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Effects of Fiscal Policy in a Closed Economy: A Dynamic AD-AS Framework Analysis

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Abstract

This study examines the effects of fiscal policies on economic indicators through an aggregate demand–aggregate supply (AD-AS) model in a closed economy. Using numerical methods, we analyze the immediate impacts of policy changes and establish conditions for economic model stability. The research focuses on three primary fiscal policy instruments: government spending, consumption tax, and investment tax. We evaluate their influence on national income through numerical simulations to provide quantitative support for policy recommendations. Our findings reveal a positive correlation between government spending and national income, highlighting public expenditure's potential role in stimulating economic growth. Conversely, the results demonstrate negative effects from increased taxation, as higher consumption and investment taxes contribute to declining national income. This inverse relationship suggests that elevated tax rates may impede economic vitality. Based on our numerical analysis, we propose strategic fiscal interventions to promote economic growth: increasing government spending can effectively enhance economic output by injecting resources and boosting aggregate demand, while reducing tax rates can decrease the burden on consumers and investors, thereby encouraging economic activity. The results also emphasize that fiscal expansion is most effective when inflationary pressures remain moderate, ensuring that growth does not come at the expense of macroeconomic stability. This study contributes to fiscal policy modeling by integrating stability analysis into AD-AS simulations and offers insights for policymakers balancing growth and inflation risks.

Keywords: fiscal policy; economic growth; inflation; closed economy; AD-AS model
JEL Classification: C62; E62; H30

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1. Introduction

Fiscal policy plays a crucial role in influencing economic growth and development, with impacts varying across countries and contexts. It serves dual purposes: immediate economic stabilization and promotion of long-term growth and development, particularly in developing countries seeking new engines for growth and equity (Brahmbhatt & Canuto, 2012). The implementation of fiscal policy is closely tied to a country's development level; poorer countries rely more heavily on international trade taxes, while income taxes predominate in developed economies (Easterly & Rebelo, 1993). Research has identified a long-term relationship between fiscal policy and economic growth, suggesting that increased capital expenditures can stimulate growth (Nwankwo et al., 2017). However, fiscal policy's impact depends on country-specific factors, such as institutional quality (Nawaz & Khawaja, 2016), leading to varying effects across nations (Abdullah et al., 2019).

Understanding the complex dynamics of fiscal policy within an economy is pivotal for macroeconomic policy analysis and growth. The aggregate demand-aggregate supply (AD-AS) framework provides a key analytical tool for examining how fiscal policy influences economic indicators, particularly inflation and national income. This study explores fiscal policy's effectiveness in promoting economic growth and its potential side effects on inflation, which may influence other economic indicators. These findings will inform policymakers' agenda in policy design and implementation.

Fiscal policy, encompassing government spending and taxation, is fundamental to managing economic stability and growth. The AD-AS framework enables policymakers to analyze fiscal policy's effects on aggregate demand and supply, facilitating comprehensive assessment of economy-wide impacts. In this model, the aggregate demand (AD) curve represents total spending at various price levels, while the aggregate supply (AS) curve shows firms' total output across price levels. Fiscal policy changes can shift these curves, affecting national income and inflation.

Government intervention through fiscal measures is particularly crucial during economic downturns, helping stabilize the economy by boosting aggregate demand, creating jobs, and promoting recovery. China's response to the 2008-2009 global financial crisis exemplifies this approach, where a substantial fiscal stimulus package, combined with structural reforms, enhanced employment and domestic demand while contributing to long-term economic development (Zheng et al., 2023). Evidence suggests fiscal interventions are especially potent during recessions, though concerns about growing government debt may compromise expansionary fiscal policies' effectiveness, highlighting the importance of prudent public debt management (Auerbach, 2012). Economic theories present diverse perspectives on fiscal policies' role: the Keynesian approach advocates intervention and increased consumption during crises, while neoliberalism emphasizes austerity and stable environments with limited government spending. Historical evidence indicates these approaches' effectiveness varies by economic context and period (Gockov & Trpeski, 2017).

Fiscal policy changes have complex effects on aggregate demand and supply. Discretionary measures, such as legislated tax cuts or increased government spending, can stimulate aggregate demand by increasing disposable income and consumption, as demonstrated during the Great Recession (Cashin et al.,

2016). However, effectiveness varies with economic context and government debt levels. In Japan, government expenditure increases had Keynesian effects at low debt-to-GDP ratios but non-Keynesian effects at high ratios (Kinari & Shibamoto, 2007). The crowding-out effect, where increased government spending may reduce private consumption, requires consideration. While some studies suggest one-for-one crowding-out (Canlas, 1986), others argue for limited substitutability between government spending and private consumption (Aschauer, 1985). Fiscal policy can indirectly affect aggregate supply through labor supply and productivity changes, with targeted policies potentially enhancing aggregate supply by increasing labor force participation and improving income distribution (Tcherneva, 2011).

This research examines fiscal policy's economic effects within a closed economy framework. It contributes to the field by extending general system equations to stability analysis and simulation, critiquing immediate policy shift effects on economic dynamics and stability. The analysis focuses on three principal fiscal policy tools: government spending, consumption tax, and investment tax, evaluating their economic influence through numerical simulations. The subsequent sections detail relevant concepts, research methodology, and present analysis results with policy implications.

2. Literature Review

This section provides key concepts of the AD-AS framework and presents empirical studies that investigate the economic effects of fiscal policy.

The AD-AS framework provides a comprehensive approach to analyzing the impacts of fiscal policy on national income and inflation by examining the interactions between aggregate demand and aggregate supply in an economy. The AD-AS framework is instrumental in understanding how fiscal policy can influence national income and inflation. However, the effectiveness of fiscal policies varies depending on the economic context, such as whether the economy is in a demand-or supply-driven downturn. In demand-driven recessions, policies that stimulate aggregate demand such as government spending have large multipliers that significantly impact national income. However, in supply-driven downturns, these policies may have smaller or even more negative effects on national income and inflation (Ghassibe & Zanetti, 2022). An analysis using the AD-AS framework shows that fiscal policy can, directly and indirectly, affect income distribution and macroeconomic stability. Direct effects are observed in the immediate changes in disposable income due to tax and benefit adjustments. In contrast, indirect effects involve behavioral and macroeconomic feedback, which can alter the overall impact on national income and inflation (European Commission, 2018). Furthermore, the complementarity between fiscal and monetary policies is crucial for determining the overall impact on national income and inflation. For example, in a liquidity trap where interest rates are at the zero lower bound, fiscal policy becomes more effective in stimulating aggregate demand and national income because monetary policy has limited room to maneuver (Andreyev & Polbin, 2018).

