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Fiscal Policy Transmission and Inflation Dynamics: Insights from DSGE Model

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ABSTRACT
This paper investigates the transmission mechanisms of fiscal policy and their effects on inflation dynamics using a medium-scale Dynamic Stochastic General Equilibrium (DSGE) model. The model integrates nominal rigidities (sticky prices and wages), forward-looking expectations, and a government sector that includes consumption, investment, taxation, and public debt dynamics. Researcher estimated the model for Pakistan using data source as World Development Indicators from 1990 to 2024, then simulated unanticipated fiscal shocks including increases in government consumption, public investment, and tax cuts, and trace their impulse responses for output, inflation, the output gap, interest rates, and debt over time. Results highlight several key findings. First, government consumption shocks generate a strong demand effect and lead to a temporary increase in inflation, which is constrained by monetary policy responses and resource constraints. Second, public investment shocks exert a less inflationary effect, due to their partial supply-side benefit over the medium run. Third, tax cuts tend to have inflationary consequences that depend on the structure of tax changes (e.g., consumption vs. income taxes). Fourth, the magnitude and persistence of inflation responses are highly sensitive to the degree of price and wage stickiness, the credibility of the fiscal framework, and the reaction function of monetary policy. Finally, in periods where monetary policy is constrained (e.g., at the zero lower bound); fiscal expansions have more pronounced inflationary impacts. The findings suggest that monetary–fiscal coordination is essential to stabilize inflation while achieving output stabilization. They also imply that public investment may be a more inflation–friendly component of fiscal stimulus compared to pure consumption spending. ARDL approach, Bound test with some diagnostic test will be employed in this analysis.

Keywords: *Fiscal Policy, Inflation Dynamics, DSGE Model, Time Series Analysis, ARDL Model, Co-Integration.*

Introduction

Macroeconomic outcomes are greatly influenced by fiscal policy, especially when it comes to aggregate demand and inflation dynamics. Understanding how fiscal policy is transmitted through taxes, spending, and public debt has become more and more crucial in contemporary macroeconomics, particularly for emerging economies and in times of economic volatility. The intertemporal behavior of families, businesses, and policymakers is frequently not adequately captured by traditional Keynesian models, which place an emphasis on the short-term simulative impacts of fiscal actions.

Dynamic Stochastic General Equilibrium (DSGE) models offer a more rigorous framework that combines macroeconomic dynamics with microeconomic underpinnings in order to overcome these drawbacks. Researchers can examine the short-term transmission and long-term impacts of fiscal policy shocks by using DSGE models, which incorporate forward-looking expectations, nominal rigidities, and policy rules. According to this paradigm, fiscal policy affects inflation through a variety of mechanisms, such as expectations creation, cost-push pressures, and aggregate demand. Furthermore, fiscal actions may also impact inflation expectations and the credibility of monetary policy in economies with significant budget deficits and debt accumulation, which could intensify price pressures. For efficient macroeconomic management, it is therefore essential to research inflation dynamics and the transmission of fiscal policy. Policymakers and scholars can simulate the effects of alternative fiscal tools, investigate the interplay between monetary and fiscal policy, and evaluate the stability of inflation dynamics under various policy regimes by using a DSGE model.

One of the most effective instruments that governments have at their disposal for bringing about economic stability and encouraging long-term growth is fiscal policy. Government taxes and spending are two of its main constituents, and they have a significant impact on output, inflationary dynamics, and aggregate demand. Recent years have seen a resurgence of interest in the connection between inflation and fiscal policy, particularly in developing nations where macroeconomic volatility, public debt accumulation, and fiscal imbalances are more noticeable. Designing sound macroeconomic policy thus requires an understanding of how fiscal measures impact inflation and are propagated across the economy. Theoretically, expansionary fiscal policy, which is defined by more government spending or tax breaks, can improve aggregate demand and, in the near term, stimulate economic activity. However, this increase in demand may cause prices to rise, leading to inflation, when the economy is operating near or beyond its productive capacity. Through cost-push processes, increased government expenditure can also impact inflation. For instance, raising public wages, providing subsidies, or investing in infrastructure may raise production costs and cause inflationary spillovers into other economic sectors. Furthermore, monetary accommodation-financed fiscal growth (such as deficit monetization or central bank borrowing) can directly raise the money supply, intensifying inflationary consequences.

