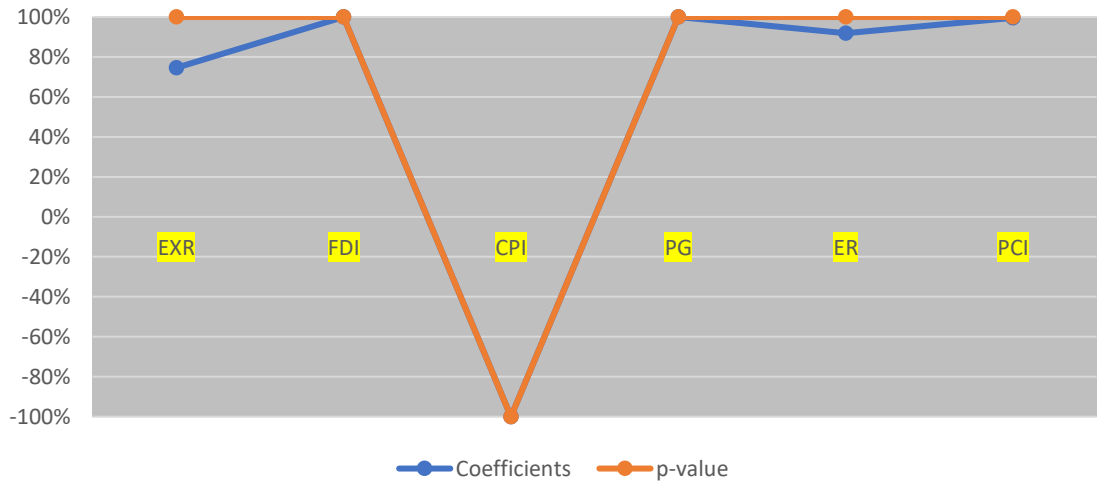
- Dependent variable: Manufacturing sector growth

Source: Author owns calculation by E-view software.

Table 8 illustrate the Manufacturing sector growth model. The coefficient for Export (EXR) shows the positive relationship with manufacturing sector growth. It implies that a one unit increases in export is related to an increase in the manufacturing sector growth by 30%. The coefficient for population (PG) demonstrates the positive association with the manufacturing sector growth. It means a one unit increases in population growth rate is likely to an increase in the manufacturing sector growth by 20%. T-statistic value is 4.60 and p-value is 0.000, which is less than 0.05 confirm significant relationship between variables. The coefficient for FDI shows the positive relation between FDI and manufacturing sector growth. If a one unit increases in investment is related to an increase in the manufacturing sector growth by 26%. The probability value is 0.0004, less than 0.05, indicating that the relationship is significant. The coefficient value for Exchange rate (ER) indicates a positive link between exchange rate and manufacturing sector growth, suggesting a one unit increases in exchange rate is related to an increase in the manufacturing sector growth by 9%. The P value is 0.0085, which is less than 0.05, illustrating significant relationship. The coefficient for per capita income (PCI) also demonstrates positive link between these two variables. It implies that a one unit increases in per capita income is associated with an augmentation in manufacturing sector growth by 25%. T-statistic value is 5.56, which is greater than 2, proving significant association. The coefficient for inflation

(CPI) shows negative association between inflation and manufacturing sector growth, suggesting a one unit increases in inflation rate is associated with a decrease in the manufacturing sector growth by 53%. The P value is 0.0000 also shows significant negative relationship. This suggest that inflation is the core factor affecting manufacturing sector growth negatively. Thus, all variables except inflation rate have positive relationship with manufacturing sector growth. These findings support to the studies of Barth, and Bennett, (1975); Faria, et al. (2001); Ayyoub, et al. (2011); Ajmair, et al. (2018), which reported negative association between inflation manufacturing sector, resultantly negative impact on economic growth. The ARDL long-term results are displayed in Figure 4

Fig 4:-Long-term impact on manufacturing sector growth



Source**:** Author owns drawing by Excel

5.2 3 Error correction Model

This model is used to identify the short-term relationship between variables and speed of adjustment of variables. It means how much time variables take to return to long-term equilibrium. This model shows the short-term behavior of variables. The outcomes in Table 9 shows significant positive association between exports (EXR), Exchange Rate (ER), Consumer Price Index (CPI) and per capita income while current FDI, FDI (-2) and CPI
(-1) have negative link with manufacturing growth in the short-term.