Although the AD-AS framework is widely used in macroeconomics, it faces significant criticism for its logical inconsistencies and empirical shortcomings. Several sources have highlighted internal contradictions within the AD-AS model. One major criticism is that the AD and AS curves represent mutually exclusive theories

of the relationship between output and price level, which lead to logical contradictions when applied to the same economy (Barro, 1994). Additionally, the model's assumption that falling prices will restore full employment is empirically unrealistic in today's economy (Moseley, 2010). Despite these criticisms, the AD-AS model remains a central teaching tool in macroeconomic analysis (Dutt, 2002). Some researchers argue for abandoning the model because of its counterfactual implications for real wages and other variables (Barro, 1994). On the other hand, some studies have attempted to refine the model by integrating it with other economic theories or using it to analyze specific economic phenomena. For instance, an academic paper uses the AD-AS framework to identify structural shocks and estimate the slope of the aggregate supply curve, revealing a high correlation between demand and supply shocks (Cover et al., 2006).

To understand the effects of fiscal policy tools on national income and inflation, it is important to consider the theoretical foundations guiding these relationships.

Keynesian economic theory, which emphasizes the role of government intervention in stabilizing the economy, has been the subject of extensive analysis and debate, particularly in the context of disequilibrium and macroeconomic stabilization policies. One of the central tenets of Keynesian theory is the concept of effective demand, which diverges from classical economic assumptions by considering the impact of nonequilibrium prices and quantity constraints on economic transactions. Although these models often handle only a limited number of goods in disequilibrium, they have been used to describe macroeconomic phenomena within simplified equilibrium models (Benassy, 1975). The debate between classical and Keynesian schools of thought is particularly evident in the context of macroeconomic stabilization policies. For instance, a study on Nigeria's economy found that Keynesian notions of economic uncertainty challenge the classical assertion that future economic behavior can be predicted from historical data. This has implications for the effectiveness of stabilization policies, which suggests that alternative approaches, such as employment-targeting policies, may be necessary (Chidinma et al., 2022). Furthermore, the role of fiscal policy in Keynesian economics is highlighted as a reliable path to economic expansion, especially when unconventional monetary policies such as zero and negative interest rates prove insufficient. Fiscal policy, through mechanisms such as automatic stabilizers, is also crucial for stimulating private investment and economic activities (Nair, 2023). In the context of public debt, Keynesian theory suggests that aggressive fiscal policies can achieve full employment without necessarily increasing the debt-to-GDP ratio, which challenges the notion that public debt is inherently burdensome for future generations (Tanaka, 2020).

From a Keynesian perspective, fiscal policy is generally viewed as an effective tool for influencing economic conditions, particularly during recessions. Several studies support the Keynesian view that fiscal stimuli such as government spending and tax cuts can positively impact real GDP and aggregate demand. For instance, research on the United Kingdom from 1997 to 2017 shows that fiscal stimuli are associated with increases in real GDP, with government expenditure shocks accounting for significant variations in GDP (Adrangi et al., 2019). Similarly, a study on fiscal policy during the Great Recession proposes that fiscal multipliers are larger during economic downturns, indicating that fiscal policy can be particularly effective in such periods (Stockhammer et al., 2019). However, the effectiveness of fiscal policy can be influenced by

various factors such as government debt levels and economic conditions. Concerns about growing government debt may undercut the effectiveness of expansionary fiscal policies, as seen in the USA during the Great Recession (Auerbach, 2012). Additionally, the impact of fiscal policy can vary across different countries and economic contexts, and the transmission channel between government expenditures and output is not as direct as the Keynesian doctrine suggests (Mlilo & Kollamparambil, 2016). Nevertheless, the Keynesian perspective provides an understanding of the interactions among fiscal policy tools, national income, and inflation, which is essential for policymakers to make informed decisions that promote economic stability and growth (Hemming et al., 2002).

Neoclassical economic theory posits that market forces and free markets play crucial roles in achieving long-term economic equilibrium through rational actors and market competition. The theory is built on the axiom of individual universal rationality, in which economic actors are assumed to make decisions that maximize their utility, leading to predictable behaviors that drive markets toward equilibrium (Marinescu, 2016). This equilibrium is characterized by a balance of supply and demand, where prices adjust to reflect the optimal allocation of resources to ensure that markets are clear without excess supply or demand. The neoclassical framework assumes perfect information and competition, which are essential to the automated nature of markets. In this idealized setting, prices serve as signals that guide the allocation of resources, and any deviations from equilibrium are corrected by rational agents responding to these price signals (Marinescu, 2016). Neoclassical economists believe that any interference, such as government intervention, can lead to distortions and inefficiencies. According to this view, the economy is naturally self-correcting, and any deviations from full employment or output are temporary. In the long run, technological advancements, capital accumulation, and labor productivity are seen as the primary drivers of economic growth. Neoclassical theory also emphasizes maintaining a stable monetary environment to control inflation and ensure steady growth. However, this theoretical construction is highly abstract and may not always correspond to real-world conditions, where technological constraints and imperfect information can lead to deviations from the neoclassical equilibrium (Kümmel & Lindenberger, 2014). Despite its theoretical elegance, neoclassical economics has faced criticism for its assumptions and limitations, particularly its ability to account for complex economic phenomena and real-world market dynamics (Clark, 2014). Nonetheless, the theory provides a foundational framework for understanding how market forces and free markets are intended to contribute to long-term economic equilibrium.

