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Effects of Expansionary Fiscal Policy in a Commodity-Exporting Economy: Evidence from Mongolia

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Abstract

This study contributes to the ongoing debate on the consequences of expansionary fiscal policy by evaluating the macroeconomic effects of various fiscal policy options in a small open economy using a dynamic stochastic general equilibrium (DSGE) model. In addition, the study emphasizes the importance of studying Mongolia, which has unique characteristics and exhibits significant research gaps regarding its fiscal policy. The general architecture of the selected DSGE model includes different types of firms and households, commodity sectors, natural resource funds, and abundant fiscal tools regarding both expenditure and revenue. Employing numerous types of fiscal policy shocks, this study reveals that an exogenous increase in government investment yields the most significant long-term economic benefits, boosting potential output by 0.3%. Among the policy options, government transfers are the least effective in promoting economic output, and existing transfer policies in Mongolia appear to exert only a modest impact on growth, instead primarily contributing to the redistribution of resources. Finally, the estimated output multipliers (except transfers) are greater than one, implying that fiscal policy instruments may be an effective tool for managing the economy in Mongolia.

JEL classification numbers: E17, E62, H24, H54, H55.
Keywords: Fiscal policy, Fiscal policy multiplier, Small open economy, Dynamic Stochastic General Equilibrium model, Natural Resource Sector.

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1 Introduction

Expansionary fiscal policy is a widely debated topic, and governments often choose this approach during economic slowdowns. The rationale for expansionary fiscal policy relates to several factors, including 1) the belief that the fiscal multiplier is greater than one and amplifies the effects of the stimulus on overall economic activity [1, 2]; 2) the implementation of counter-cyclical measures to boost demand and limit job losses during hard times is consistent with the primary objective of macroeconomic stability [1, 3, 4]; and 3) the sustainable provision of public goods such as healthcare, education, and infrastructure becomes fragile during economic downturns without additional resources from the government [5].

However, critics of expansionary fiscal policy argue that it may have unintended consequences, such as crowding out private-sector investments, reducing consumption, increasing public debt, shrinking fiscal space, and raising the risk of default. Numerous empirical studies have identified negative or insignificant results when examining the effects of fiscal policies [6–13]. In contrast, other studies have confirmed that fiscal policy shocks have a stimulating effect on the economy [14–20]. Furthermore, some studies suggest that country-specific case studies should be undertaken because the effects of fiscal policy may vary depending on country-specific factors and stimulus characteristics, such as the economic structure, zero lower bound binding, stimulus size, composition, persistency, announcement timing, implementation efficiency, and the presence of strong institutional systems [21–23]. Overall, there is no consensus in the literature, highlighting the need for further studies.

This study revisits long-standing questions about fiscal policy effects using a structural-model-based approach. The research assesses the impact of fiscal measures based on the hypothesis that directing fiscal tools towards bolstering supply expansion—specifically by increasing public investment and reducing labor income taxes – may result in favorable outcome for long-term macroeconomic stability, rather than focusing on bolstering household demand by providing subsidies to households, decreasing consumption taxes and increasing government purchases. This distinction is especially relevant for developing nations with a heavy reliance on imported goods, a non-diversified and mining dependent production base, and a small economy.

The contributions of this study are threefold. First, it contributes to the small open economy dynamic stochastic general equilibrium (DSGE) literature by introducing numerical comparisons of various fiscal measures using Mongolia as a case study. Based on the economic responses to multiple policies, this study provides a better understanding of each fiscal instrument regarding policy choice. Second, this study finds fiscal multipliers for expenditure and tax components and investigates the current fiscal decisions in Mongolia. Using quantitative measurements of multipliers and simulation results, this study identifies the critical macroeconomic concerns the country faces. Third, it creates a model with a wide range of fiscal extensions. For instance, regarding expenditure, the model distinguishes between public investment, consumption, and transfers. On the revenue side, it separately comprises consumption and labor income taxes. The model also includes the presence of the Natural Resource Fund and a commodity sector. Thus, it provides valuable guidance for fiscal authorities in similar economies to make decisions about increasing government consumption, scaling up public investment, expanding transfers, and lowering taxes.

The main findings reveal that a 1% increase in government consumption as a proportion of GDP results in a 1.4% increase in real GDP growth, indicating a positive multiplier effect. However, this effect is temporary and gradually diminishes with an increase in the real interest rate. An increase in public investment shows a similar short-term output gain as an increase in public consumption, delivering a similar fiscal investment multiplier. However, an increase in public investment has a more positive effect on long-term economic growth than public consumption, permanently lifting potential output by 0.3%. This phenomenon is due to the gradual increase in private sector productivity due to public capital stock. The government transfer policy exhibits the weakest effect on supporting labor compared with other policies, showing that households choose to work less when they receive extra income through transfers. Overall, the current transfer policies in Mongolia appear to have a limited stimulus effect on output. Reducing the consumption tax rate triggers an increase in the disposable income of consumers. However, a steep rise in public debt and a substantial deterioration in the current account balance are expected to occur in this scenario. The instant effect of a decrease in labor tax is the reallocation of production inputs from capital

to labor, which sustains macroeconomic stability by promoting robust labor growth, minimizing debt accumulation, maintaining a low current account volatility.
The remainder of this paper is organized as follows. Section 2 reviews the literature evaluating fiscal DSGE models. Section 3 presents the proposed model, outlining its structure and components. Section 4 focuses on the calibration of the model solution parameters. Section 5 presents the empirical results and discussions, analyzing the responses of macroeconomic variables to different exogenous fiscal shocks. The last section concludes and summarizes the study's findings and implications.