The coefficient for error correction term is -1.27, significant at p = 0.000, suggesting a solid adjustment toward long-term equilibrium. The magnitude suggests that 127% of disequilibrium is corrected in each period, illuminating a rapid adjustment process. The lagged variables of EXR (-1), PG (-1) and FDI (-1) do not depict statistically significant relationship as (p-values > 0.05), confirm that their effects may not be relevant in the short run. The same case is of population growth (-3.3) and p=0.95, showing no discernible short-term effect on manufacturing sector growth. Per capita income has also not significant impact on manufacturing sector growth in the short run because its p-value is greater than 0.05. Table 9 exhibits the outcomes of ECM.

Table 9

Short-term impact on Manufacturing sector growth

Variable	Coefficient	Std. Error	t-Statistic	Pr
EXR	0.43	0.19	2.20	0

EXR (-1)	-0.21	0.19	-1.11	0
EXR (-2)	0.17	0.12	1.38	0
PG	-3.31	6.26	-0.05	0
PG (-1)	1.33	1.31	1.01	0
TG (-2)	-1.26	7.35	-1.70	0
FDI	-2.63	5.63	-4.67	0
FDI (-1)	8.82	6.54	1.34	0
FDI (-2)	-1.62	7.09	-2.28	0
ER	0.07	0.03	2.39	0
ER (-1)	-0.01	0.02	-0.64	0
ER (-2)	0.06	0.02	2.28	0
PCI	5.43	7.49	0.72	0
PCI (-1)	1.96	7.49	0.26	0
PCI (-2)	0.25	7.58	3.30	0
CPI	0.21	0.08	2.50	0
CPI (-1)	-0.54	0.15	-3.41	0
CPI (-2)	-0.35	0.19	-1.82	0
Coint Eq (-1)	-1.27	0.20	-6.25	0
R-square 0.88		D.W 2.72		
Adj-R Square 0.69		F-Statistic 4. 72		

***** Dependent variable: Manufacturing sector growth.

4.3. Model: 3 (Service Sector Growth)

4.3 5.1 Bound Test Results:

The bound test has been applied to verify the presence of co integration in the selected variables of time series. The value of F-statistic is 10.13, which is grater then lower and upper bound. The estimated results in Table 10 shows that the calculated F-statistics is 10.13 (while upper bound and lower bound 1(0) and 1(1) are lower than the calculated value. Therefore, it is confirmed that there is long-term connection between independent variables and dependent variable (service sector growth.

Table 10
Bound Test results

Test Statistic	Values	Significance	I(0)	I (
F-statistic K	**10.13 8**	**10%**	**1.95**	**3.**
		5%	**2.22**	**3.**
		2.5%	**2.48**	**3**
		1%	**2.79**	**4**

Source: Author owns calculation by E-view software.

4.3.2 ARDL Model:

Table 11 depicts the outcomes of the link between different independent variables and service sector growth.

Table 11
Long-term impact on service sector growth

Variable	Coefficient	Std. Error	t-Statistic	Pr
CPI	-0.74	0.11	-6.92	0.0
FDI	0.03	0.11	4.60	0.0
ER	0.72	0.03	2.40	0.0

EXR	0.04	0.02	1.82	0.0
PG	0.10	0.11	4.10	0.0
PCI	0.08	0.01	4.06	0.0
C	2.57	0.681	3.77	0.0

- Dependent variable: Service sector growth

Source: Author owns calculation by E-view software.