From a neoclassical perspective, the effects of fiscal policy are complex and depend on various factors, such as the type of fiscal policy, the economic environment, and the assumptions of the model used. In a New Neoclassical Synthesis model, fiscal policy shocks can have cyclical effects where price stickiness is crucial. An increase in government demand can affect labor demand and supply, but the overall impact on output, wages, and inflation depends on the monetary policy regime. If the central bank controls money growth, fiscal expansions might be deflationary or contractionary. However, if an interest rate rule dampens the real interest rate increase, output and inflation can rise, although price stickiness alone does not explain a rise in consumption as predicted by Keynesian theory (Linnemann & Schabert, 2003). In a simple static neoclassical

model, changes in government purchases do not result in a multiplier effect under standard assumptions when the capital stock is fixed. The neoclassical growth model allows for analyzing government spending, where the expansionary effects operate through an income effect on labor supply. This model highlights the importance of elastic labor supply in understanding the macroeconomic effects of fiscal policy (Chu et al., 2020). Furthermore, the fiscal multiplier is argued to be increasing with the size of the shock. Large positive government spending shocks have a larger multiplier effect than large contractions. This is explained through the relationship between fiscal shocks, wealth distribution, and labor supply elasticity, where liquidity-constrained agents have less elastic labor supply responses (Brinca et al., 2019).

By integrating Keynesian and neoclassical perspectives, policymakers can develop a more nuanced and effective approach to fiscal policy. This balanced strategy would involve using Keynesian methods to address short-term economic fluctuations and demand shortfalls while relying on neoclassical principles to guide long-term growth and efficiency. For instance, during a recession, the government could implement expansionary fiscal policies to boost demand and reduce unemployment while fostering an environment that encourages innovation, investment, and productivity improvements to support sustainable growth. This dual approach helps promote economic stability and growth while mitigating inflationary pressures and avoiding the pitfalls of excessive government intervention.

Empirical studies investigating fiscal policy's effects demonstrate that taxation and government spending impacts on economic growth vary across different countries and contexts. Railavo (2003) incorporated supply-side channels into the New Keynesian model, using proportional tax rates instead of lump-sum taxes to illustrate tax wedge distortions. The research revealed that including supply-side effects restricts fiscal policy parameters necessary for economic stability, which results in more persistent inflation and output responses to shocks than demand-only effects. The progression of research throughout the following years continued to demonstrate diverse outcomes. In Tanzania, Sende and Ngasamiaku (2020) established that recurrent expenditure and income tax negatively affect short-term growth, whereas development expenditure positively influences both short-term and long-term growth. Al-Tarawneh et al. (2020) discovered negative relationships between taxes and economic growth in both short and long terms in Jordan, indicating that fiscal policy should consider appropriate tax rates to support growth. Subsequent research by Ganchev and Todorov (2021) in Bulgaria demonstrated that fiscal instruments such as direct and indirect taxes and government expenditure effectively stabilize economic growth in the short term but remain neutral in the long run. Their research determined that long-term growth receives more influence from household consumption and exports. Shafiq et al. (2022) found in Pakistan that tax revenue and inflation negatively impact growth, while government spending and capital formation generate positive effects. During the same period, Prasad et al. (2022) revealed that direct and indirect taxes positively impact GDP growth in India, which led to recommendations focusing on corporate tax policies to stimulate additional growth. More recent studies have expanded understanding of these relationships. Balasoiu et al. (2023) discovered in the EU that corporate income taxes negatively impact growth, and personal income taxes prove particularly detrimental in countries with limited fiscal efficiency. Ali and Asfaw (2023) identified a long-run relationship among inflation, income inequality, and economic growth in Ethiopia,

with bidirectional causality between economic growth and inflation. In addition, Zheng et al. (2023) examined China's fiscal policy effectiveness during economic downturns, particularly during the 2008-2009 financial crisis. Their findings showed that combining fiscal stimulus with structural reforms effectively boosted economic recovery. They recommended focusing on high-multiplier sectors while maintaining fiscal sustainability through debt management and ongoing policy assessment. Additionally, Majenge et al. (2024) demonstrated that fiscal policy variables such as government debt, expenditure, and revenue showed long-term cointegration with economic growth in South Africa, although monetary policy variables did not exhibit this long-term relationship. The research also established that economic growth Granger-causes inflation, which supports the demand-pull inflation hypothesis.

3. Methodology

To set up the model, this study assumes that the interest rate gap, defined as the difference between the nominal interest rate and expected inflation, negatively affects consumption, investment, and government spending. In other words, a larger gap results in a higher opportunity cost for these economic activities. Therefore, let us define consumption, investment, and government spending in the goods market of this hypothetical economy as follows:

Let the consumption equation (Krugman & Wells, 2015) is represented by $C = a + bY_d$, where C is consumption. Y_d is disposable income. a is autonomous consumption, and b is the marginal propensity to consume. Changes in interest rates can influence consumer spending. Higher interest rates generally lead to decreased consumption due to increased borrowing costs. Additionally, fluctuations in interest rates can affect the purchasing power of consumers, impacting their propensity to spend money on goods and services. Consequently, higher interest rates tend to reduce consumer spending and, thus, aggregate demand. The real interest rate, calculated as the nominal interest rate minus the inflation rate, represents the true cost of borrowing or the return on investment. This rate reflects the purchasing power of interest income after accounting for inflation, providing a more accurate measure of the return on investment.

Similarly, changes in tax rates or government transfers can directly impact disposable income, affecting consumer spending. Tax cuts, for example, can increase after-tax income, potentially leading to higher consumption levels. Changes in tax policies can also alter wealth distribution, influencing household consumer spending patterns. Thus, tax changes can shift the aggregate demand curve by affecting consumer spending habits. The implication of interest rate and tax on household consumption can be expressed as follows:

$$C_t = C_0 - c_1 R_t + c_2 \left(1 - \tau_C\right) Y_t , \tag{1}$$

where $R_t = \left(r - \pi_t\right)$ and τ_C is a tax collected from consumption, a component of Y.

The investment equation general is expressed (Krugman & Wells, 2015) as $I = I_0 + iY$, where I represent an investment. I_0 is an autonomous investment, and i is the marginal propensity to invest, implying that changes in income lead to movements along the investment function, illustrating how investment spending adjusts in response to income fluctuations in the economy.