2 Literature Review

The literature on the DSGE model with fiscal extensions has witnessed significant growth in recent years. Scholars have proposed innovative approaches to extend DSGE models, allowing a deeper examination of the macroeconomic impact of fiscal policies. Some developments in the analysis of fiscal policy through the DSGE models include Cogan et al. [10], Eggertsson [24], Woodford [25], Christiano et al. [26], Stähler and Thomas [27],[2] Bilbiie et al. [28], Zubairy [18], Dupaigne and Fève [29], Drygalla et al. [30],[3] Bhattarai and Trzeciakiewicz [31],[4] Giambattista and Pennings [32], Mehrotra [33], Aursland et al.[34],[5] Fotiou et al. [35], Adrian et al. [36], and Lemoine and Lindé [37]. However, a common shortcoming of these studies is that the model setting focuses on developed nations such as the United States, and major EU economies. Hence, a scarcity of similar studies conducted in developing economies is observed.
In Mongolia, a few studies have examined the macroeconomic impacts assessed by DSGE models, including those by Batchuluun and Dalkhjav [38], Dutu [39], Sanduijav [40], Li et al. [41], Doojav and Batmunkh [42], and Taguchi and Ganbayar [43]. However, these studies have either neglected to comprehensively analyze the effects of fiscal policy or primarily focused on monetary policy, resulting in a lack of comprehensive studies in fiscal policy areas.
Mongolia has substantial potential in the energy, organic agriculture, tourism, and information and communication technology (ICT) industries. However, one of the challenges the country faces is its landlocked geographical position, situated between two larger nations, Russia and China. Consequently, Mongolia's connectivity with the global supply chain is limited, posing obstacles to the efficient trade of industrial products, except for the mining industry. Hence, Mongolia stands out as one of the world's most commodity-dependent nations. Approximately 90% of Mongolia's total export revenue is derived from the export of mineral commodities, such as copper, coal, gold, oil, iron ore, and other raw materials. These commodities hold substantial importance in the country's economy, contributing 26% of the budget revenue and 20% of GDP. However, this heavy reliance on the commodity sector exposes the Mongolian economy to significant volatility. To mitigate the negative consequences associated with the high fluctuations, fiscal authorities aim for macroeconomic stability in the short term, structural reforms and sustainable growth in the long run. For this reason, the Mongolian government has established two types of Natural Resource Funds: the Fiscal Stabilization Fund (to maintain fiscal stability) and the Future Heritage Fund (to support intergenerational equality). Therefore, a model structure that includes a separate mining sector, different types of disaggregated levels of fiscal instruments, and Natural Resource Funds allows for a more realistic representation of the Mongolian economy.
Drawing inspiration from previous studies such as those by Buffie et al. [44], Berg et al. [45], Melina et al. [46, 47], and Gurara et al. [48], among others, which applied a small open economy DSGE model to explain macroeconomic issues related to natural resource development and growth sustainability, this study focuses on comparisons of the effectiveness of five alternative fiscal instruments.

2 FiMod - A DSGE Model for Fiscal Policy Simulations in the ECB.
3 Stimulus package estimation in Germany.
4 Fiscal policy analysis in the UK.
5 Fiscal policy analysis in Norway.

Buffie et al. [44] construct a comprehensive DSGE model for small open economies.[6] Their model accommodates infrastructure investment, government funding through concessional, commercial, or domestic debt, and potential fiscal adjustments. Its application is centered on analyzing the macroeconomic consequences of sudden increases in public investment.

Melina et al. [46] further expand the model by incorporating a natural resource sector.[7] They utilize an extended framework to examine debt sustainability and the macroeconomic implications of public investment strategies in commodity-exporting and small open economies.

Expanding into a particular sector, the model was extended by Andreolli and Abdychev [49]. They apply an energy-incorporated model to evaluate the macroeconomic outcomes of energy projects in a small open economy. Through a series of simulations involving various scenarios, the authors assess the potential advantages of government investment initiatives in the energy sector.

The model proposed by Marto et al. [50] includes climate-resilient infrastructure alongside conventional infrastructure components of the DIG model. This approach demonstrates that investing in resilient infrastructure may raise the marginal productivity of private capital, attract increased private investments, and reinforce the capacity of developing nations to endure natural catastrophes.

Atolia et al. [51] exercise the model but include human capital considerations. By exploring the trade-offs between investing in infrastructure (e.g., roads) and education (e.g., schools), the proposed simulations reveal that infrastructure may lead to a relatively rapid improvement in firm productivity. In contrast, scaling up schools may boost worker productivity in the long term, potentially to a greater degree. However, in developing economies, political decisions tend to prioritize investments in roads while not adequately allocating resources to schools, despite the greater demand for human capital.

International Monetary Fund [52] extends the DIG model to examine the effects of governance reform. This approach focuses on combating corruption, enhancing the effectiveness of public investment, and mitigating tax collection inefficiencies. The simulations under this extended framework project a significant 70% upsurge in private investment over a decade, accompanied by an approximately 30% growth in output and private consumption. Moreover, after governance reforms, public debt is anticipated to decrease by nearly 15% of the GDP.

While the model has been previously utilized in various fields, such as public investment scaling-up analysis, debt sustainability analysis, and structural reforms, this study extends the application of the model by introducing different types of exogenous fiscal shocks simultaneously.

3 Model

In line with Buffie et al. [44] and Melina et al. [47], I adopt an open-economy dynamic general equilibrium model with real variables tailored to Mongolia. The model considers optimizer households (also known as Ricardian households) and non-optimizer households (also known as non-Ricardian or rule-of-thumb households). Optimizer households have access to capital and financial markets, allowing them to invest, borrow, and make intertemporal consumption and savings decisions. In contrast, non-optimizer households lack access to financial markets and consume their entire disposable income in each period without engaging in long-term financial planning. The model features three production sectors: a non-traded goods sector, a traded goods sector (excluding the resource sector), and a natural resource sector. The proposed model considers various spending and tax variables, the Natural Resource Fund, and several types of public debt instruments. The government sector exhibits substantial disaggregation. In each period, the government's total receipts consist of i) consumption taxes, ii) labor income taxes, iii) resource revenues, iv) foreign aid, v) bond sales, and v) interest earnings from the Natural Resource Fund. The government's total expenditures consist of i) public consumption, ii) public investment, iii) transfers to households, iv) debt service payments, and v) savings in the Natural Resource Fund. In this model, productive capital is

[6] Debt, Investment, and Growth (DIG) model.
[7] Debt, Investment, Growth and Natural Resource (DIGNAR) model.

generated through public investment and utilized in the production processes of both traded and non-traded sectors.