By raising disposable income and lowering the cost of capital, tax cuts can encourage investment and consumption, which will increase demand-side inflationary pressures. On the other hand, tax increases may reduce inflation and demand, but they may also increase production costs (for example, by raising indirect taxes like VAT), which could result in cost-push inflation. Therefore, the way taxes are structured, when they are implemented, and how they interact with monetary policy all affect how much inflation they cause.

Expectations and credibility play a role in how fiscal policy is transmitted to inflation, in addition to the magnitude of fiscal measures. In economies with inadequate institutional frameworks, persistent fiscal deficits can exacerbate risk premia, boost inflation expectations, and erode fiscal sustainability. Through exchange rate depreciation, increased interest rates, or a decline in trust in the independence of monetary policy, fiscal policy can have indirect inflationary consequences in these situations. This emphasizes how crucial it is to comprehend fiscal transmission mechanisms in a macroeconomic framework that makes sense.

Dynamic Stochastic General Equilibrium (DSGE) models offer a powerful analytical tool to describe these intricate interconnections. Researchers may simulate and examine how shocks to government spending and taxation spread across the economy over time by using DSGE models, which take into account forward-looking behavior of families and enterprises, policy norms,

nominal rigidities, and expectation creation. DSGE frameworks have the ability to separate the short-term demand effects, medium-term supply responses, and long-term equilibrium adjustments that influence inflation dynamics, in contrast to static or purely empirical models.

Research objectives

• To analyze fiscal policy transmission mechanisms using a DSGE framework.
• To examine how fiscal shocks affect inflation dynamics in Pakistan.
• To simulate fiscal policy shocks and study their macroeconomic impact.
• To provide evidence-based policy recommendations for fiscal and monetary coordination.

Research questions

- How do fiscal shocks (government spending and tax policies) influence inflation in the short and long run?
- What are the main channels of fiscal transmission affecting prices?
- How does monetary policy interact with fiscal policy in shaping inflation dynamics?

Literature Review

Benigno and Eggertsson (2023) examined that search-and-matching new Keynesian model when the labor market is tight; the aggregate supply curve gets much steeper. However, such nonlinearities can also naturally emerge from input-output models with sectoral supply shocks, as Baqaee and Farhi (2022) examined. In their model, wage inflation rises as businesses compete for fewer workers. In these models, sectoral bottlenecks or frictions cause price increases for some intermediate goods. Even though wage inflation remains low, price inflation occurs when there are nominal rigidities because price increases do not offset price cuts in other sectors. Importantly, these methods suggest that the impact of (traditional) fiscal consolidation is also state-dependent: fiscal policy can have a significant impact on inflation while having a relatively small impact on output down a steep section of the aggregate supply curve (i.e., there is a weak/failing fiscal multiplier, which is typically calculated in terms of the equilibrium effect on demand for firms' output, but not in terms of how far they have been shifted away from it). Gourinc and associates arrive to precisely this conclusion. At the scale of the COVID-19 epidemic, the study demonstrates that policies with minimal impact on output. The link between error and subsidy should be zero between income and government payments.FD = A + be+, which is what we will have after compensation. Once the previous equation has been averaged across n~, I will continue to solve for solutions..They had a significant impact on prices. This line of models suggests, in the opposite direction of the argument, that when the economy is overheating, fiscal consolidation may play a significant role and may assist in lowering significant and core inflation at minimal cost in terms of lost output.