Interest rates play a crucial role in firms' investment spending decisions. Lower interest rates stimulate spending on residential construction by making homes more affordable, thereby increasing demand in the housing market. Lower interest rates generally lead to higher economic investment spending as the demand for loanable funds increases. A fall in interest rates boosts investment spending, increasing real GDP and consumer spending while generating additional savings to match the rise in investment spending. The implications of interest rates and taxes on private investment can be summarized as follows:

$$I = I_0 - i_1 R_t + i_2 \left(1 - \tau_i\right) Y_t , \quad (2)$$

where τ_i is a tax collected from investment, a component of Y.

The government spending equation can be represented as $G = G_0 + gY$, where G is government spending, G_0 is autonomous government spending, Y is income, and g is the marginal propensity of government spending. The marginal propensity of government spending indicates the proportion of an increase in income that the government allocates to spending, reflecting the responsiveness of government expenditure to changes in income levels and economic conditions (Malinvaud, 1998).

Rising interest rates may constrain government budgets, limiting spending on infrastructure, social programs, and other public projects. Increased interest rates elevate the cost of servicing government debt, diverting funds from essential services and economic investments. Consequently, the government may need to adjust fiscal policies in response to interest rate changes to manage debt levels and sustain public spending. Fluctuations in interest rates can influence government spending decisions, impacting economic growth and overall stability (Krugman & Wells, 2015). However, this study defines government spending by:

$$G_t = G_0 + g\left(1 + \tau_c + \tau_i\right) Y_t , \quad (3)$$

In the Equilibrium, it requires that $Y_t = C_t + I_t + G_t$.

In the money market, it is assumed that interest rates negatively impact the demand for money and positively affect by income and price level, implying inflation, π_t , and expected inflation, $\pi_{e,t}$. However, the money supply is controlled by the central bank. Regarding money demand, changes in interest rates influence the opportunity cost of holding money, thus impacting money demand with an effect size of d. Additionally, higher income levels generally increase money demand, with an effect size of b, as individuals have more transactions. Money demand is also proportional to the rate of inflation, with a higher inflation rate leading to increased money demand, with an effect size of h. Therefore, the demand for real money $M_{d,t}$ (Krugman & Wells, 2015) can be expressed as follows:

$$M_{d,t} = bY_t + h\pi_t - dr_t \quad (4)$$

In the case of money supply, central bank actions, such as open market operations and reserve requirements, directly impact the money supply. Government decisions, like treasury operations and public debt management, can influence the money supply dynamics. Also, factors like economic growth, inflation rates, and

overall financial stability affect the money supply levels. Financial technology and payment system advancements can impact how money is created and circulated in the economy. However, this study assumes the real supply of real money $M_{s,t}$ is written by:

$$M_{s,t} = M_t - \pi_t, \tag{5}$$

The equilibrium condition in this money market is expressed by: $M_{d,t} = M_{s,t}$ which lead to:

$$r_t = \frac{\pi_t + bY_t + h\pi_t - M_t}{d}. \tag{6}$$

Regarding inflation, several factors determine its dynamics. One key factor is aggregate demand. Rapid increases in aggregate demand relative to aggregate supply, influenced by consumption, investment spending, and fiscal policies, can drive inflation. Additionally, money supply growth can cause inflation, as central banks may permit rapid monetary expansion to stimulate the economy (Malinvaud & Malinvaud, 1998). Thus, let us define:

$$P_t = P_{e,t} + \varsigma_1 Y_t + \varsigma_2 M_t, \tag{7}$$

Using (1) - (3) and money market equilibrium condition to get:

$$Y_t = \alpha + \beta_1 \pi_t + \beta_2 M_t, \tag{8}$$

$$\alpha = \frac{I_0 d + dC_0 + dG_0}{\left(\left(\tau_c + \tau_i + 1\right)g - c_2\tau_c - i_2\tau_i + c_2 + i_2 - 1\right)d - b\left(c_1 + i_1\right)}$$

$$\beta_1 = \frac{dc_1 + di_1 - hc_1 - hi_1 - c_1 - i_1}{\left(\left(\tau_c + \tau_i + 1\right)g - c_2\tau_c - i_2\tau_i + c_2 + i_2 - 1\right)d - b\left(c_1 + i_1\right)}$$

$$\beta_2 = \frac{c_1 + i_1}{\left(\left(\tau_c + \tau_i + 1\right)g - c_2\tau_c - i_2\tau_i + c_2 + i_2 - 1\right)d - b\left(c_1 + i_1\right)}$$

Assuming $\dot{M}_t = M_t - M_{ss}$ and $\dot{\pi}_t = \pi_t - \pi_{ss}$ where ss denote steady state. Also define $\dot{\pi}_{e,t} = \theta\pi_t - \delta\pi_{e,t}$ and with derivative of (7) with respect to t, the dynamics of this economy can be expressed by:

$$\dot{Y}_t = \left(\beta_1\zeta_2 + \beta_2\right)\left(M - M_{ss}\right) + \beta_1\left(\pi_{e,t} + \zeta_1\left(Y_t - Y_{ss}\right)\right), \tag{9}$$

$$\dot{\pi}_{e,t} = \left(\theta - \delta\right)\pi_{e,t} + \theta\left(\zeta_2 M_t + \zeta_1 Y_t - \zeta_2 M_{ss} - \zeta_1 Y_{ss}\right).$$

4. Results

This section reports the model analysis results, starting with the stability conditions and then presenting the model simulation results.