3.1 Households

The variables associated with intertemporal optimizer and non-optimizer households are denoted by superscript OH and NH, respectively. A fraction ω of the households are categorized as intertemporal optimizer households, while the remaining fraction 1 − ω represents non-optimizer households. The consumption bundles of both households are composed of traded and non-traded goods, as indicated by the subscripts T and N. Households consume traded goods $\left(c_{T,t}^{i}\right)$ and non-traded goods $\left(c_{N,t}^{i}\right)$, following the constant-elasticity-of-substitution (CES) function shown in Equation (1):

$$\left(c_t^i\right) = \left[\varphi^{\frac{1}{\chi}}\left(c_{N,t}^i\right)^{\frac{\chi-1}{\chi}} + (1-\varphi)^{\frac{1}{\chi}}\left(c_{T,t}^i\right)^{\frac{\chi-1}{\chi}}\right]^{\frac{\chi}{\chi-1}} \quad for\ i = OH, NH, \tag{1}$$

where φ is the degree of non-traded goods bias in the consumption basket. This parameter captures the extent to which households prefer non-traded goods in their consumption choices. The intra-temporal elasticity of substitution is denoted as χ (and χ > 0). The elasticity of substitution determines the degree to which households may adjust their consumption patterns between traded and non-traded goods in response to changes in relative prices. The consumption basket serves as the numeraire for the economy.

The unit price of this basket corresponds to the following expression:

$$1 = \left[\varphi p_{N,t}^{1-\chi} + (1-\varphi) s_t^{1-\chi}\right]^{\frac{1}{1-\chi}}. \tag{2}$$

The relative prices of non-traded and traded goods are represented by $p_{N,t}$ and s_t, respectively. I assume that the law of one price holds for traded goods; s_t corresponds to the price of one unit of the foreign consumption basket in terms of the domestic consumption basket, implying a real exchange rate.
When minimizing total consumption expenditures subject to the consumption basket, Eq. (1) yields the demand function for each good.

Demand for non-traded goods:

$$c_{N,t}^i = \varphi\left(\mathrm{p_{N,t}}\right)^{-\chi} c_t^i, \text{ for } i = OH, NH. \tag{3}$$

Demand for traded goods:

$$c_{T,t}^i = (1-\varphi)(\mathrm{s_t})^{-\chi} c_t^i, \text{ for } i = OH, NH. \tag{4}$$

Both optimizer and non-optimizer households supply labor services to the traded and non-traded sectors of the economy. Total labor supply L_t^i is described by a CES specification that captures the imperfect substitutability between the labor supplied to the two sectors:

$$L_t^i = \left[\delta^{-\frac{1}{\rho}}\left(L_{N,t}^i\right)^{\frac{1+\rho}{\rho}} + (1-\delta)^{-\frac{1}{\rho}}\left(L_{T,t}^i\right)^{\frac{1+\rho}{\rho}}\right]^{\frac{\rho}{1+\rho}}, \ for\ i = OH, NH, \tag{5}$$

where δ represents the proportion of labor in the non-traded goods sector, ρ is the intra-temporal elasticity of substitution, and $\rho > 0$. The real wage rate in the non-traded goods sector is denoted as $w_{N,t}$ and in the traded goods sector is denoted as $w_{T,t}$.

Households decide labor supply by maximizing total labor income ($w_t L_t^i = w_{T,t} L_{T,t}^i + w_{N,t} L_{N,t}^i$) subject to aggregate labor constraint (5).

Labor supply for the non-traded goods sector becomes as follows:

$$L_{N,t}^i = \delta \left(\frac{w_{N,t}}{w_t}\right)^{\rho} L_t^i, \text{ for } i = OH, NH. \tag{6}$$

Labor supply for the traded goods sector becomes as follows:

$$L_{T,t}^i = (1-\delta) \left(\frac{w_{T,t}}{w_t}\right)^{\rho} L_t^i, \text{ for } i = OH, NH. \tag{7}$$

The real wage index becomes as follows:

$$w_t = \left[\delta w_{N,t}^{1+\rho} + (1-\delta) w_{T,t}^{1+\rho}\right]^{\frac{1}{1+\rho}}. \tag{8}$$

3.1.1 Intertemporal optimizer households

The main distinction between the two types of households lies in their access to financial markets. A representative optimizer household maximizes the expected discounted value of the utility it receives from consumption and labor activities:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_t^{OH}, L_t^{OH}) = E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\frac{1}{1-\sigma} (c_t^{OH})^{1-\sigma} - \frac{\kappa^{OH}}{1+\psi} (L_t^{OH})^{1+\psi} \right] \right\}, \tag{9}$$

subject to the following budget constraint:

$$(1+\tau_t^C) c_t^{OH} + b_t^{OH} - s_t b_t^{OH*} = (1-\tau_t^L) w_t L_t^{OH} + R_{t-1} b_{t-1}^{OH} - R_{t-1}^* s_t b_{t-1}^{OH*} + \Omega_{T,t} + \Omega_{N,t} + \vartheta^K \tau^K \left(r_{T,t}^K k_{T,t-1} + r_{N,t}^K k_{N,t-1}\right) + s_t rm_t^* + z_t - \mu k_{G,t-1} - \Theta_t^{OH}. \tag{10}$$

The subjective discount factor is defined as β. E_0 represents the expectation at time zero, and σ is assigned for the inverse of the intertemporal elasticity of substitution for consumption. In addition, ψ is the inverse of the intertemporal elasticity of substitution for labor supply, and κ^{OH} denotes the weight assigned to the disutility of labor.

Moreover, τ_t^C and τ_t^L represent the effective tax rates on consumption and labor income, respectively. Optimizer households engaging in intertemporal optimization have access to government bonds b_t^{OH}, which yield a gross real interest rate R_t. In addition, they may borrow from abroad b_t^{OH*} at the interest rate R_t^*, which equals the government's external debt (commercial) interest rate $R_{dc,t}$ plus a constant premium u:

$$R_t^* = R_{dc,t} + u. \tag{11}$$

In addition to their labor income and interest earnings, these households receive profits $\Omega_{T,t}$ and $\Omega_{N,t}$ from firms operating in the traded and non-traded goods sectors, respectively. The expression $\vartheta^K \tau^K \left(r_{T,t}^K k_{T,t-1} + r_{N,t}^K k_{N,t-1}\right)$ represents a tax rebate that optimizer households receive on the taxes imposed on the capital returns of firms.

The variable rm_t^* represents remittances received from abroad, z_t denotes government transfers, $\mu k_{G,t-1}$ represents the user fees imposed for public capital services, and Θ_t^{OH} represents the portfolio adjustment costs associated with foreign liabilities. In this case, $\Theta_t^{OH} \equiv \frac{\eta}{2}(b_t^{OH*} - b^{OH*})$,[2] parameter η determines the degree of capital account openness, and b^{OH*} (a variable without a time subscript) represents the initial steady-state value of these liabilities.

