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THE IMPACT OF CONSUMPTION TAXES ON THE MACROECONOMIC POLICY MIX: DSGE MODEL WITH FINANCIAL FRICTIONS

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Abstract. The paper captures the effects of a fiscal policy shock on the macroeconomic environment in Romania, using a Dynamic Stochastic General Equilibrium (DSGE) model with financial accelerator, using country specific data for the period 2011–2023. The recent reliance on higher consumption taxes as a primary tool for reducing Romania's budget deficit highlights the need to assess their macroeconomic consequences. A consumption tax demand shock, representing a 1 percent increase relative to the steady-state level, is expected to reduce economic activity by approximately 0.2 percent in the presence of financial frictions. The significant differences between scenarios with and without a financial accelerator highlight the importance of financial stability policies aimed at increasing the economy's resilience to adverse shocks. Moreover, effective coordination among macroeconomic policies is essential in an environment characterized by overlapping and recurrent crises.

1. Introduction

Recent fiscal consolidation efforts and recurring episodes of tax reform have renewed interest in understanding the macroeconomic consequences of increases in taxation. Governments often view indirect taxes as comparatively stable revenue instruments, yet their short- and medium-term effects on aggregate activity remain subject to debate. Empirical evidence documents that consumption tax hikes can generate sizable fluctuations in output, consumption, investment, and inflation, but the magnitude and persistence of these dynamics vary across episodes and policy environments. This variability underscores the need for a rigorous, model-based evaluation of how tax shocks propagate through the macroeconomic environment.

In Romania, one of the most important topics of debate currently is related to the need to create fiscal space, so that the state could cope with increasing spending needs, such as those related to investments, defense, digitalization, or climate change. The need for fiscal consolidation and increasing public budget revenues, which are among the lowest in the EU (approximately 28% in 2025), is reinforced by the completion of the funds from the National Recovery and Resilience Plan in 2026. Another worrying factor for which fiscal consolidation is essential is related to the rapid increase in public debt, which is currently around the 60% limit of GDP, compared to a level of 35% before the start of the Pandemic.

The model presented in this paper can be useful for policymakers because it tries to estimate the impact of consumption tax shock on macroeconomic variables. The presence of financial accelerator model can help understand the implications for both macroeconomic dynamics and economic policy, particularly in understanding crisis episodes, the transmission of monetary policy, and the role of financial regulation. This mechanism explains why recessions linked to financial stress are typically deeper and longer-lasting, even when the initial shock is moderate. Through model-based simulations, this paper quantifies the transmission of indirect tax

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increases to key macroeconomic variables, including output, inflation, consumption, and investment. The analysis is particularly relevant in the current context, as Romania has entered a fiscal consolidation phase in which increases in consumption taxes have become one of the primary instruments for reducing the budget deficit. As such, the study provides timely evidence on the macroeconomic trade-offs associated with fiscal adjustment measures.

Furthermore, the financial accelerator magnifies shocks, it justifies the use of macroprudential regulation to limit excessive amplification. Macroprudential instruments that can limit excessive propagation of risk to the economy could be capital buffers (especially CCyB or SyRB) or borrower-based measures. Moreover, the interactions between monetary and macroprudential policy in an environment marked by the action of fiscal risks can give us hints on how the three policies interact.

The remainder of the paper is structured as follows. Section 2 provides a review of the literature on DSGE models incorporating financial accelerators and fiscal policy. Sections 3 and 4 present the model and describe the parameter calibration procedure. Section 5 reports the model simulations and analyzes the effects of different types of shocks on the macroeconomic environment. Finally, Section 6 concludes.

2. Literature Review

One of the most important contemporary debates concerns how governments should conduct optimal fiscal policy, particularly with respect to taxation levels and the structuring of public administration aimed at rationalizing public expenditure, to generate the highest possible output and maximize social welfare. Identifying the optimal policy mix remains a central issue in macroeconomic policy design, and DSGE models constitute useful tools for simulating the effects of taxation and government spending shocks on the economy.

The literature on fiscal stimulus, the use of such policies to rebalance economic conditions following recessions, and the role of financial markets in shaping current macroeconomic dynamics is analyzed for the United States by Fernández-Villaverde (2010). Macroeconomic variables are highly interconnected, and the role of the state becomes particularly relevant during crisis episodes. By fiscal policy instruments, governments may support the reversion of economies toward stable growth paths. This process is grounded in the analysis of business cycles and the implementation of policies aimed at maintaining macroeconomic equilibrium, ensuring the capacity of the economy to absorb adverse shocks over time.

The real business cycle (RBC) framework is examined by Galí (2007), who seeks to establish the relationship between monetary policy, business cycles, and inflation. DSGE models represent the core methodological framework for evaluating RBC theory, as they formalize behavioral relationships such as households' utility maximization and firms' profit maximization under technological constraints. The quantitative analysis of RBC theory is typically grounded in three main dimensions: the efficiency properties of business cycles, the role of technology-driven shocks in explaining fluctuations, and the limited effectiveness of monetary factors in driving real economic activity.

An analysis of fiscal and monetary interactions within a small open economy DSGE framework is provided by Çebi (2012) for the case of Turkey. The results indicate that fiscal policy plays an important role in debt stabilization; however, no empirical evidence is found regarding its effectiveness in stabilizing the output gap. This suggests that the Turkish government exhibits limited capacity to offset business cycle fluctuations through discretionary fiscal interventions.