The equilibrium of this model which is affected by the value of variables and their steady states is as follows:

$$\begin{bmatrix} Y^* \\ \pi_e^* \end{bmatrix} = \begin{bmatrix} \dfrac{Mss\varsigma_2\delta\beta_1 + Yss\varsigma_1\delta\beta_1 + M\theta\beta_2 + Mss\delta\beta_2 - M\varsigma_2\delta\beta_1 - M\delta\beta_2 - Mss\theta\beta_2}{\varsigma_1\delta\beta_1} \\ \dfrac{\beta_2\theta(Mss - M)}{\delta\beta_1} \end{bmatrix}. \quad (10)$$

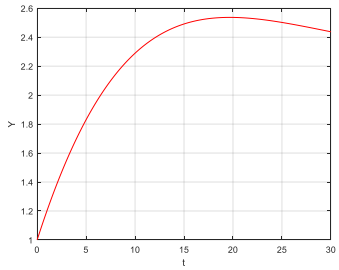
The stability of (8) for this particular equilibrium point can be analyzed by considering the Jacobian matrix, which is expressed as follows:

$$J(E_1) = \begin{bmatrix} \varsigma_1\beta_1 & \beta_1 \\ \theta\varsigma_1 & -\delta + \theta \end{bmatrix}. \quad (11)$$

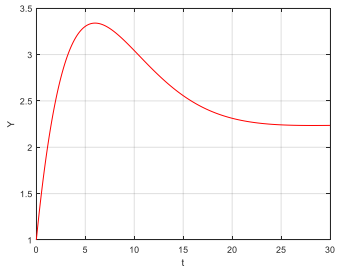
$$\lambda_{1,2}(J) = \begin{bmatrix} \dfrac{\varsigma_1\beta_1 - \delta + \theta}{2} + \dfrac{\sqrt{\varsigma_1^2\beta_1^2 + 2\varsigma(\delta+\theta)\beta_1 + (\delta-\theta)^2}}{2} \\ \dfrac{\varsigma_1\beta_1 - \delta + \theta}{2} - \dfrac{\sqrt{\varsigma_1^2\beta_1^2 + 2\varsigma(\delta+\theta)\beta_1 + (\delta-\theta)^2}}{2} \end{bmatrix}$$

which provide $Det(J) = -\varsigma_1\delta\beta_1 > 0$ implying that $Tr(J) = \varsigma_1\beta_1 - \delta + \theta < 0$ will lead to the stability of this economy.

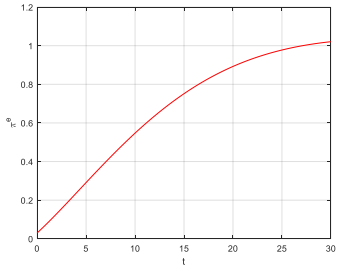
The following section reports the model simulation results. This simulation aims to explain the effect of varying the values of g, τ_c, and τ_i, which are the parameters related to fiscal policy, income, Y, and expected inflation, $\pi_{e,t}$. By assuming $Y_0 = 1$, $\pi_0^e = 0.03$, $c_1 = 0.6$, $c_2 = 0.8$, $i_1 = 0.2$, $i_2 = 0.6$, $b = 0.4$, $d = 0.8$, $h = 0.3$, $\theta = 0.1$, and $\delta = 0.2$, the simulation results are as follows:



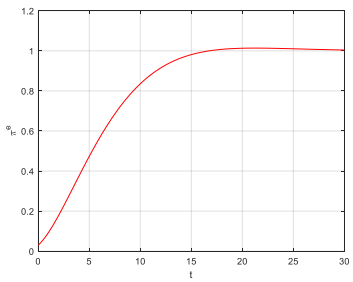
(a)



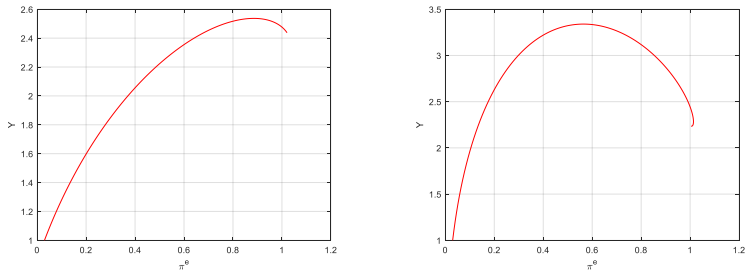
(d)



(b)



(e)



(c) (f)

g = 0.1, τ_c =3 , τ_i =3 g = 0.5, τ_c =3, τ_i =3

Figure 1: Sensitivity analysis of the marginal propensity of government spending (g)

Source: Authors' simulation

Figure 1 presents a sensitivity analysis of the marginal propensity of government spending (*g*). The analysis demonstrates the impact of varying *g* on the economy's income and expected inflation. As g increases, the simulation results, (a) and (d), indicate a corresponding rise in national income. This outcome aligns with the theoretical expectation that higher government spending (G), resulting from an increase in the marginal propensity to spend (g), stimulates economic activity by injecting additional resources into the economy, boosting aggregate demand and increasing output. Conversely, lower values of *g* result in reduced income levels, reflecting the diminished stimulative effect of government expenditure. Additionally, the analysis shows that changes in *g* influence expected inflation, (b) and (e), with higher government spending potentially leading to increased inflationary pressures due to heightened economic demand. The relationship between national income and inflation can be observed in (c) and (f) which shows that at low inflation levels, increases in inflation are associated with higher output. However, after reaching a peak, further increases in inflation are associated with declining output. Conceptually, Figure 1 provides diagrams to visualize the relationships between government spending, national income, and inflation.