3.1.2. Non-optimizer households

Non-optimizer households (NH) share the same utility function as optimizer households:

$$U(c_t^{NH}, L_t^{NH}) = \frac{1}{1-\sigma}(c_t^{NH})^{1-\sigma} - \frac{\kappa^{NH}}{1+\psi}(L_t^{NH})^{1+\psi}. \quad (12)$$

Their consumption is constrained by following budget:

$$(1+\tau_t^C)c_t^{NH} = (1-\tau_t^L)w_t L_t^{NH} + s_t rm_t^* + z_t - \mu k_{G,t-1}. \quad (13)$$

From the static maximization of utility, the labor supplied by non-optimizer households reads:

$$L_t^{NH} = \left[\frac{1}{\kappa^{NH}}\left(\frac{1-\tau_t^L}{1+\tau_t^C}\right)\left(c_t^{NH}\right)^{-\sigma} w_t\right]^{\frac{1}{\psi}}. \quad (14)$$

3.2. Firms

3.2.1. Non-traded sector

Non-traded sector firms produce output $y_{N,t}$ using Cobb-Douglas technology:

$$y_{N,t} = z_n\left(k_{N,t-1}\right)^{1-\alpha_N}\left(L_{N,t}\right)^{\alpha_N}\left(k_{G,t-1}\right),^{\alpha_G} \quad (15)$$

where z_n is total factor productivity, $k_{N,t-1}$, $k_{G,t-1}$ are private and public capital used for non-traded firms' production at t, α_N is the labor share, and the public capital affects output with an elasticity equal to α_G.

Private capital used for the non-traded sector evolves as:

$$k_{N,t} = (1-\delta_N)k_{N,t-1} + \left[1 - \frac{\kappa_N}{2}\left(\frac{i_{N,t}}{i_{N,t-1}} - 1\right)^2\right] i_{N,t}, \quad (16)$$

where δ_N is the capital depreciation rate, κ_N is the investment adjustment cost parameter, and $i_{N,t}$ represents investment expenditure.

The representative non-traded firm maximizes its discounted lifetime profits weighted by the marginal utility of consumption of optimizer households λ_t, choosing labor $(L_{N,t})$, capital $(k_{N,t})$, and investment $(i_{N,t})$:

$$\Omega_{T,0} = E_0 \sum_{t=0}^{\infty} \beta^t \lambda_t \left[p_{N,t} y_{N,t} - w_{N,t} L_{N,t} - i_{N,t} - \tau^K r_{N,t}^K k_{N,t-1}\right], \quad (17)$$

where $r_{N,t}^K = (1-\alpha_N) p_{N,t} \frac{y_{N,t}}{k_{N,t-1}}$ is the capital return.

3.2.2. Traded sector

Similar to the non-traded goods sector, firms in the traded goods sector utilize Cobb-Douglas technology to produce output:

$$y_{T,t} = z_{T,t}\left(k_{T,t-1}\right)^{1-\alpha_T}\left(L_{T,t}\right)^{\alpha_T}\left(k_{G,t-1}\right).^{\alpha_G} \quad (18)$$

To capture the "Dutch disease" phenomenon in the traded sector, the total factor productivity, $z_{T,t}$, is incorporated with learning-by-doing externalities:

$$\frac{z_{T,t}}{z_T} = \left(\frac{z_{T,t-1}}{z_T}\right)^{\rho_{zT}} + \left(\frac{y_{T,t-1}}{y_T}\right)^{\rho_{yT}}, \tag{19}$$

where ρ_{zT}, $\rho_{yT} \in [0,1]$ control the severity of the Dutch disease. They are less than one, indicating no permanent effect on output and productivity; however, some persistency exists.
The law of motion for private capital in the traded sector is:

$$k_{T,t} = (1-\delta_T)k_{T,t-1} + \left[1 - \frac{\kappa_T}{2}\left(\frac{i_{T,t}}{i_{T,t-1}} - 1\right)^2\right] i_{T,t}. \tag{20}$$

Like non-traded good firms, a representative traded goods firm maximizes the following discounted lifetime profit by choosing labor $(L_{T,t})$, capital $(k_{T,t})$, and investment $(i_{T,t})$:

$$\Omega_{T,0} = E_0 \sum_{t=0}^{\infty} \beta^t \lambda_t \left[s_t y_{T,t} - w_{T,t} L_{T,t} - i_{T,t} - \tau^K r^K_{T,t} k_{T,t-1}\right]. \tag{21}$$

3.2.3. Natural resource sector

The following simple rule (22) is employed for a natural resource firm's production. Considering that natural resource production in Mongolia is capital intensive, a large percentage is financed by foreign direct investment (FDI), as in most resource-rich economies:

$$\tilde{y}_{nr,t} = s_t p^*_{nr,t} y_{nr,t}. \tag{22}$$

The production and prices of natural resource firms are assumed to follow exogenous processes:

$$\frac{y_{nr,t}}{y_{nr}} = \left(\frac{y_{nr,t-1}}{y_{nr}}\right)^{\rho_{y_{nr}}} \exp\left(\varepsilon_t^{y_{nr}}\right), \tag{23}$$

where y_{nr} is a steady-state value, $\rho_{y_{nr}} \in (0,1)$ is an auto-regressive coefficient, and $\varepsilon_t^{y_{nr}} \sim iid\ N(0, \sigma^2_{\rho_{y_{nr}}})$ is a resource production shock.

$$\frac{p^*_{nr,t}}{p^*_{nr}} = \left(\frac{p^*_{nr,t-1}}{p^*_{nr}}\right)^{\rho_{p_{nr}}} \exp\left(\varepsilon_t^{p_{nr}}\right), \tag{24}$$

where p^*_{nr} is a steady-state value, $\rho_{p_{nr}} \in (0,1)$ is an auto-regressive coefficient, and $(\varepsilon_t^{p_{nr}} \sim iid\ N(0, \sigma^2_{\rho_{p_{nr}}})$ is a commodity price shock.