For Japan, Iwata (2009) emphasizes the importance of the tax-rule structure in assessing fiscal policy effectiveness, showing that fiscal interventions are more effective when labor-distorting taxes are kept at relatively low levels. This mechanism operates through stronger incentives for labor market participation and productivity growth. This finding is particularly relevant in the context of Japan's ageing population, where maintaining competitiveness in the global labor market represents a structural challenge.

The DSGE model developed by Copaciu et al. (2017) constitutes one of the most comprehensive frameworks estimated for the Romanian economy, incorporating structural features specific to an emerging and partially euroized economy. Building on the benchmark model of Christiano et al. (2011), the authors introduce partial euroization in the financial sector, oil as a production input, a decomposition of inflation into administered and core components, and a more detailed treatment of national accounts. Their results highlight the importance of balance sheet effects in shaping macroeconomic dynamics. Specifically, following a risk premium shock that induces exchange rate depreciation, output contracts as the negative balance sheet effects on entrepreneurs, who are exposed to foreign currency liabilities, dominate the standard expansionary effects of depreciation. The model further indicates that external shocks are a key driver of domestic fluctuations, consistent with Romania's high degree of openness and financial integration. Through extensive validation procedures, including impulse response analysis, variance decomposition, historical decomposition, and forecasting exercises, the authors demonstrate that the model replicates key empirical regularities and provides a consistent framework for policy analysis.

The study by Bobașu and Murarașu (2021) shows that fiscal and monetary policies in Romania are strongly interdependent, with the effectiveness of fiscal actions being conditional on the monetary policy stance. DSGE-based estimates indicate that fiscal expansions generate stronger and more persistent effects on output under accommodative monetary conditions, while a restrictive monetary stance significantly attenuates these effects. The authors further highlight the central role of public debt in determining policy effectiveness. When public debt exceeds approximately 60 percent of GDP, the economy becomes more vulnerable to adverse shocks, fiscal multipliers decline, and the sustainability of fiscal interventions weakens. Simulation results indicate that elevated debt levels not only restrict fiscal space for countercyclical policy but also amplify macroeconomic vulnerabilities. Overall, fiscal policy in Romania cannot be evaluated independently of monetary conditions and debt dynamics, which jointly determine medium-term macroeconomic stability.

Another DSGE framework is proposed by Stähler and Thomas (2012), who develop a two-country monetary union model. This framework allows for the analysis of two key dimensions: first, spillover effects of fiscal expansions across member countries, and second, the implications of disaggregating public expenditure components. The first channel provides insights into the interdependence of countries within a monetary union and the role of fiscal policy in influencing competitiveness, foreign direct investment, and welfare outcomes.

Regarding fiscal multipliers and output responses during recessions, Auerbach and Gorodnichenko (2010) derive three main results. First, using regime-switching models, fiscal policy is shown to be significantly more effective during recessions than during expansions. Second, the largest multipliers are associated with military spending. Third, controlling for the predictable component of fiscal shocks leads to higher estimated multipliers in recessionary regimes.

Additional evidence on fiscal stabilization is provided by Blanchard et al. (2012), who argue that prior to the financial crisis, macroeconomic stabilization was largely attributed to monetary policy. However, post-crisis evidence demonstrates that fiscal policy also plays a significant stabilizing role by mitigating aggregate demand shocks. A further key implication is the necessity for maintaining sufficient fiscal space, enabling governments to implement countercyclical fiscal expansions during downturns and consolidation during periods of expansion.

An important component of the model presented in this paper is the incorporation of the financial accelerator mechanism, which serves as a propagation channel that amplifies the effects of shocks throughout the economy. Originally theorized by Townsend (1979), this mechanism was formally developed in the Bernanke et al. (1999) framework, where financial frictions play a central role in amplifying and propagating macroeconomic fluctuations.

3. Methodology – DSGE Model

The model employed in this paper is the Bernanke et al. (1999) (BGG) framework, extended to incorporate fiscal and budgetary policy in a closed-economy setting calibrated for Romania. The model is designed to analyze the effects of fiscal shocks and their transmission to aggregate output. It examines how changes in taxation affect each sector of the economy and their respective contributions to macroeconomic dynamics. The model includes six representative sectors: households, banks, entrepreneurs, capital producers, retailers, and the government, all of which are modeled as optimizing agents.

A central feature of the framework is the financial accelerator mechanism, adapted to the structure of the model. The financial accelerator operates through the external finance premium, which is specified as a function of firms' financial leverage, defined as the ratio of debt to equity.

The model structure is further characterized by the interaction of all sectors, which will be explicitly detailed in the subsequent section. The government sector plays a key role, as it sets the tax policy instruments that generate fiscal shocks, allowing the analysis of their transmission to macroeconomic aggregates. The model is solved under the assumption that all agents behave as intertemporal optimizers, leading to the derivation of first-order conditions that define optimal decision rules. Following this, the steady state of the model is computed, and the system is log-linearized around the steady state to obtain a tractable representation of the equilibrium dynamics.

Finally, the model is calibrated based on standard values from the literature, and stochastic simulations are conducted to evaluate the effects of various shocks on the Romanian economy.