The Results in Table 11 demonstrate that all variables except consumer price index (-0.74) have positive relationship with service sector growth in the long-term. The coefficient for FDI shows a positive link between foreign direct investment and services sector growth, it implies that a one unit increases in FDI is associated with an increase in services sector growth by 3% in the long-term if all other factors remain unchanged. Similarly, the coefficient for exchange rate (ER) has positive association with services sector growth. It implies that a one unit change in exchange rate is associated with an increase in service sector growth by 7% in the long-term. This relationship is significant because t-value is 2.60 and p-value is 0.031 respectively. The coefficient for exports (EXR) also has a positive connection with service sector growth, it means a one unit increases in exports will likely to increase in service sector growth by 4 percent if all other factors. Further, per capita income (PCI) also has a positive association with service sector growth in the long-run, suggesting a one unit increase in per capita income is associated with an increase in service sector growth by 8%. This relationship is statistically significant because t-value is 4.065 and p-value is 0.0013. These results support to the studies of (Kim,2022; 2023; 2024).

These relationships are illuminated in Figure 5.

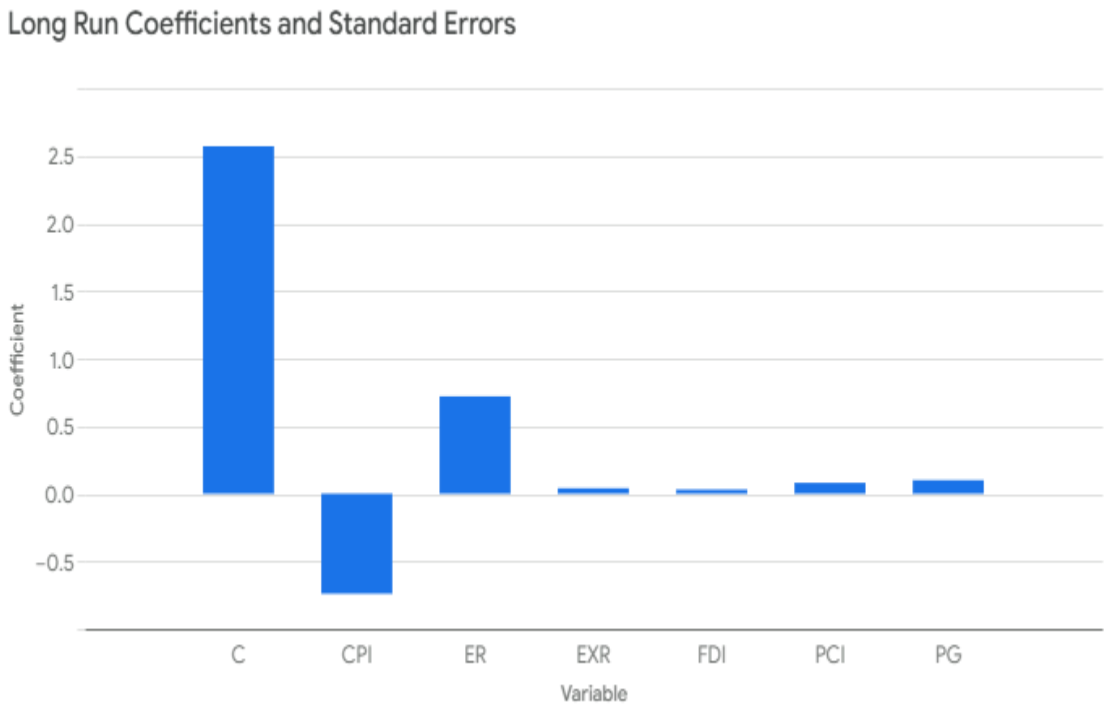


Fig 5: Long-term impact on service sector growth.

Source: Author owns drawing by Excel.

5.3.3 Short Run Relationship

The short-term dynamics of ECM shows cointegration between variables. The consumer price index has a positive and statistically significant relationship between service sector growth because of coefficient of 0.10 and p-value 0.020. FDI has a positive but insignificant relationship with service sector growth. However, lagged FDI (1-) and FDI (-2) have significant negative impacts, illuminating that past FDI inflows have a dampening impact on the current period. Similarly, exchange rate (ER) has a negative but insignificant effect on service sector growth. The lagged ER (-1) has a positive and significant impact. Exports (EXR) has a negative and insignificant impact currently but lagged EXR (-1) has a positive and significant impact on service sector growth. Current per capita income (PCI) has a negative and insignificant impact service sector growth in the short-term. But lagged PCI has a positive and significant impact on service sector growth. The coefficient term "Coint Eq (-1)" and (p-value = 0.000), suggesting a long-run equilibrium relationship between the variables. This means that these variables tend to move together in the long run.