3.3. Government

The government budget flow is given by:

$$\tau_t^C c_t + \tau_t^L w_t L_t + t_t^{nr} + \left(1-\vartheta^{K}\right)\tau^K\left(r^K_{T,t} k_{T,t-1} + r^K_{N,t} k_{N,t-1}\right) + s_t gr_t^* + \mu k_{G,t-1} + b_t + s_t d_t + s_t d_{c,t} + s_t R^{SWF} f^*_{t-1} = \mathrm{p}_t^G (g_t^c + g_t^I) + z_t + R_{t-1} b_{t-1} + s_t R_{d,t-1} d_{t-1} + s_t R_{dc,t-1} d_{c,t-1} + s_t f_t^* \tag{25}$$

In addition to the receipt from taxes on consumption ($\tau_t^C c_t$), labor ($\tau_t^L w_t L_t$), and capital $\left(1-\vartheta^{K}\right)\tau^K\left(r^K_{T,t} k_{T,t-1} + r^K_{N,t} k_{N,t-1}\right)$, the government obtains income through royalties related to natural resources (t_t^{nr}), receives external grants (gr_t^*), and collects user fees ($\mu k_{G,t-1}$).

The calculation of resource revenues collected each period is determined by the following expression:

$$t_t^{nr} = \tau^{nr} * \tilde{y}_{nr,t}, \tag{26}$$

where τ^{nr} is the constant royalty rate.

The user fee paid on public capital is computed as a fraction f of recurrent costs as $\mu \equiv f p^G \delta_G$.
The government resorts to three types of debt instruments, namely, domestic debt b_t, external debt (concessional) d_t, and external debt (commercial) $d_{c,t}$. In the model, concessional loans provided by official creditors are considered exogenous, with real interest rate R_d. However, the gross real interest rates on external debt (commercial) include a risk premium that varies depending on the external public debt to GDP ratio deviations from its initial steady state:

$$R_{dc,t-1} = R^f + v_{dc}\exp\left[\eta_{dc}\left(\frac{d_t+d_{c,t}}{y_t} - \frac{d+d_c}{y}\right)\right], \tag{27}$$

where R^f is the world's risk-free interest rate (constant), v_{dc} and η_{dc} are structural parameters, and y_t is total GDP.

Government expenditures include government consumption (g_t^C) and public investment (g_t^I). The government expenditure basket, $(g_t \equiv g_t^C + g_t^I)$, is CES aggregation of both traded and non-traded goods, like private consumption:

$$g_t = \left[v_t^{\frac{1}{\chi}}(g_{N,t})^{\frac{\chi-1}{\chi}} + (1-v_t)^{\frac{1}{\chi}}(g_{T,t})^{\frac{\chi-1}{\chi}}\right]^{\frac{\chi}{\chi-1}}, \tag{28}$$

where v_t is the weight of the non-traded goods in government consumption. The intra-temporal elasticity of substitution of the government consumption is assumed the same as private consumption, denoted as χ, but home bias differs from the private sector's degree ($v_t \neq \varphi$ in Equation(1)).

The price index for government consumption, denoted as (p_t^G), is determined in terms of the units of the consumption basket:

$$p_t^G = \left[v_t p_N^{1-\chi} + (1-v_t)s_t^{1-\chi}\right]^{\frac{\chi}{\chi-1}}. \tag{29}$$

By minimizing government expenditure $(p_t^G g_t = p_{N,t}g_{N,t} + s_t g_{T,t})$ subject to government consumption basket (29), the following public demand functions are obtained for the non-traded and traded sectors, respectively:

$$g_{N,t} = v_t\left(\frac{p_{N,t}}{p_t^G}\right)^{-\chi} g_{t,} \tag{30}$$

$$g_{N,t} = (1-v_t)\left(\frac{s_t}{p_t^G}\right)^{-\chi} g_t. \tag{31}$$

This model assumes that public investment (g_t^I) cannot be totally converted into public capital. Public investment is influenced by inefficiency and absorptive capacity constraints. While Mongolia often experiences a shortage of financial resources, the country also encounters limitations in its absorptive capacity. Hence, when engaging in rapid investments, the government may experience a significant decline in efficiency due to the limited absorptive capacity. The proposed model suggests that when the threshold of absorptive capacity is surpassed, the efficiency of the exceeding portion of the public investment drops from a steady-state value of efficiency (ε) to a lower value $(\tilde{\varepsilon})$.

The effective public investment ($\tilde{g}_t^I$) varies depending on the magnitude of public investment (g_t^I) relative to public investment to output ratio $s^{GI} \equiv \frac{g_t^I}{y^I}$ and efficiency rate (ε,$\tilde{\varepsilon}$):

$$\tilde{g}_t^I = \begin{Bmatrix} \text{when } s_t^{GI} \leq \bar{s}^{GI}, \varepsilon g_t^I \\ \text{when } s_t^{GI} > \bar{s}^{GI}, \varepsilon(\bar{s}^{GI}\mathrm{y_t}) + \tilde{\varepsilon}(g_t^I - (\bar{s}^{GI}\mathrm{y_t}) \end{Bmatrix}, \tag{32}$$

where $\bar{s}^{GI}$ is the threshold or steady state public investment growth rate.
As public investment is restricted by inefficiency and absorptive capacity constraints, public capital evolves as follows:

$$k_{G,t} = (1 - \delta_G)k_{G,t-1} + \tilde{g}_t^I, \tag{33}$$

where δ_G is the depreciation rate of public capital, and $\tilde{g}_t^I$ is the effective investment rate affected by absorptive capacity constraints.

The model incorporates the natural resource fund (f_t^*), which functions as a fiscal buffer to absorb the fiscal surplus or deficit. When the Natural Resource Fund is depleted and reaches zero, the government must borrow to compensate for its revenue shortfall. Natural resource funds accumulate over time when commodity production and prices remain stable. In each period, the natural resource fund generates interest income represented by $s_t\left(R^{rf} - 1\right)f_{t-1,}^*$ where R^{rf} is the constant gross real interest rate:

$$f_t^* - f^* = max\left\{f_{floor} - f^*, (f_{t-1}^* - f^*) + \frac{f_{in,t}}{s_t} - \frac{f_{out,t}}{s_t}\right\}. \tag{34}$$