3.1. **Households.** This sector works, supplies the entrepreneurs with work force, consumes, holds money, and invests the savings resulted from the wage they receive in exchange for their working ability. The household's objective is to maximize utility, which is given by:

$$\max U^{\text{intertemporal}} = E_t \sum_{s=0}^{\infty} \beta^s \left\{ \log\left(C_t - hC_{t-1}\right) - \psi \frac{H_t^{1+v}}{1+v} \right\} \tag{1}$$

Where C_t represents consumption at moment t, H_t is the labour supply from households, h represents the consumption habits of households, β is the discount factor and ψ represents a corrective coefficient of relative importance for labor.

For households we must take into consideration also the budget constraint for period t, which is given by the following equation:

$$\left(1+\tau_{c,t}\right) C_t + \frac{B_t}{\Pr_t} + \frac{D_t}{\Pr_t} = \left(1-\tau_{l,t}\right) W_t H_t + R_{t-1}^n \frac{B_{t-1}}{\Pr_t} + Rd_{t-1}^n \frac{D_{t-1}}{\Pr_t} + \Pr_t \tag{2}$$

For this we assume that: B_t represent bank securities, r_t represent the interest rate for bank securities and $R_t = 1 + r_t$, D_t is nominal public debt, rd is the interest rate for the government debt and $Rd_t = 1 + rd_t$. $\tau_{c,t}$ is the tax rate on consumption, $\tau_{l,t}$ is the tax rate on labour, W_t is the wage received at time t, H_t represents the labor supply from households and $\Pr_t$ is the profit from households.

3.2. **Entrepreneurs.** Wholesales firms (entrepreneurs) have as main objective the maximization of gross operating coefficient in real value, in an intertemporal environment under the technological constraints imposed by capital accumulation and the presence of investment adjustment costs.

The activity of capital producers is internalized, and it influences the model directly through its implications over the production firms.

Same as the BGG model, we assume that firms have a probability of surviving for the next period γ, implicit a survival time in the market of $\frac{1}{1-\gamma}$. This hypothesis is done to include the phenomenon of finite lifetime for entrepreneurs, and the possibility that they will be able

to self-finance their activity in the future. Their performance can be measured by their level of net worth accumulated, which comes from two sources: own profits gained from previous investment process and income from supplying labor.

Net worth is of crucial importance for this micro-block because it affects the external finance premium, and the cost of borrowing. As far as a firm has its own resources, they can borrow money at a lower cost but also can increase the degree to which the firm is self-financed, mitigating the agency problems.

For our model, we assume that entrepreneurs buy capital to use it in subsequent periods, in combination with labor to produce output. We write the aggregate production function as follows:

$$Y_t = A_t \times K_t^{\alpha} \times L_t^{1-\alpha} \tag{3}$$

Where Y_t represents aggregate output of wholesale goods, K_t is the capital purchased by entrepreneurs in period $t-1$, L_t is labour input and A_t is a parameter that measures the level of technologisation in the firm.

For operating in the business market, entrepreneurs must possess an amount of initial net worth, and as in literature, we suppose that entrepreneurs supplement their income by working in general labor market. Then, the labor input is a composite of labor from households H_t, and entrepreneurs labor H_t^e, and the equation is the following:

$$L_t = H_t^{\Omega} \times H_t^{e(1-\Omega)} \tag{4}$$

From equations (3) and (4), if H_t^e is normalized to 1, we obtain the following form for the production function:

$$Y_t = A_t \times K_t^{\alpha} \times H_t^{\Omega(1-\alpha)} \tag{5}$$

We denote I_t the investment expenditures done by the wholesale firms in period t, K_t is the capital of the firm in period t, and δ is the depreciation rate of capital. The process of capital accumulation will be captured in the model as follows:

$$K_{t+1} = I_t + (1-\delta) \times K_t \tag{6}$$

For the equation of net worth accumulation we will denote N_{t+1} the net worth at the end of period t, W_t^e entrepreneur's wage resulted from the participation in the labor market, V_t is the profit obtained by the firm in period t, which has the following form:

$$V_t = R_t^K \times Q_{t-1} \times K_t - (R_{t-1} + EFP_{t-1}) \times (Q_{t-1} \times K_t - N_t) \tag{7}$$

$R_t^K \times Q_{t-1} \times K_t$ represents the profit resulted from capital usage in period t and $Q_{t-1} \times K_t - N_t$ is the payment of debt to banks. Then, the net worth has the following formula:

$$N_{t+1} = \gamma_f \times (V_t + W_t^e) \tag{8}$$

The resulted profit, V_t, has a contribution to the net worth accumulation with a probability γ_f, given by the probability that firm will remain in the market, observed from one period to another.

If the firm goes out of the market, then it will consume all its remaining resources:

$$C_t^E = \frac{1-\gamma_f}{\gamma_f} \times N_{t+1} \tag{9}$$

Where C_t^E represents the consumption of entrepreneurs that will go out of the market.