As regard to the model the R^2 0.88 reveal that 88% of the variation in the explained

variable is illustrated by the model. While adjusted R^2 0.69 that accounts for the number

of construct in the model and it shows predictive power of the model. The F-statistics, 4.72

indicates that overall model is statistically significant and its results are robust. Durbin-

Watson (D.W.): 2.69, which lies within the acceptable range (around 2) and illuminates that

there is no significant autocorrelation in the residuals. In short, the Error Correction Model

(ECM) suggests that the variables may be deviated from their long-run equilibrium in the

short-term, but they return to their long-term equilibrium. The coefficients provide insights

into the speed and pattern of adjustment process. Table 12 shows the outcomes of Error

Correction Model.

Table 12

Short Run impact on Service sector growth

Variable	Coefficient	Std. Error	t-Statistic	p-Valu
CPI	0.10	0.04	2.63	0.020
CPI (-1)	-0.27	0.047	-5.82	0.000
FDI	2.70	1.25	2.16	0.049
FDI (-1)	-5.20	1.82	-2.88	0.012
FDI (-2)	-5.33	1.77	-3.01	0.009
ER	-0.20	0.05	-0.40	0.692
ER (-1)	0.18	0.084	2.19	0.047
EXR	-0.39	0.044	-0.88	0.392
EXR (-1)	0.13	0.039	3.36	0.005

Variable	Coefficient	Std. Error	t-Statistic	p-Valu
PPI	-3.98	2.93	-1.35	0.197
PPI (-1)	0.01	2.35	5.96	0.000
Coint Eq (-1)	-2.27	0.19	-11.88	0.000

Model Statistics	Value
R-squared	0.88
Adjusted R-squared	0.69
F-statistic	4.72
Durbin-Watson (D.W.)	2.69

Source: Author owns calculation by E-View software.

5. Findings and discussion

This research was conducted to analyses the impact of inflation along with other variables on sectoral growth (Agriculture, Manufacturing and Services sectors) using 30 years' time series data from 1981 to 2021. We constructed three econometric model to identify the impact of inflation along with other relevant variables on Pakistan's three sectors economy. We estimated separate results of Agriculture, manufacturing and services sectors in order to differentiate which sector is mostly affected by inflation. Key findings of this research are as follows:

In the first model, we examine the impact of six explanatory variables, such as Agricultural Land (AL), Foreign Direct Investment (FDI), Consumer Price Index (CPI), Population Growth (PG), Employment (EAT), Exchange Rate (ER), and Exports (EXR) on agriculture sector growth. We find that all explanatory variables demonstrate positive and significant impact on agriculture sector growth in the long-term. These

results suggest that the variables such as inflation, foreign direct investment and per capita income contribute significantly to agriculture sector growth, highlighting the significance of long-term policy interventions by focusing on these variables. We estimated short-term results using Error Correction Model. The findings reveal that the variables, such as Agriculture land, consumer price index and exchange rate have positive impact on agriculture sector growth while population growth and FDI have negative impact. The empirical analysis of ARDL and Error Correction models confirm that inflation has positive impact on agriculture sector growth in the long and short-term, therefore, the null hypothesis **Ho**, which postulates negative nexus between inflation and agriculture sector growth is rejected and alternate hypothesis **(H_1)** is accepted.