The variables $f_{in,t}$ and $f_{out,t}$ denote the total fiscal inflows and outflows of funds, respectively, $f_{floor} \geq 0$ represents the minimum threshold or lower bound for the fund that the government decides to maintain, and $f^*$is the initial level of the natural resource fund.
Five fiscal instruments are used as policy tools for decision-making. This model adopts an approach similar to those of Leeper et al. [53], Stähler and Thomas [27], and Drygalla et al. [29] when defining expenditure and revenue shocks in the fiscal sector. However, I slightly modify the approach to suit the research objectives. The five instruments convert as follows:

$$\frac{\mathrm{G_t^C}}{\mathrm{g^C}} = \left(\frac{\mathrm{g_{t-1}^C}}{\mathrm{g^C}}\right)^{\rho_{\mathrm{gc}}} \exp\left(\varepsilon_t^{\mathrm{gC}}\right), \tag{35}$$

$$\frac{\mathrm{g_t^I}}{\mathrm{g^I}} = \left(\frac{\mathrm{g_{t-1}^I}}{\mathrm{g^I}}\right)^{\rho_{\mathrm{gI}}} \exp\left(\varepsilon_t^{\mathrm{gI}}\right), \tag{36}$$

$$\frac{\mathrm{g_t^Z}}{\mathrm{g^Z}} = \left(\frac{\mathrm{g_{t-1}^Z}}{\mathrm{g^Z}}\right)^{\rho_{\mathrm{gz}}} \exp\left(\varepsilon_t^{\mathrm{gZ}}\right), \tag{37}$$

$$\frac{\tau_t^C}{\tau^{\mathrm{C}}} = \left(\frac{\tau_{t-1}^{\mathrm{C}}}{\tau^{\mathrm{C}}}\right)^{\rho_{\tau\mathrm{c}}} \exp\left(\varepsilon_t^{\tau\mathrm{C}}\right), \tag{38}$$

$$\frac{\tau_t^L}{\tau^{\mathrm{L}}} = \left(\frac{\tau_{t-1}^{\mathrm{L}}}{\tau^{\mathrm{L}}}\right)^{\rho_{\tau\mathrm{L}}} \exp\left(\varepsilon_t^{\tau\mathrm{L}}\right), \tag{39}$$

where, $g^C, g^I, g^z, \tau^C, and\ \tau^L$ denote steady state values, $\rho_{gc}, \rho_{gI}, \rho_z, \rho_{\tau c}, and\ \rho_{\tau L}$ are the smoothing parameters, ε_t^{gC}, ε_t^{gI}, $\varepsilon_t^z, \varepsilon_t^{\tau c}, and\ \varepsilon_t^{\tau L}$ are independent and identically distributed (i.i.d) with zero mean and variances $\sigma_{\varepsilon gc}^2$, $\sigma_{\varepsilon gI}^2, \sigma_{\varepsilon z}^2, \sigma_{\varepsilon\tau c}^2, and\ \sigma_{\varepsilon\tau L,}^2$and fiscal policy shocks affect the economy.

3.4. Aggregation and market-clearing

Total consumption, labor, privately owned government bonds, and foreign liabilities are aggregated as follows:

$$c_t = \omega c_t^{OH} + (1-\omega) c_t^{NH}, \tag{40}$$

$$L_t = \omega L_t^{OH} + (1-\omega) L_t^{NH}, \tag{41}$$

$$b_t = \omega b_t^{OH}, \tag{42}$$

$$b_t^* = \omega b_t^{*OH}. \tag{43}$$

The non-traded goods market-clearing condition is:

$$y_{N,t} = \varphi p_{N,t}^{-\chi}\left(c_t + i_{N,t} + i_{T,t}\right) + v_t \left(\frac{p_{N,t}}{p_t^G}\right)^{-\chi} g_t. \tag{44}$$

The balance of payment (BOP) condition is:

$$\frac{ca_t^d}{s_t} = gr_t^* - \Delta f_t^* + \Delta d_t + \Delta d_{c,t} + \Delta b_t^*, \tag{45}$$

where the current account deficit ca_t^d is defined as:

$$ca_t^d = c_t + i_{N,t} + i_{T,t} + p_t^G g_t + \Theta_t^{OH} - y_t - s_t rm_t^* + (R_d - 1) s_t d_{t-1} + \left(R_{dc,t-1} - 1\right) s_t d_{c,t-1} + (R_{t-1}^* - 1) s_t b_{t-1}^* - (R^{RF} - 1) s_t f_{t-1}^*. \tag{46}$$

Finally, the total output of the economy, y_t, is defined as:

$$y_t = p_{N,t} y_{N,t} + s_t y_{T,t} + \tilde{y}_{nr,t} \tag{47}$$

4 Calibration

The computation of the model's equilibrium involves several essential components, including first-order conditions for optimization problems faced by households and firms, market-clearing and BOP conditions, exogenously given fiscal inputs, and country-specific calibrated parameters. To reflect the most reliable and accurate information available to the country, the model utilizes a wide range of annual data such as national accounts, fiscal data, trade data, and other relevant economic statistics from official government sources. Incorporating these parameters into the model provides a realistic representation of household behavior and choices regarding consumption, labor supply, and resource allocation in Mongolia. The model simulates economic dynamics for ten years and provides valuable insights into the long-term trends and challenges the country may face.

The baseline calibration for the initial steady state is elaborated as follows.

National accounting. National accounting data derived from the National Statistical Office (NSO) database spanning the last 30 years are used in the calibration process. The ratios of exports and imports to GDP are determined by averaging data from recent years, resulting in values of 45.2% and 46.6%, respectively. Moreover, government primary spending is 21.1% of GDP, with 13.5% allocated to government consumption and 7.6% to government investment expenditures.

Private sector production. The labor income share in the non-traded sector is represented by $\alpha_N = 0.45$, while in the traded goods sector is $\alpha_T = 0.60$, aligning with the empirical evidence for developing countries, as shown in Buffie et al. [44], Melina et al. [47], and Li et al. (2017). Private capital in both sectors experiences an annual depreciation of 10%. Moreover, in line with Berg et al. [45], the model assumes a minor degree of learning-by-doing externality in the traded goods sector, with $\rho_{YT} = \rho_{zT} = 0.10$. Furthermore, investment adjustment costs are specified as $\kappa_N = \kappa_T = 50$.

Intertemporal optimizer households. Given that a significant proportion of households in Mongolia face liquidity constraints, the parameter ω is set at 0.40, indicating that 60% of households are considered non-optimizers, meaning they do not engage in full intertemporal optimization of consumption and savings decisions. This is rooted in the fact that the country exhibits a substantial poverty rate despite a significant level of financial inclusiveness.[8]

Elasticity of substitution between traded and non-traded goods. The model assumes an elasticity of substitution (χ) equal to 0.44 between traded and non-traded goods. This parameter indicates that households may easily switch between consuming different types of goods. The value reflects the estimates of Stockman and Tesar [54].

Households' risk aversion. The coefficient of risk aversion σ is set to 2.94, representing households' willingness to save or spend. This value implies an intertemporal elasticity of substitution of 0.34, indicating that households cautiously make consumption decisions between different periods.