We assume that there are increasing marginal adjustment costs in the production of capital, which we capture by assuming that aggregate investment expenditures of I_t yield a gross output of new capital goods $\Phi(I_t, K_t)$, where Φ is increasing and concave and $\Phi(0) = 0$. We include adjustment costs to permit a variable price of capital. As in Kiyotaki and Moore (1997), the

idea is to have asset price variability contributing to volatility in entrepreneurial net worth. In equilibrium, given the adjustment cost function, the price of a unit of capital in terms of the numeraire good, Q_t, is given by:

$$\text{Investment adjustment cost} = \Phi(I_t, K_t) = \frac{\theta}{2} \times \left(\frac{I_t}{K_t} - \delta\right)^2 \times K_t \tag{10}$$

For introducing in the model the price differentiation, is necessary to make a distinction between prices of entrepreneurs (P^W) and prices of retailers (P).

If there has been made a clear distinction between the prices for entrepreneurs and retailers, earnings before interest and taxes in nominal value, which is defined as revenues minus expenses, without interest and taxes, and is a measure of a firm's profitability will take the following form:

$$\begin{aligned} EBIT_{t+k} = {} & \frac{P^W_{t+k}}{P_{t+k}} \times A_{t+k} \times K^{\alpha}_{t+k} \times L^{1-\alpha}_{t+k} - W_{t+k} \times H_{t+k} - W^e_{t+k} \times H^e_{t+k} \\ & - \frac{P_{t+k}}{P_{t+k}} \times I_{t+k} + \frac{\theta}{2} \times \left(\frac{I_{t+k}}{K_{t+k}} - \delta\right)^2 \times K_{t+k} \end{aligned} \tag{11}$$

Where $\frac{\theta}{2} \times \left(\frac{I_{t+k}}{K_{t+k}} - \delta\right)^2 \times K_{t+k}$ represents the adjustment costs in real terms, and for the future notations, $\frac{P^W_{t+k}}{P_{t+k}} = \frac{1}{\mu_{t+k}} = \rho_{t+k}$, which represents the margin applied by retailers. Applying Lagrange formula to identify the optimum price of capital in real value (Q_t), we obtain:

$$\begin{aligned} L = {} & E_t \sum_{k=0}^{\infty} \frac{1}{\prod_{j=1}^{k} R^k_{k+j}} \times \Big\{ \rho_{t+k} \times A_{t+k} \times K^{\alpha}_{t+k} \times L^{1-\alpha}_{t+k} - W_{t+k} \times H_{t+k} \\ & - W^e_{t+k} \times H^e_{t+k} - \left[I_{t+k} + \frac{\theta}{2} \times \left(\frac{I_{t+k}}{K_{t+k}} - \delta\right)^2 \times K_{t+k} \right] \\ & + Q_{t+k} \times \left[I_{t+k} + (1-\delta) \times K_{t+k} - K_{t+k+1} \right] \Big\} \end{aligned} \tag{12}$$

Where Q_{t+k} is a Lagrange coefficient associated with the accumulation of capital, which takes into consideration the costs that are necessary for obtaining one unit of capital. After solving the FOC equations we obtain that the price of capital in real value has the following formula at optimum:

$$Q_t = 1 + \theta \times \left(\frac{I_t}{K_t} - \delta\right) \tag{13}$$

Real adjustment cost being already included in defining price Q, they will be ignored in the derivative of Lagrange function with respect to the quantity of capital in period $t+1$, as follows:

$$\frac{\partial \mathcal{L}}{\partial K_{t+1}} = 0, \qquad E_t\left(R^K_{t+1}\right) = \frac{\rho_{t+1} \times \alpha \times \frac{Y_{t+1}}{K_{t+1}}}{Q_t} + \frac{(1-\delta) \times Q_{t+1}}{Q_t} \tag{14}$$

Internalization of the activity of capital producers should affect interest rate for capital, but only indirect.

3.2.1. *Financial Accelerator.* The financial accelerator represents a transmission mechanism that could amplify the effects of different shocks to the rest of the economy, compared to an economy with perfect financial market. This concept was first theorized by Townsend (1979) and was named "Costly state verification" and was used also in the BGG baseline financial accelerator model. It appears as problem of asymmetric information between lender and borrower because the borrower has private information about his performance and lender should pay a monitoring cost to obtain this information. This verification is important mainly when

the borrower declares bankruptcy, and cannot repay the loan, and it depends mostly on the probability that the firm will default. The cost of external finance premium has a negative relation with the financial situation of the firm. The presence of monitoring costs justifies the presence of external finance premium (the cost of external finance is higher than the cost of internal finance).

The function that defines the external finance premium in our model is:

$$EFP_t = \frac{E_t\left(R^K_{t+1}\right)}{R_t} \tag{15}$$

After log-linearization of this equation, the external finance premium can be defined as the difference between the financing cost and the risk-free rate.

As mentioned before, the external finance premium depends on the financial performance of the firm, mainly by the financial leverage of the firm, which has the following formula:

$$\frac{Q_t \times K_{t+1}}{N_{t+1}} = \frac{N_{t+1} + B_t}{N_{t+1}} = 1 + \frac{B_t}{N_{t+1}}$$

where B_t represents the level of debt accumulated by the firm.

We can take the conclusion, that external finance premium is a function that depends on the price of capital in real value in period t, the quantity of capital in period $t+1$, and the net worth of the firm in period $t+1$.