In the second model, we found positive and significant relationship between Exports (EXR), Population Growth (PG), Foreign Direct Investment (FDI), Exchange Rate (ER), Per Capita Income (PCI), inflation and manufacturing sector growth in the long-term, providing valuable insights into the policy intervention to accelerate manufacturing sector growth in the long-term by focusing on these variables. The findings of Error Correction Model reveal that FDI and CPI show negative impacts on manufacturing sector growth, while EXR, ER, and PCI have positive effects. The policymakers can frame actionable long-and-short-term strategies to trigger growth in the manufacturing sector. The empirical analysis of ARDL model confirms that inflation has negative impact on manufacturing sector growth. Therefore, null hypothesis (Ho), which posits that inflation is negatively correlated with manufacturing sector growth is accepted because empirical findings support it. The finding suggests that policymakers should opt intervening strategies to control inflation to reduce its negative impact on manufacturing sector. The findings of this study also confirm Kenes' (1936) "Wage- Price Spiral theory" which posits that when producer and workers are not agreed on relative price of goods and labor, then compete each other in determining nominal wages, and prices and this results in inflation. In Pakistan minimum wages of labor is fixed by Government and increase them every year. The manufactures will have to increase wages of labor in order to avoid penalty but int order to meet its rising cost he increases prices of his products. In this way, wage-price-spiral follows each other. **(**Gertler & Hofmann, 2018).

In third model, the ARDL results demonstrate that CPI, FDI, Exchange Rate (RE), Exports, Population growth (PG) and Per Capital income (PCI) all positively and significantly contributes to the service sector growth. CPI was the only variable, which shows negative impact on service sector growth. The negative impact of CPI (-74) on service sector illuminates that inflation hinders this sector growth as confirmed by the t-statistics of -6.29. Therefore, Central banks and policymakers should focus on the control of inflation to bolster growth in service sector. The short-term results of Error Correction Model show that FDI, CPI, and lagged EXR have negative, while ER and PCI have positive relationship with service sector growth. The empirical analysis of third model proves that inflation has significant negative impact on services sector growth. Therefore, null hypothesis **(Ho),** which postulates that inflation is negatively correlated to service sector growth. These results confirm the findings of (Lorenzoni & Werning (2022).

5.1 Policy implications

The findings of this study underline the critical role of inflation control in promoting sectoral growth across Pakistan's agriculture, manufacturing, and services sectors. Inflation, as measured by the Consumer Price Index (CPI), was consistently identified as a significant negative factor affecting growth in all three sectors. The detrimental impact of inflation emphasizes the need for robust monetary policies aimed at stabilizing prices. Central banks and fiscal authorities should prioritize inflation-targeting measures, such as managing exchange rates and adjusting interest rates, to mitigate inflationary pressures. Maintaining low and stable inflation is essential for

enhancing the investment climate, supporting consumer purchasing power, and ensuring overall economic stability, which, in turn, will foster sustainable sectoral growth.

In the agriculture sector, long-term growth is positively influenced by factors such as foreign direct investment (FDI), agricultural land use, exports, and population growth. Policymakers should continue to promote FDI through incentives that attract both domestic and foreign investments, focusing on sustainable agricultural practices and technological advancements. Improving the utilization and management of agricultural land is crucial for enhancing productivity and addressing food security challenges. Additionally, policies aimed at stabilizing exchange rates will help farmers cope with fluctuating input costs, while increasing per capita income within rural populations through targeted subsidies or income transfers can promote inclusive agricultural development. In the short term, interventions to increase agricultural land productivity and manage population growth will further support sectoral growth.

For the manufacturing sector, the study highlights the importance of exports, FDI, population growth, and per capita income as long-term drivers of growth. Export promotion policies should focus on expanding market access and improving competitiveness through infrastructure development and innovation. Similarly, attracting foreign investment in the manufacturing sector can stimulate technological advancements and job creation. As population growth continues, aligning labor force growth with industrial needs will be crucial, while addressing inflation's negative impact on manufacturing growth will require income-enhancing measures for workers and strategic inflation control policies. Short-term strategies

should emphasize export promotion and workforce income enhancement to foster immediate growth in the sector**.**

The services sector faces a unique challenge due to the significant negative impact of inflation on its growth. Given that inflation adversely affects service costs and consumer spending, it is imperative for policymakers to implement effective inflation control measures to safeguard the sector's competitiveness. While other variables such as FDI, exchange rates, exports, and per capita income positively contribute to the growth of the services sector, the negative impact of inflation necessitates the regulation of service prices and wages. Investment in digital infrastructure, skills development, and innovation will further enhance the sector's potential. A comprehensive policy approach, combining inflation control with measures to stimulate investment and human capital development, will be essential for fostering sustainable growth across all sectors in Pakistan.