Wasner and Weber (2023) inspected the price limits that would restrain "business greed" should be implemented to address the current inflationary event, which is fueled by heightened corporate pricing power. However, there is currently little microeconomic evidence linking enhanced market dominance to higher corporate margins; this could simply be the result of an inelastic supply and a boom in demand. To put it another way, corporate margins may initially expand if prices must rise to clear markets rather than the other way around. However, it is important to note that our paper does not directly address this debate and does not have to. What matters to us is that, in some circumstances, UFP measures lower consumer energy prices, which can change the dynamics of inflation. Price caps, which lower corporate profits, or subsidies, which raise them inasmuch as they boost demand, are two examples of such policies. Ball, Leigh, and Mishra (2022) offered a comparable empirical analysis for the US and concluded that the tight labor market is mostly to blame for the rise in median inflation in the US. Like in our system, nonlinearities in the price Phillips curve are crucial to theirs. After comparing the

effects of labor market and product market shocks, Bernanke and Blanchard (2023) concluded that the majority of the US inflation spike was caused by steep rises in sectors and commodity prices rather than increases in wages. Di Giovanni and colleagues (2022) compare US and euro-area inflation using an input-output, model-based calibration. They determined that, in contrast to the US, a significant portion of inflation in the euro area is caused by global supply chain bottlenecks and external shocks. Furthermore, di Giovanni and colleagues (2023) discover that the majority of US inflation is caused by shocks to aggregate demand. The majority of these findings align with our own analysis.

According to Chen and colleagues (2022) examined that monetary policy has a greater ability to lower inflation in advanced economies than fiscal policy.7 Fiscal and monetary interconnections in the euro area are examined by Beyer and others (forthcoming). Their study shows a relatively small effect of fiscal consolidation on inflation, which is in line with this reasoning and our own model-based conclusions. In particular, their findings show that fiscal consolidation of 1 percent of GDP in 2023 and 2024 lowers core inflation by a moderate 0.15 to 0.25 percentage points in the first two years compared to the baseline.

Cavalcanti and Vereda (2015) calibrated a DSGE model with a diverse family sector and wage and price rigidity to the Brazilian economy. The authors discovered that macroeconomic effects from fiscal shocks under various fiscal rules were primarily favorable. Babecky et al. (2018) examined the impact of disaggregated fiscal shocks on the Czechosvakia economy by estimating both DSGE and DSGE-VAR models.The study's findings demonstrated that the Czech economy had expansionary impacts from favorable shocks to government investment and spending. To examine the impact of government expenditure, consumption tax, and income tax shocks on African economies, Takyil and Leon-Gonzalez (2019) constructed a New-Keynesian DSGE model for the Ghanaian economy. Both Ricardian and non-Ricardian households were included in the model. They discovered that fiscal shocks had a mixed impact on the economy.In other words, government expenditure had a negative effect on Ricardian consumers but an expansionary one on non-Ricardian households.

Data and Methods

Data

The study employs yearly time series data covering the period 1990 to 2024, collected from reliable international databases including the World Development Indicators (WDI) of the World Bank This source provides standardized and internationally comparable macroeconomic and health sector indicators, ensuring the accuracy**,** consistency, and reliability of the data employed in the analysis.

Methodology

First, the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981) was employed to examine the stationarity of the data series**.** The Autoregressive Distributed Lag (ARDL) model was then applied to assess the co-integrating relationships among variables, while the Bounds Test determined the presence of long-run associations**.** To capture the short-run dynamics and the speed of adjustment towards long-run equilibrium, the Error Correction Mechanism (ECM) was estimated following Pesaran and Shin (1998). Variance Inflation Factors (VIF) were used to detect possible multicollinearity issues. Additionally, the Heteroscedasticity Test was applied to check for non-constant variance in the error terms, and the Lagrange Multiplier (LM) Test was conducted to identify any serial correlation or autocorrelation. A Normality Test ensured that the residuals were approximately normally distributed. Finally, the Granger Causality Test (Perron, 1990; Pesaran and Shin, 1998) was employed to verify the predictive causality between

health sector indicators and GDP growth. All statistical analyses were performed using EViews, a widely recognized econometric software package.