3.3. **Retailers.** The inclusion of retailers in the model ensures the presence of price stickiness and nominal rigidities, consistent with the standard DSGE literature. Retailers purchase wholesale goods from entrepreneurs and redistribute them to households, the government, and capital producers. Unlike the other sectors, households are influenced by retailers through consumption habits formation, implying that retailers indirectly shape households' consumption preferences and demand patterns.

The distinction between entrepreneurs and retailers is necessary to introduce price-setting agents into the model and, consequently, allow for price differentiation. To incorporate price stickiness and nominal rigidities, the model follows the Calvo (1983) pricing framework:

$$\pi_t = \beta \times E_t\left[\pi_{t+1}\right] + \frac{(1-\varphi) \times (1 - \varphi \times \beta)}{\varphi} \times \rho_t \tag{16}$$

Where π_t represents the inflation in period t, and is obtained from Fischer equation for real interest rate:

$$1 + R_t = \frac{1 + R_{pm\,t}}{1 + E_t\left[\pi_{t+1}\right]} \tag{17}$$

$R_t = 1 + r_t$, and r_t is the real interest rate at time t, $R_{pm\,t} = 1 + r_{pm\,t}$, $r_{pm\,t}$ is monetary policy interest rate at time t, which is fixed by the central bank, which has as mains objectives the stabilization of inflation and output. For capturing this, we have introduce in the model the parameters: β_0, which reflects the movement in the monetary policy interest rate from one period to another, β_1, which reflects the movements in inflation from one period to another, and β_2, which captures the fluctuations in output, and also ε_{rpm} which represents the monetary policy shock. After presenting this, the monetary policy interest rate will take the following form:

$$r_{pm\,t} = \beta_0 \times r_{pm,\,t-1} + (1 - \beta_0) \times (\beta_1 \times \pi_t + \beta_2 \times Y_t) + \varepsilon_{rpm} \tag{18}$$

3.4. **Banks.** Banks are responsible for reallocating funds from surplus agents, namely households that save through deposits, to deficit agents, namely entrepreneurs that use these resources for investment purposes. In the model, banks play an intermediary role, facilitating financial intermediation and enabling entrepreneurs to benefit from economies of scale in the investment process.

3.5. **Government.** The government conducts fiscal policy by setting the tax rates applied to households and finances its activity through a lump-sum budget mechanism. Government expenditure is constrained both by intertemporal budget limitations and by the fiscal rules imposed at the European level, namely maintaining the budget deficit below 3% of GDP and public debt below 60% of GDP. The government budget constraint is given by the following equation:

$$\frac{D_t^n}{P_t} = G_t - Tax_t + R_{t-1} \times \frac{D_{t-1}^n}{P_t} \tag{19}$$

The variables used are: D_t^n public debt in nominal value at time t, G_t government spending at time t, Tax_t the value of taxes collected by the government at time t, $G_t - Tax_t$ represents the primary deficit of the government and $R_{t-1} \times \frac{D_{t-1}^n}{P_t}$ is the public debt registered in period $t-1$. For the real value of public debt, we divide the nominal value (D_t^n) to inflation registered in period t, π_t. For our analysis, we used the public debt as percentage in GDP, and we divided each factor from equation 21 to Y_t.

The total number of taxes from the economy is composed of consumption and labor one, having the described structure:

$$Tax_t = \tau_{C,t} \times C_t + \tau_{L,t} \times W_t \times H_t \tag{20}$$

$\tau_{C,t}$ tax rate on consumption and $\tau_{L,t}$ tax rate on labor. To introduce the shocks that influence the level of taxation, we use:

$$\tau_{C,t} = \tau_{C,t-1} \times \rho_{\tau_C} + \varepsilon_{\tau_C},$$

where ρ_{τ_C} an autoregressive coefficient for consumption taxes and ε_{τ_C} is the shock introduced on consumption taxes.

$$\tau_{W,t} = \tau_{W,t-1} \times \rho_{\tau_W} + \varepsilon_{\tau_W},$$

where ρ_{τ_W} is an autoregressive coefficient for labor taxes, and ε_{τ_W} is the shock introduced on labour taxes.

We introduce the impact of technological shock in the economy by the following form:

$$A_t = \rho_A \times A_{t-1} + \varepsilon_A,$$

and ρ_A represents an autoregressive coefficient of the technological factor, and ε_A is the technological shock from the economy.

Government spending is introduced in the model by the following equation:

$$G_t = \rho_G \times G_{t-1} + \rho_{G_D} \times D_{Y_t} + \varepsilon_{G,t},$$

where ρ_G is an autoregressive coefficient for government spending, ρ_{G_D} is an autoregressive coefficient for government debt from the previous period, D_{Y_t} is public debt and $\varepsilon_{G,t}$ is the shock for public expenditure.