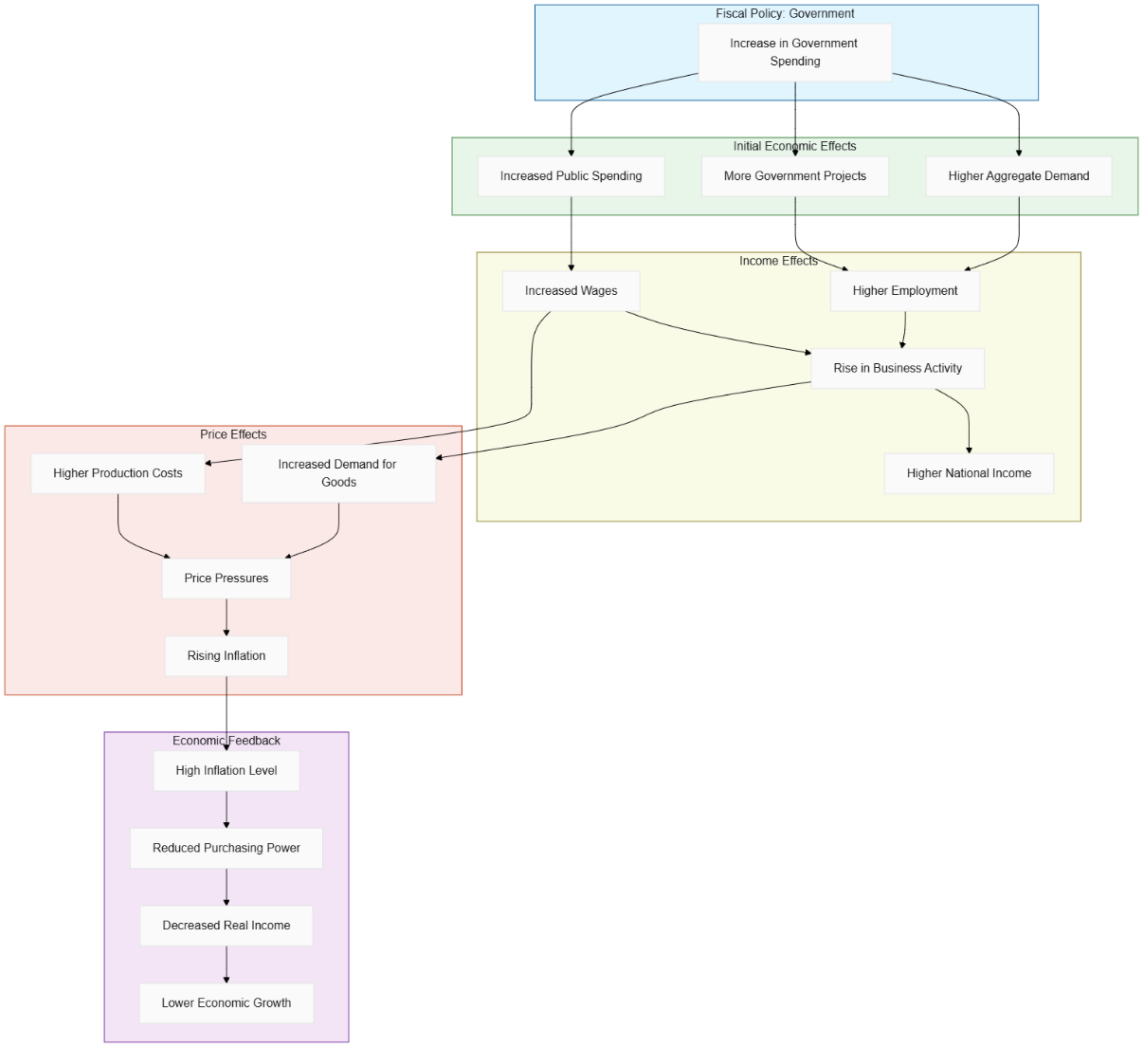
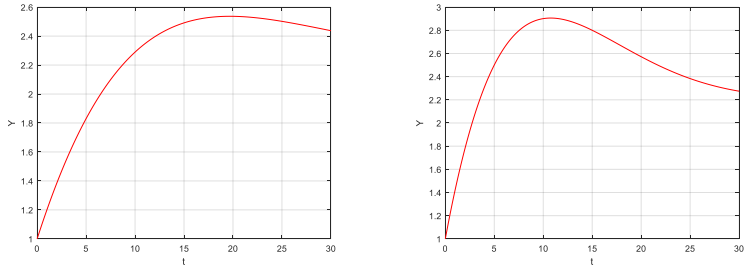


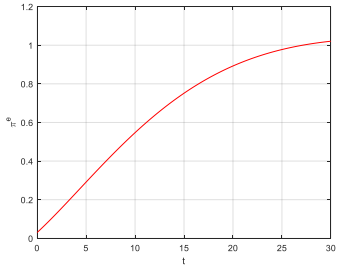
Figure 2: relationships between government spending, national income, and inflation

Source: Authors' presentation

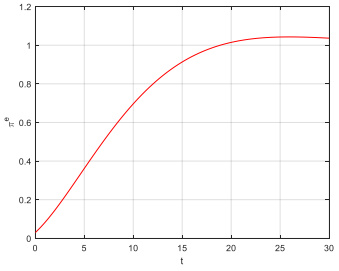


(a)

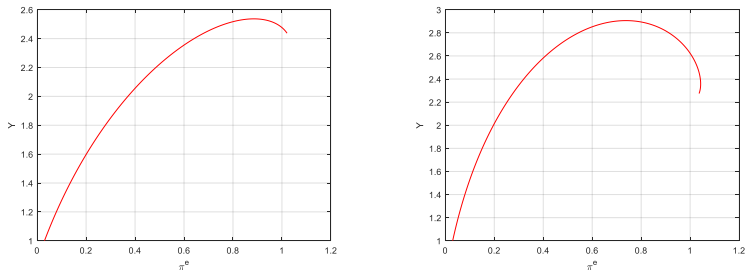
(d)



(b)



(e)



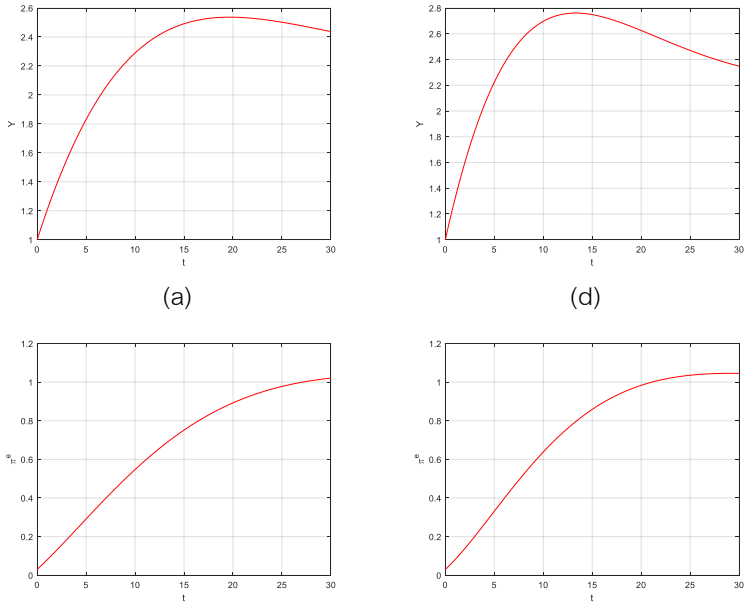
(c) (f)

g = 0.1, τ_c =3 , τ_i =3 g = 0.1, τ_c =0.3, τ_i =3

Figure 3: Sensitivity analysis of the consumption tax. (τ_c)