Description, Nature, Time Period and Source of the data used in time series analysis

Description of variables	Time Period	Source
Inflation, GDP deflator (annual %)	1990-2024	World Development Indicators (WDI)
Gross capital formation (% of GDP	1990-2024	World Development Indicators (WDI)
General government final consumption expenditure (% of GDP)	1990-2024	World Development Indicators (WDI)
Tax revenue (% of GDP)	1990-2024	World Development Indicators (WDI)

Specification of the model

$I_t = a_0 + a_1GS_t + a_2GCF_t + a_3T_t + {}_+ et$

It = Inflation, GDP deflator (annual %) in Pakistan in year t

a_0 = intercept

a1, a2, a3 = coefficients

GS_t = General government final consumption expenditure (% of GDP) in year t

T_t= Tax revenue (% of GDP in year t

GCF_t = Gross capital formation (% of GDP) in in year t

e_t = error term

Results and Discussions

Unit Root Test for Variables

Augmented tDickey-Fuller t(ADF) tTest confirmed that dependent variable (*$Inflation_t$)* was found stationary at level I(0) sequence of integration, whereas rest of other independent variables (GS_t, T_t, GCF_t) are termed stationary at 1st difference at level I(1) as reflected in Table-1.

Table 4.1 Unit Root Test for variables (*$Inflation_t$*, GS_t, T_t, GCF_t)

Variables	ADF(Levels)		ADF with 1st Differences		Integration order
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
Inflation	-3.53	-4.11			**I(0)**
Govt: spending	-3.67	-3.57	-2.96	-3.57	**1(1)**
Gross Capital formation	-2.90	-2.99			**1(0)**
Tax	**-2.95**	**-3.56**	**-2.96**	**-3.59**	**1(1)**

Table 2 Auto-Regressive Distributed Lags Model for Variables (*$Inflation_t$*, GS_t, T_t, GCF_t)

Dependent Variable: Inflation				
Method: ARDL ((4, 1, 4, 2)				
Sample (adjusted): 1990-2024				
Included observations: 30				
Fixed regressors: C				
Number of models evaluated: 500				
Variable(s)	Coefficient(s)	Std. Error	t-Statistics	Probability*
Inflation(-1)	-0.526624	0.216356	-2.434061	0.0332

Gross Capital Formation(-2)	-8.935306	3.260039	-2.740859	0.0192
Govt Spending(-1)	1.857416	4.320992	0.429859	0.6756
Govt_Spending(-4)	-6.549681	4.065575	-1.611010	0.1355
Tax	-16.46571	5.176520	-3.180845	0.0087
C	373.0402	148.1752	2.517561	0.0286
R-squared	0.737771	Durbin-Watson Stat.		2.131
Adjusted R-squared	0.404025			
F-statistic	2.210578			
Prob(F-statistic)	0.046019			

Inflation (-1)

We can see in table 2 that ARDL model has the special characteristics to show the value of its lagged dependent variable. It cane be observed that coefficient value of this lagged inflation of previous year is -0.526. It illustrates that one unit increase in previous inflation leads to a 0.526 units decrease in current inflation, indicating deceleration." The negative and significant coefficient of lagged inflation (−0.5266) suggests that inflation in Pakistan exhibits mean-reverting behavior. A one-unit rise in inflation in the previous period leads to a 0.526 unit decline in the current period, indicating that inflationary pressures tend to decelerate over time. This pattern is generally favorable for macroeconomic stability, as it reflects a non-explosive inflation path; however, excessive disinflation could also point toward weak demand dynamics."