3.6. **General Equilibrium Conditions.** For this part of the paper, two general equilibrium conditions must be satisfied: equilibrium in the labor market, where labor demand from firms equals labor supply from households, and equilibrium in the goods and services market. The equation describing labor supply from households is derived from the first-order conditions obtained from the households' optimization problem.

$$\frac{\delta L}{\delta H_t} = 0, \qquad \psi \times H_t^v = (1 - \tau_{L,t}) \times W_t \times \lambda_t$$

The equation for demand of labor coming from firm has resulted from FOC applied at the level of enterprise and has the following form:

$$\frac{\delta L}{\delta H_t} = 0, \qquad \rho_t \times \Omega \times (1 - \alpha) \times \frac{Y_t}{H_t} = W_t$$

At equilibrium by equalizing the two equations, we obtain:

$$\psi \times H_t^v = (1 - \tau_{L,t}) \times \rho_t \times \Omega \times (1 - \alpha) \times \frac{Y_t}{H_t} \times \lambda_t \tag{21}$$

The equilibrium on the markets of goods and service is obtained by the following equation:

$$Y_t = C_t + I_t + G_t + C_t^e \tag{22}$$

Where Y_t is total output of the economy in period t, C_t is the consumption in period t, I_t represents the investments made in period t, G_t is the government spending and C_t^e represents the consumption of firms that are out of the market. This equation is done for a model of closed economy that does not have external influences considered for output.

The inflation measured in the form of consumer price index was introduced in the model according to the following equation:

$$\pi_{t,CPI} = \pi_t + \tau_{C,t} - \tau_{C,t-1} + \varepsilon_{\tau_C} \tag{23}$$

4. Model Calibration

In this part we have calibrated the model after the Romanian fiscal conditions but maintaining the original calibration for the financial accelerator. The calibrated parameters for Romania's fiscal conditions are taken from the paper of Copaciu et al. (2017).

Several parameters are calibrated, being kept fixed through the estimation, these parameters are explained and have the values in Table 1. To solve the steady state, we have the steady state equations that are explained in Table 2.

For the calibration of the tax rates, it was used the same method as in Copaciu et al. (2017), taking the mean for the implicit tax rates on consumption and labor, 2011–2023, Taxation Trends Report (2025). The average implicit tax rate on consumption for the period under analysis was 16%, and was calibrated at a value of 0,16, and the average for the implicit tax rate on labor was 31,4%, which was calibrated at a value of 0,32.

5. Model Simulations

In this section, the potential changes in the economy are analyzed in response to the introduction of four types of shocks: a technology shock, a monetary shock, a government spending shock, and a consumption tax shock, both with and without the financial accelerator mechanism (Figure 1).

A technological shock increases value added, strengthening firms' competitiveness and raising output and profits. Higher profitability improves firms' net worth, enabling higher wages and/or investment in higher-quality production. At the same time, technological adoption may

Table 1. Calibration

Parameter	Explanation	Value
Ω	Entrepreneurs labor	0,99
α	Capital share in production	0,35
β	Discount factor	0,99
δ	Depreciation rate of capital	0,049
θ	As in BGG, $\theta \times \delta = 0,49$, correspondent for price elasticity of capital in connection with investment over capital	10
v	Inverse Frisch elasticity	2,5
ρ_G	Persistence parameter in government expenditures	0,5
ρ_A	Persistence parameter for technological factor	1
β_0	Taylor lagged interest rate	0,8
β_1	Taylor inflation	1,1
β_2	Taylor output	0
γ_f	Entrepreneurial survival rate	0,932
Ψ	Correction coefficient, of relative importance for labor	0,06
φ	From Calvo: the part of firms which are not revising their prices within the period	0,75
τ_C	Tax rate on consumption	0,16
τ_W	Tax rate on labor	0,32
ρ_{τ_C}	Autoregressive coefficient for consumption	0,8
ρ_{τ_W}	Autoregressive coefficient for labor	0,8
ρ_{G_D}	Autoregressive coefficient for government debt	0,05
h	Consumption habits of households	0,38
D_{Y_t}	Public debt as percentage in GDP	0,01

Source: calibration based on the literature.

Table 2. Steady State ratios

Ratio	Value
Government spending as % in GDP	0,16
Net wealth as % in capital	0,5
Real interest rate	$1/\beta$
Capital return	Real interest rate $+ 0,05$
Output/capital	(Capital return − (1 − depreciation rate of capital)) / (capital share in production / mark-up)
Capital as % in GDP	(Capital share in production / mark-up) / (capital return − (1 − depreciation rate of capital))
Entrepreneurs' consumption as % in GDP	(1 − entrepreneurial survival rate) / entrepreneurial survival rate × net wealth as % in capital × capital as % in GDP
Investments as % in GDP	Depreciation rate of capital × capital as % in GDP
Consumption as % in GDP	1 − investments as % in GDP − government spending as % in GDP − entrepreneurs consumption as % in GDP
ε	(1 − depreciation rate of capital) / (1 / mark-up × capital share in production × output/capital + 1 − depreciation rate of capital)

Source: authors estimation.

induce labor substitution, reducing labor demand and exerting downward pressure on wages and inflation. In the presence of a financial accelerator, improved firm balance sheets reduce the external finance premium and financing costs, amplifying the expansionary effect on output. In