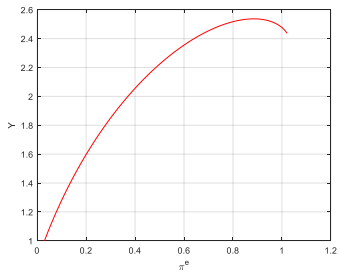
Source: Authors' simulation

Figure 2 presents a sensitivity analysis of the consumption tax. The analysis explores how varying the consumption tax rate affects the economy's income and expected inflation. As the consumption tax rate increases, the simulation results indicate a decrease in national income. This outcome is consistent with the theoretical expectation that higher consumption taxes reduce disposable income, leading to lower consumer spending and, consequently, a decline in aggregate demand. Lower consumer spending dampens economic activity, resulting in reduced income levels. Furthermore, the analysis reveals that changes in the consumption tax rate also impact expected inflation. Higher consumption taxes can lead to lower inflationary pressures due to the reduced demand for goods and services. Conversely, reducing the consumption tax rate stimulates consumer spending, boosting aggregate demand and potentially increasing national income and inflation.



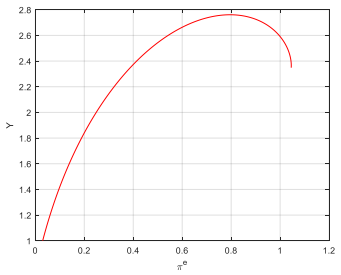
(a) (d)

(b) (e)



(c)

g = 0.1, τ_c =3 , τ_i =3



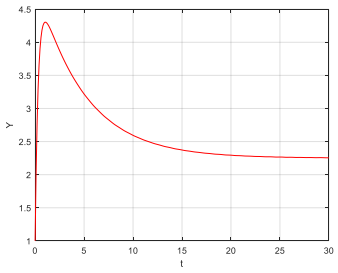
(f)

g = 0.1, τ_c =3 , τ_i =0.3

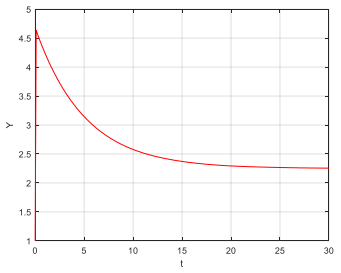
Figure 4: Sensitivity analysis of the capital investment tax. (τ_i)

Source: Authors' simulation

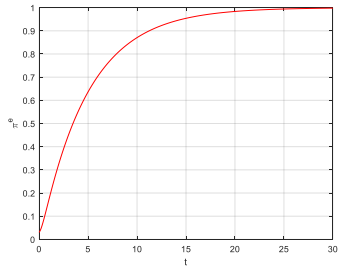
Figure 3 presents a sensitivity analysis of the capital investment tax. The analysis examines how varying capital investment tax rate influences the economy's income and expected inflation. The simulation results indicate that national income increases as the capital investment tax rate decreases. This result aligns with the theoretical expectation that lower investment taxes reduce firms' capital costs, encouraging more investment in productive activities. Increased investment boosts aggregate demand and economic output, increasing national income. Furthermore, the analysis shows that capital investment tax rate changes also affect expected inflation. Lower investment taxes can stimulate economic activity, increasing demand for goods and services, which results in higher inflation. Conversely, higher capital investment taxes can dampen investment, reduce economic activity, and lower inflation.



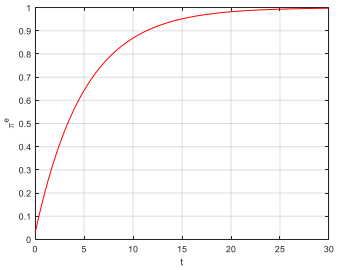
(a)



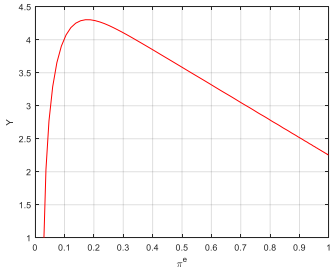
(d)



(b)

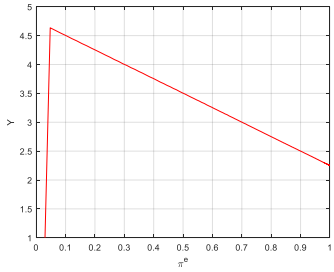


(e)



(c)

g = 0.05, τ_c =0.085, τ_i =0.085



(f)

g = 0.1, τ_c =0.085, τ_i =0.085

Figure 5: Sensitivity analysis of the marginal propensity of government spending (g) assuming tax levels that do not affect national income

Source: Authors' simulation

Figure 4 presents a sensitivity analysis of the marginal propensity of government spending (*g*), assuming that tax levels do not affect national income. The analysis demonstrates how variations in g impact the economy's income and expected inflation under the condition that taxes remain neutral in their effect on national income. The simulation results indicate that as *g* increases, national income rises correspondingly. Additionally, the results reveal that higher g values do not precisely lead to increased inflationary pressures. This sensitivity analysis emphasizes the importance of government spending as a tool for economic policy.

5. Discussion

A key finding from the study is the positive correlation between increased government spending and national income, a result that aligns closely with Keynesian economic theory. Keynesianism posits that government intervention through fiscal policy is essential for stimulating aggregate demand, especially during periods of economic downturn. The sensitivity analysis shows that as the marginal propensity of government spending (g) increases, national income rises proportionately. This outcome supports the Keynesian argument that government expenditure, lifting by g, can be a potent tool for reducing unemployment and spurring economic activity by injecting resources into the economy (Hemming et al., 2002). However, the results also indicate that increased government spending can lead to inflationary pressures, a finding consistent with the Keynesian critique of prolonged use of expansionary fiscal policies. Excessive government spending may create excess demand, which could outstrip supply and increase prices, as seen in this study's model simulation. This dual effect, i.e., boosting income while increasing inflation highlights the necessity for carefully calibrated fiscal interventions to avoid overheating the economy.