Labor mobility parameter. The labor mobility parameter ρ is set to one, following Horváth [55]. This parameter indicates that labor may move quickly between the traded and non-traded sectors of the economy in response to changes in relative wages.

Frisch labor elasticity. The inverse of Frisch labor elasticity (ψ) is assumed to be low at 2.5. This parameter reflects the responsiveness of the labor supply to changes in wages. In this case, the model assumes $\frac{1}{\psi}$ labor elasticity of 0.4, well within most estimates from the empirical labor supply literature [56].

Assets, debt, and grants. The stock variables are built using data from 2022 for Mongolia. The general government debt level is approximately 50% of the GDP (NPV term). This debt comprises 2% domestic debt, 32% concessional debt, and 16% external government borrowings. In contrast, private foreign borrowing amounts to 74% of the GDP, imposing a significant debt burden on the country from the external sector.

Interest rates. Mongolia faces high interest rates owing to its rapid economic growth and high inflation. To reflect reality, the real annual interest rate on domestic debt $(R - 1)$ is 10%. The real annual risk-free world interest rate $(R^f - 1)$ is fixed at 4%. The real interest rate paid on concessional loans $(R_d - 1)$ is 0.01%. The real interest rate on external commercial debt $(R_{dc} - 1)$ is 7%, and the real return on the Resource Fund $(R^{RF} - 1)$ is 2.0%. These interest rate parameters are essential in the model to determine the cost of borrowing and returns on different types of debt and financial assets.

Access to international capital markets. To capture the limited access to international capital markets, the parameter η is set to one, in line with Buffie et al. [44]. This parameter implies that the economy faces tight constraints on borrowing from foreign sources, which affects investment and consumption decisions.

Fiscal instruments. The output elasticity to public capital (α_G) is set at 0.15, implying that a 1% increase in public capital leads to a 0.15% increase in output. The home bias for government purchases ν is 0.6, indicating that 60% of government spending is directed toward the non-traded goods sector. Public investment efficiency is set at 50% $(\varepsilon = 0.5)$, implying that only half of the public investment is converted

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[8] According to the latest estimate by NSO, the poverty headcount rate is 27.8%, and the population holding savings account is 82.6% in 2020.

into productive capital. Absorptive capacity constraints come into effect when public investment exceeds 75%. The calibration of absorptive capacity constraints with a parameter ($\tilde{\varepsilon}$) set to 25 implies that the average investment efficiency decreases to 25% for exceeded public investment compared with the specified threshold. The annual depreciation rate for public capital is 7% ($\delta_G = 0.07$). To ensure that the stabilization fund remains non-negative, a constraint is set to the floor value (f_{floor}) to zero. The steady-state values for the consumption and labor tax rates are 10%. These values are consistent with the observed data and reflect the proportion of consumption and labor income on which households are taxed. The tax rate on the return on capital is calibrated at 24%. This rate matches the country's corporate income tax rate. In addition, the contribution of resource revenue to the total revenue amounts to 26%, implying a royalty tax rate $\tau^o = 0.26$.

Table 1 shows calibrated parameters for the model simulation. These are consistent with the literature and were set based on preexisting studies and available information for the country.

Table 1: Calibrated parameters

Variable	Value	Description	Variable	Value	Description
g^c_{share}	0.135	Government consumption to GDP	κ_N	50	Investment adjustment cost non-traded sector
g^i_{share}	0.076	Government investment to GDP	κ_T	50	Investment adjustment cost traded sector
i_{share}	0.24	Private investment to GDP	ψ	2.5	Inverse of Frisch labor elasticity
y^o_{share}	0.20	Natural resources to GDP	σ	2.94	Inverse of intertemporal elasticity of substitution
$g_{T,share}$	0.40	Tradables share in government purchases	ρ	1	Intra-temporal elasticity of substitution of labor
$c_{T,share}$	0.60	Tradables share in private consumption	ω	0.40	Measure of optimizers households in the economy
RF_{share}	0.02	Resources fund to GDP	χ	0.44	Elasticity of substitution between traded and non-traded goods
b_{share}	0.02	Government domestic debt to GDP	τ^L	0.10	Labor income tax rate
b^*_{share}	0.74	Private foreign debt to GDP	τ^C	0.10	Consumption tax rate
d_{share}	0.32	Concessional debt to GDP	τ^K	0.24	Capital return tax rate
$d_{c,share}$	0.16	Government external commercial debt to GDP	τ^o	0.26	Royalty tax rate on natural resources
gr_{share}	0.02	Grants to GDP	f_{floor}	0	Lower bound on for the resource fund
$R-1$	0.10	Domestic net real interest rate	v	0.6	Home bias of government purchases
$R^{RF}-1$	0.02	Foreign net real interest rate on savings	α_G	0.15	Output elasticity to public capital
R_d-1	0.01	Net interest rate on concessional debt	δ_G	0.07	Depreciation rate of public capital
R^f-1	0.04	Net real risk-free rate	Exp_{share}	0.452	Exports to GDP
$R_{dc}-1$	0.07	Net real interest rate on external commercial debt	Imp_{share}	0.466	Imports to GDP
α_N	0.45	Labor income share in non-traded sector	ρ_{z_T}	0.10	Persistence in TFP in traded sector
α_T	0.60	Labor income share in traded sector	ρ_δ	0.80	Persistence of depreciation rate of public capital
δ_N	0.10	Depreciation rate of $k_{N},_t$	ε	0.50	Steady-state efficiency of public capital
δ_T	0.10	Depreciation rate of $k_{T},_t$	$\tilde{\varepsilon}$	0.25	Lower efficiency on additional investment
η	1.00	Degree of capital account openness			

5 Results and Discussions

This study performs a simulation analysis using various fiscal policy instruments. In the simulation, the DSGE model is maintained first at a steady-state level, and then fiscal policy shocks are introduced to the model. Finally, I obtain the dynamic response of macroeconomic development to exogenous shocks. The DSGE model is processed using MATLAB, Dynare toolbox, and simulation toolbox. According to research practice, this study assumes that permanent exogenous shocks equal 1% of GDP. As previously discussed, the stochastic shocks in this study include government consumption shocks, public investment shocks, government transfer shocks, consumption tax shocks, and labor income tax shocks. Figures 1–5 display the simulation results for the critical macroeconomic variable responses to different exogenous shocks.