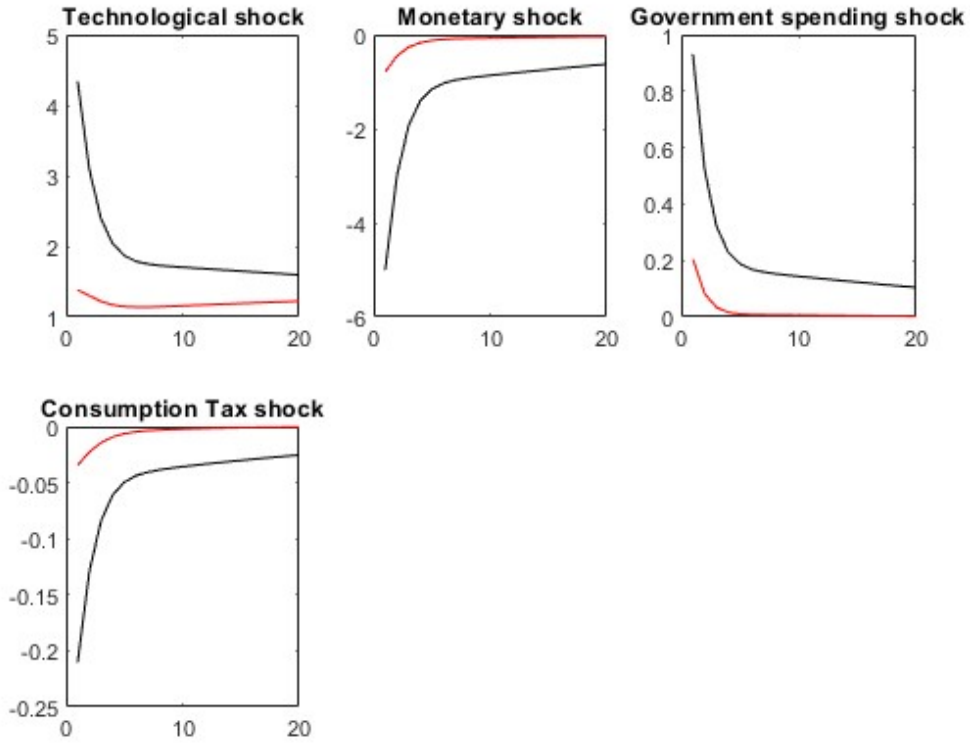

FIGURE 1. Output responses to different shocks

Source: authors estimations.
Note: Black line – Impact with financial accelerator; Red line – Impact without financial accelerator.

the calibrated model, a 1% positive technology shock increases output by 4.33% with financial frictions, compared to 1.4% without.

The contractionary effects of an increase in the monetary policy interest rate on output arise primarily from higher financing costs faced by firms. As debt servicing becomes more expensive, investment, a key driver of value added, declines. Higher financing costs also reduce firms' production levels, leading to lower profits. Reduced profitability, or even losses induced by monetary tightening, may lead firms to increase prices, generating a negative supply-side effect that reduces consumption and government tax revenues, ultimately lowering output. At the same time, higher interest rates contribute to lower inflation, which may enhance macroeconomic stability. Moreover, tighter monetary policy negatively affects consumption, as households are incentivized to save in deposits rather than spend, thereby postponing consumption to future periods.

A positive government spending shock (1% increase in wages, pensions, or public investment relative to steady state) raises output by approximately 0.9% with a financial accelerator and 0.2% without, highlighting the role of financial frictions in amplifying fiscal multipliers. These results underscore the importance of fiscal space for countercyclical stabilization.

Following a consumption tax shock, where the tax rate increases by 1% relative to its steady-state level, output declines more significantly in the presence of a financial accelerator (−0.2%) than in an economy without financial frictions (−0.03%). The increase in consumption taxation raises consumer prices (+1.97%). In response to weaker demand, firms adjust pricing behavior by reducing markups, resulting in a decline in firms' prices of approximately 0.15%. However, highly leveraged firms have limited ability to compress margins further, as this would

deteriorate their financial position. Consequently, balance sheet conditions weaken, amplifying the adverse effects of the shock through the financial accelerator mechanism. Investment is also more strongly affected, declining by approximately 0.4% in the model with financial frictions compared to around 0.04% in the model without financial accelerator effects. Higher financing costs reduce investment and value added, thereby slowing overall economic activity. At the household level, higher consumption taxes lead to higher prices, which reduces consumption demand, as households adjust their behavior by substituting consumption with savings, resulting in a short-run decline in aggregate demand.