The study also investigates the impact of consumption and investment taxes on economic outcomes. The sensitivity analysis demonstrates that higher consumption taxes reduce national income by dampening consumer spending and lowering aggregate demand. This finding resonates with supply-side economic theory, which argues that lower taxes on consumption and investment can incentivize consumer spending and business investment, thereby promoting long-term economic growth (Canlas, 1986). Moreover, the study finds that higher consumption taxes reduce inflationary pressures by curbing demand for goods and services. This inverse

relationship between consumption taxes and inflation underlines the complex trade-offs that policymakers face when designing tax policies. While reducing taxes can stimulate economic activity and income, as evidenced by the simulation, it also risks exacerbating inflation if not carefully managed. This aligns with empirical findings from Railavo (2003), who argued that including supply-side channels in economic models restricts fiscal policy parameters necessary for stability, leading to persistent inflation and output responses. On the investment side, the study's results suggest that lowering capital investment taxes increases national income by reducing the cost of capital for firms, encouraging investment in productive activities. This finding supports the classical economic view that investment is a key driver of long-term economic growth. However, the results also reveal that lower investment taxes can stimulate inflationary pressures, illustrating the delicate balance policymakers must strike between fostering economic growth and managing inflation.

The findings of this study provide empirical support for both Keynesian and neoclassical economic perspectives. While confirming Keynesian principles about the effectiveness of government intervention in stimulating national income through fiscal policy, the results also validate neoclassical predictions about market self-correction mechanisms. Specifically, the analysis demonstrates that though government interventions initially impact economic variables, the money market and price mechanisms automatically adjust to these interventions, working to restore equilibrium. Specifically, from a Keynesian perspective, government spending is shown to be a highly effective tool for stimulating demand, especially during economic downturns. This supports the notion that fiscal policy can act as a crucial stabilizer in times of recession, as seen in the study by Zheng et al. (2023), which demonstrated that fiscal stimulus played a pivotal role in China's recovery during the global financial crisis. Conversely, the neoclassical view that markets naturally correct themselves with minimal government intervention partially supports the study’s results. However, different economic contexts require tailored fiscal interventions to address their specific challenges and promote sustainable growth. Developing economies that face high poverty and inequality benefit significantly from targeted government spending on public infrastructure, education, and health services. These investments serve multiple purposes as they create immediate economic stimulus while building long-term capacity through enhanced human capital and improved productivity. Emerging market economies that struggle with high inflation require a different approach focused on prudent fiscal management. These economies need to implement strict controls on government spending while simultaneously developing strategies. Economies experiencing high unemployment levels require fiscal interventions that specifically target job creation and workforce development. These interventions often take the form of carefully designed fiscal stimulus packages. Such focused fiscal measures generate immediate employment opportunities while stimulating aggregate demand throughout the economy.

6. Policy Implication

The analysis yields critical implications for using fiscal policy tools to manage economic performance. Our sensitivity analysis of the marginal propensity of government spending indicates that increased spending can enhance national income. This suggests that during economic downturns or periods of sluggish growth, policymakers should consider expanding government expenditure on infrastructure, social programs, and

public projects to stimulate demand and drive economic recovery. However, our findings also reveal that higher government spending can intensify inflationary pressures, requiring policymakers to balance stimulative effects against inflation risks while ensuring targeted and efficient spending allocation.

Our analysis demonstrates that higher consumption taxes diminish consumer spending and national income. This finding cautions policymakers against raising consumption taxes, as such measures can suppress economic activity and reduce aggregate demand. The sensitivity analysis of capital investment tax emphasizes the importance of private investment in driving economic growth. Lower capital investment taxes reduce firms' capital costs, promoting investment in productive activities and increasing national income. However, policymakers must balance tax reductions against the imperative of maintaining adequate public revenues.

Based on these results, we propose specific policy recommendations for varying economic conditions:

In Recessionary Economies:

- Strategically increase government spending propensity, particularly in productive sectors such as infrastructure and human capital development
- Reduce capital investment and consumption taxes to preserve aggregate demand during recovery

In Inflationary Environments:

- Implement more restrictive fiscal policy
- Carefully control and target government spending by adjusting its marginal propensity
- Consider increasing consumption taxes to moderate demand and contain inflation
- Cautiously adjust capital investment taxes to avoid constraining productive capacity, which could trigger supply-side inflation

In Stagflation Scenarios:

- Adopt a balanced approach combining targeted government spending with prudent tax policy
- Focus government expenditure on productivity-enhancing investments that address both stagnation and inflation simultaneously
- Fine-tune tax policies to support productive investment while managing aggregate demand

7. Future Research

Future research should explore several avenues to deepen the understanding of fiscal policy impacts on economic performance. Firstly, extending the analysis to include open economy models would provide insights into how international trade and capital flows influence the effectiveness of fiscal policies. Additionally, incorporating the role of monetary policy alongside fiscal measures could help elucidate the interplay between interest rates, money supply, and government spending.

8. Conclusion

Fiscal policy plays a crucial role in economic growth and development, with impacts varying across countries and contexts. It serves both immediate economic stabilization and long-term development objectives.

This research explored fiscal policy dynamics within a closed economy through the AD-AS framework using model simulation methods, motivated by the framework's analytical capabilities.

Our study examined the effects of three fiscal policy tools on national income and expected inflation: the marginal propensity of government spending, consumption tax, and investment tax. The sensitivity analysis of government spending propensity revealed its potent role in stimulating economic growth, demonstrating that increased government spending directly enhances national income. However, our findings also indicated a corresponding rise in inflationary pressures, highlighting the necessity for balanced and targeted fiscal interventions.

Analysis of consumption taxes demonstrated their significant influence on disposable income and consumer spending. Higher consumption taxes reduced national income by curtailing consumer expenditure and dampening aggregate demand. Conversely, lower consumption taxes stimulated economic activity by increasing disposable income and boosting consumer confidence.

The investment tax sensitivity analysis highlighted its critical impact on private investment and economic growth. Lower investment taxes increased national income by reducing firms' capital costs and encouraging investment in productive activities. While our results suggest that increasing government spending and strategically reducing taxes can stimulate economic growth, these measures require careful management to avoid excessive inflation and maintain fiscal responsibility.

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