5.3 Theoretical contribution

The findings of this study align with several economic theories that explain the dynamics of inflation and its impact on sectoral growth. The Wage-Price Spiral Theory, also known as the cost-push inflation theory proposed by Keynes (1936), provides a theoretical framework foundation for understanding the relationship between inflation and sectoral growth, particularly in the agriculture and manufacturing sectors. The theory suggests that when firms face rising production costs due to inflation, they increase prices of their products to maintain profitability. Workers, in turn, demand higher wages to keep up with the rising cost of living (Paldam,

Martin,1973). This wage-price conflict can create a cycle of inflationary pressures. The study's findings that inflation, represented by the Consumer Price Index (CPI), negatively impacts manufacturing, and services are aligned with this theory.

The Quantity Theory of Money, proposed by Irvin Fisher (1926) and the refined by Milton Friedman (1961, 1970), emphasizes the long-term relationship between the money supply and inflation. It is another theory that helps explain the study's findings. As posited by inflation is primarily a monetary issue, driven by an increase in the money supply. The study's results suggest that inflation significantly hampers sectoral growth, particularly in the manufacturing and services sectors, which aligns with the theory's emphasis on controlling money supply to curb inflation. The negative impact of inflation on manufacturing growth in the study can be attributed to the inflationary pressures on input costs and wages, which are consistent with the monetary model's prediction that excessive money supply leads to persistent inflation and, consequently, reduced economic growth. Moreover, the study's findings emphasize the role of central banks in regulating inflation through monetary policies, are also in line with Lucas's (2006) argument that central banks' actions can influence inflation but with a lag, reinforcing the need for cautious and forward-looking monetary policy.

The Structuralist Theory of Inflation developed by Myrdal and Streeten (1960), is particularly relevant to understanding of inflationary pressures in developing countries like Pakistan. This theory highlights the supply-side factors such as wages, food prices, and import prices as primary drivers of inflation, which is consistent with the study's findings that

inflation negatively impacts sectoral growth, especially in the agriculture and manufacturing sectors. The study also supports the structuralist view that inflation in developing countries cannot be explained solely by aggregate demand and supply dynamics, as there are structural weaknesses, market imperfections, and inter-sectoral imbalances. For instance, in the agriculture sector, where inflationary pressures on food prices and agricultural inputs can lead to reduced productivity, the findings align with the structuralist notion that inflation is deeply rooted in the underdevelopment and inefficiencies of the supply side in these economies.

Finally, the Modern Theory of Inflation, which posits that inflation is often the result of excessive money printing by governments to finance debt, offers another lens through which to view the findings. According to this theory, inflation happens when governments increase the money supply to meet fiscal needs, often leading to hyperinflation if not controlled. The study's results, which show inflation as a significant obstacle to sectoral growth, particularly in the services sector, resonate with the concerns outlined by Randall (2015) and Mankiw (2020) regarding the dangers of excessive money supply leading to inflationary spirals. Policymakers must, therefore, adopt strategies to control both inflation and money supply, particularly in sectors sensitive to price changes like services, to ensure sustainable growth in Pakistan's economy. The study highlights that controlling inflation through careful monetary management is crucial to preventing the negative impacts of inflation on sectoral development.

Although this study is restricted to Pakistan, which is the main limitation of this research, yet its findings can be generalize to other developing countries facing the same situation of high inflation and low sectoral growth. The new researchers can expand these findings by including more variables like population density, external debt, unemployment, and productivity to broaden the scope of their studies and add fresh knowledge to this domain.

Data statement

The data that is used in this study will be made available on request.

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