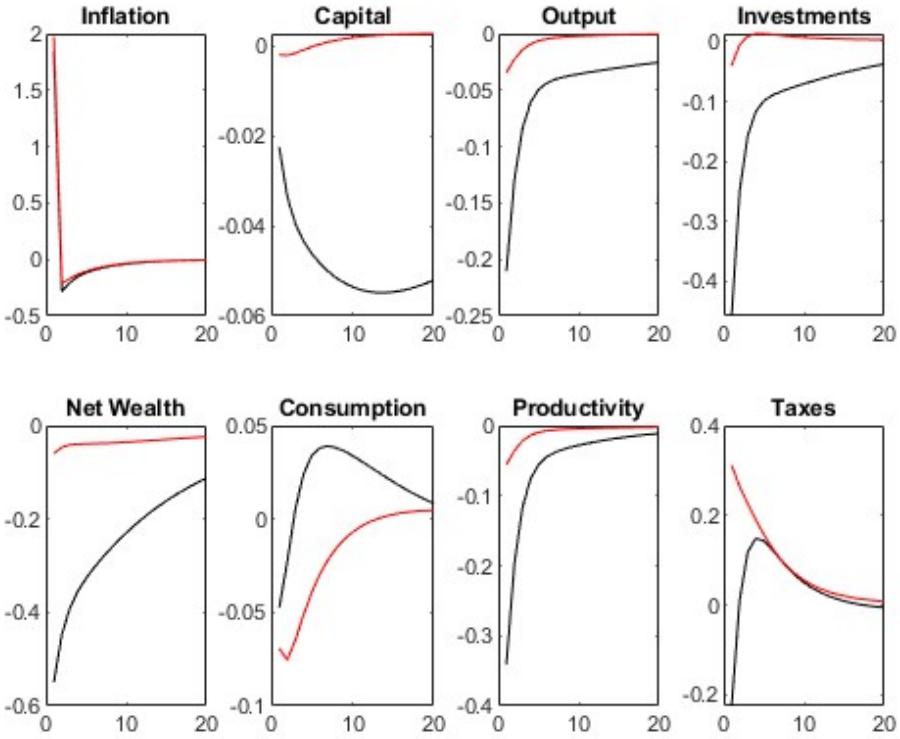

FIGURE 2. Macroeconomic variables responses to a consumption tax shock

Source: authors estimations.

Note: Black line – Impact with financial accelerator; Red line – Impact without financial accelerator.

The consumption tax shock primarily affects the economy through the price and demand channels. In the benchmark model, the increase in consumption taxation is immediately transmitted to consumer prices, generating a temporary rise in inflation of approximately 2% on impact. At the same time, higher consumption costs reduce households' purchasing power and discourage current expenditure, leading to a decline in consumption. When financial frictions are introduced, the response of consumption becomes more persistent, reflecting the deterioration in agents' balance-sheet positions and the associated tightening of financing conditions. Although the inflationary impact remains relatively short-lived, the reduction in net worth amplifies the contraction in private demand, extending the adjustment process beyond the initial fiscal shock.

The decline in consumption and the weakening of balance sheets are subsequently transmitted to the non-financial companies through the financial accelerator mechanism. As firms

experience a deterioration in net worth, the external finance premium increases, raising the cost of borrowing and limiting access to credit. Consequently, investment exhibits the strongest response among all macroeconomic variables, falling by nearly 0.5% in the model with a financial accelerator, compared with less than 0.05% in the benchmark specification. The sharp contraction in investment gradually translates into lower capital accumulation, leading to a persistent decline in the capital stock. These results highlight that the main amplification channel of a consumption tax shock operates through firms' financing conditions, whereby weaker balance sheets constrain investment activity and generate longer-lasting effects on productive capacity.

Overall, the comparison between the two specifications demonstrates that the financial accelerator substantially strengthens the transmission of consumption tax shocks. The amplification operates primarily through the deterioration of net worth, which increases financing constraints, depresses investment, and leads to more persistent declines in capital accumulation and economic performance. These findings are particularly relevant for the Romanian economy, where firms continue to face significant capitalization needs and where investment dynamics remain highly dependent on access to external financing. In addition, in a context characterized by the need for fiscal consolidation and a likely moderation in the availability of European Union funds relative to previous programming periods, the capacity of the private sector to sustain investment becomes increasingly important. Under these conditions, policies aimed at strengthening firms' balance sheets and facilitating access to finance may play a critical role in supporting private investment as a key driver of long-term economic growth and convergence.

6. Conclusions

The conclusions section will be formulated in terms of recommendations for the different categories of actors in the economy, namely the government, the central bank, and companies. Moreover, this paper highlights the importance of financial frictions in shaping the transmission of consumption tax shocks, as the financial accelerator intensifies the impact of fiscal adjustments on key macroeconomic variables. By jointly modeling fiscal policy and credit market imperfections, the study extends the evidence available for Romania and offers a novel framework for evaluating the macroeconomic consequences of deficit-reduction measures based on indirect taxation.

In terms of recommendations, for the government, policy predictability is essential, alongside a shift from discretionary interventions toward automatic stabilizers that support fiscal sustainability and create a favorable environment for development for both firms and households. In the context of the current need for fiscal consolidation and the objective of reducing inequalities, the effective functioning of fiscal policy, through its redistribution, stabilization, and allocation roles, as defined by Musgrave (1959), should remain a central consideration in fiscal policy decision-making.

From a monetary policy perspective, the central bank should aim at preventing macroeconomic imbalances and ensuring price and output stability through its policy instruments. A consistent policy framework combining monetary and macroprudential tools is necessary to preserve both price and financial stability. While contractionary monetary policy is effective in containing inflationary pressures, it may amplify financial stress through balance sheet channels; conversely, accommodative monetary conditions may increase leverage and contribute to asset price misalignments. These trade-offs become particularly relevant in the presence of a financial accelerator mechanism, implying a policy mix in which monetary policy is primarily oriented toward price stability, while macroprudential policy targets financial vulnerabilities.

At the firm level, reducing leverage ratios is essential for improving financial resilience and limiting exposure to adverse shocks transmitted through financial frictions. In addition, higher investment in technology enhances productivity and competitiveness, leading to increases in value added and positive spillover effects at the aggregate level. An increased capital intensity in production further strengthens firms' balance sheets and improves their capacity to withstand shocks, while also signaling financial soundness and long-term viability. In the case of

Romania, as an emerging economy, structural characteristics such as a relatively skilled labor force and a favorable geostrategic position continue to support its integration within regional and international value chains, reinforcing its role as a linkage economy between Western and Eastern markets.

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