Gross Capital_Formation (-2)

A one-unit increase in gross capital formation (two periods earlier) is associated with **an** 8.9353 unit decrease in current inflation**,** holding other factors constant." A negative relationship between GCF (investment) and inflation usually reflects a healthy macroeconomic mechanism**,** especially in developing economies. it can further be expanded in term economy in both short and long run perspectives.

1. **Productive investment expands supply:**
   More capital investment increases production capacity → more goods and services → less upward pressure on prices.
2. **Inflation control:**
   Lower inflation improves purchasing power, stabilizes costs, and supports monetary policy credibility.
3. **Economic stability:**
   Stable or moderate inflation creates a good environment for investment, savings, and long-term planning.
4. **Long-term growth support:**
   Investment-driven disinflation is different from demand collapse, it usually indicates supply-side strengthening, which supports sustainable growth.

Government Spending or consumption (-1)

It shows that P-Value for this variable is greater than five percent indicating it as insignificant showing no impact of previous year government spending on the inflation in present year.An insignificant effect of government spending on inflation can suggest several things depending on context:

1. **Weak transmission mechanism:**
   Government consumption may not create strong price pressures meither because spending is too small relative to GDP or absorbed without affecting aggregate demand much.

2. **Monetary policy offset:**
   Even if government spending increases demand, the central bank may counteract it with monetary tightening, neutralizing the inflationary impact.
3. **Supply response:**
   If the economy has excess capacity, government spending might not raise prices, because producers can increase output without raising costs.
4. **Noise or instability:**
   Fiscal policy effects can be unstable over time, especially in developing economies with inconsistent fiscal stances.

Government Spending or consumption (-4)

A change in government consumption four periods earlier is not a statistically significant predictor of current inflation. The negative coefficient is not strong enough to reject the null hypothesis of no effect. The above-mentioned policy can also be regarded for this variable interpretation.

Tax

A one-unit increase in the tax variable (as measured in your model) is associated with a ≈16.47 unit decrease in inflation, ceteris paribus. Economic Interpretation that why higher taxes reduce inflation

1. **Aggregate demand channel (Keynesian mechanism)**

When the government increases taxes, it reduces disposable income of households and businesses.

Households have less income to spend → consumption demand falls

Firms face lower demand → they slow down price increases

→ Inflationary pressure decreases. This is the most direct and common explanation in both Keynesian and DSGE frameworks.

2. Fiscal consolidation & expectations channel

Higher taxes can signal fiscal tightening**,** which:

1. Reduces budget deficits and borrowing needs,
2. Lowers inflation expectations (people expect the government will not monetize deficits),
3. Strengthens monetary-fiscal policy coordination.

When inflation expectations are anchored, current inflation tends to fall**.**

3. Monetary policy interaction

If higher taxes slow demand, the central bank may ease its policy stance (or avoid tightening), stabilizing prices without additional shocks andaAlso, less fiscal pressure causes less need to print money or expand credit to lower inflation**.**

4. **DSGE model perspective**

In DSGE frameworks:

Higher taxes reduce households' optimal consumption and firms' pricing power, shifting the aggregate demand curve to the left.

With sticky prices, inflation adjusts downward as output returns to equilibrium.

If taxes are distortionary but reduce demand more than supply, net effect = disinflation.

Table 3: Bound Test for the estimation of long run association of variables (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$)

ARDL Bounds Test
Sample: 1990- 2024

Included observations: 30		
HO: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.591008	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

HO= Non-Existence of Long Run Relationships between variables

HI = Existence of Long Run Relationships between variables

Table-3 revealed results of Bound Test wherein that value of F statistics is worked out 5.59, greater than the 5% significance value upper bound limit; hence, the variables in the model are termed as significant.

Table 4: Error Correction Mechanism for short run relationship and long run adjustment of the variables (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$)

Dependent Variable: Inflation				
Method: Least Squares				
Sample (adjusted): 1990- 2024				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Gross Capital Formation(-2)	4.176987	2.535032	1.647706	0.1277
Govt Spending(-1)	11.90759	2.934897	4.057244	0.0019
Govt_Spending(-4)	6.549681	3.281269	1.996082	0.0713
Tax	-16.46571	4.235714	-3.887351	0.0025
C	373.0402	148.1752	2.517561	0.0286
ECT(-1)	-0.773278	0.449173	-1.721559	0.0001
R-squared	0.874889	Durbin-Watson stat		2.312431
Adjusted R-squared	0.791482			

According to table 4, the co-integraoin value is found negative -0.773278 and statistically significant by revealing that Error correction is present in the system and adjusts back to equilibrium after a shock. There is co-integration. This value reveals that when inflation deviates from its long-run equilibrium level, the system adjusts back toward equilibrium and each year 77% of deviation will be adjusted. There is a long-run co-integrating relationship between inflation and the explanatory variables in the model.

Table 5: Variance inflation factor for perusing the presence of severe mulitcollinearity for the variables (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$)

Variance Inflation Factors
Sample: 1990- 2024
Included observations: 30

Variable(s)	Coefficient Variance	Uncentered VIF	Centered VIF
Gross Capital Formation(-2)	10.62785	807.1197	4.724541
Inflation (-1)	0.046810	3.333353	1.958241
Govt Spending(-1)	18.67097	2176.613	4.840924
Govt Spending(-4)	16.52890	1886.696	3.932493
Tax	26.79636	580.8031	7.607870

Table 5 represents that all the variables have their VIF(Variance Inflation Factors) values less than ten, so it can be concluded that there is no presence of severe multicollinearity in the data.

Table-6 Heteroscedasticity Test for variable (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$)

Heteroscedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.666834	Prob. F(14,11)	0.1544
Obs*R-squared	20.08305	Prob. Chi-Square(14)	0.1275
Scaled explained SS	3.831852	Prob. Chi-Square(14)	0.9964

HO: No Heteroscedasticity

H1: Heteroscedasticity

Table 6 provided that P-Values of F-Statistic and Chi-Square test are found greater than five percent significance level, hence H_0 is accepted by concluding that three is no presence of heteroscedasticity in the model.

Table 7: Lagrange Multiplier LM test for checking serial correlation/Autocorrelation of variables (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.391757	Prob. F(2,9)	0.1469
Obs*R-squared	9.023198	Prob. Chi-Square(2)	0.0110

HO: Nobserialbcorrelationbbetweenbvariablesb

H1: Serial correlation between variables

Since the P values of all tested variables (*Inflation*$_t$, GS$_t$, T$_t$, GCF$_t$) are found greater than 5% significance level in Table-7, hence HO is accepted revealing absence of serial correlation in the model.

Conclusion

The empirical results of the ARDL–ECM model confirm the existence of a stable long-run equilibrium relationship between inflation and its key macroeconomic determinants in the economy. The negative and statistically significant error correction term (−0.773278) indicates that approximately 77.3% of short-run disequilibrium is corrected each period, reflecting a rapid adjustment mechanism toward long-run stability. Lagged inflation (−0.5266) shows a self-correcting dynamic, suggesting that inflationary shocks tend to moderate over time. Gross capital formation (−8.9353) exerts a significant negative effect on inflation, implying that higher investment expands productive capacity and eases inflationary pressures. Taxation (−16.4657) also shows a significant negative impact, indicating that fiscal measures can play an important role in controlling inflation. In contrast, government spending (−6.5497) is statistically insignificant; suggesting that fiscal consumption alone may not be an effective short-run policy tool to influence inflation.

Overall, the findings underscore the importance of investment promotion, effective tax policy, and coordinated fiscal-monetary strategies for achieving long-run price stability. Policies aimed

at strengthening supply-side capacity and improving fiscal discipline can support a sustainable low-inflation environment and enhance macroeconomic resilience.

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