5.1. Increase in public consumption

In line with the literature, I begin the analysis by examining the impact of increased government consumption (Figure 1). A shock to government purchases raises aggregate demand, leading domestic firms to expand their production. Labor supply responds positively to increasing demand for production factors, resulting in higher real wages. A higher real wage induces liquidity-constrained households to work more, owing to both wealth and substitution effects. Therefore, non-optimizer household consumption increases. However, a higher real interest rate leads optimizer households to reduce consumption because their investments have high returns. This negative wealth effect on optimizer households, who has a smaller share but higher disposable income outweighs the positive results in non-optimizer households. Therefore, total private consumption declines. Initially, I observe an increase in private investment driven by firms' demand for capital utilization. A rise of 1% in government consumption as a proportion of the GDP results in a 1.4% increase in real GDP growth, indicating a positive multiplier effect. However, this effect is temporary and diminishes immediately after the real interest rate increases.

In addition, additional government consumption is financed through a fiscal deficit, leading to a surge in public debt of 8.1% over a decade. Increased debt results in external commercial debt (high interest-bearing debt) that exceeds the baseline by 4%. An increase in public consumption also causes the current account deficit to exceed the initial steady-state level by 0.5%. Therefore, fiscal policy through public consumption channels accelerates GDP growth in the short term but leads to external debt sustainability issues and pressure on BOP in the case of Mongolia, a resource-rich developing country.

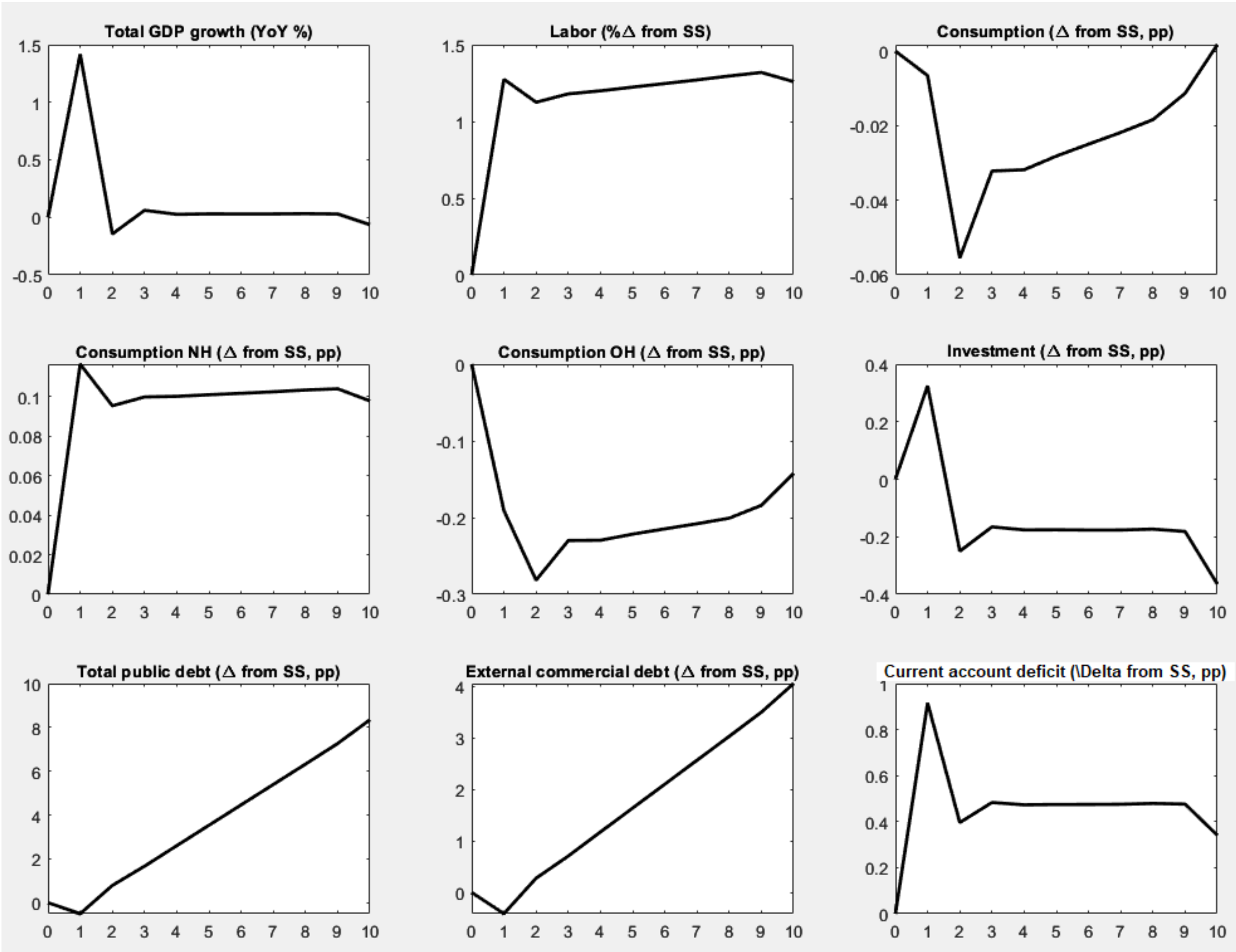

Figure 1: Public consumption shock (1% of GDP)

5.2. Increase in public investment

An increase in public investment shows similar short-term output gains to an increase in public consumption, delivering similar fiscal investment multipliers (Figure 2). However, an increase in public investment has a more positive effect on long-term economic growth than public consumption, permanently lifting potential output by 0.3%. This phenomenon is due to the gradual increase in private sector productivity through public capital stock.

Higher public investment also boosts demand for factors of production, labor, and capital. Consequently, labor will surge by 2.7% over the next decade. Higher labor income leads to an increase in the consumption of non-optimizer households, whereas the consumption of optimizer households is affected by rising interest rates. In this case, the surge in consumption by non-optimizer households outweighs the decline in consumption by optimizer households. Therefore, the simulation suggests an increase in total private consumption, confirming the crowding-in effect.

As the real interest rate increases, the resources available for private sector investment decrease. Therefore, the crowding-out effect dominates the overall response of private investment to a positive public investment shock. In addition to an expansionary effect on output, government investment shock yields the most substantial increase in tradable-sector production, improving national competitiveness (Figure 6). In this scenario, total public debt increases but is lower than the government consumption shock, which is related to the productivity increase in the private sector due to public capital.

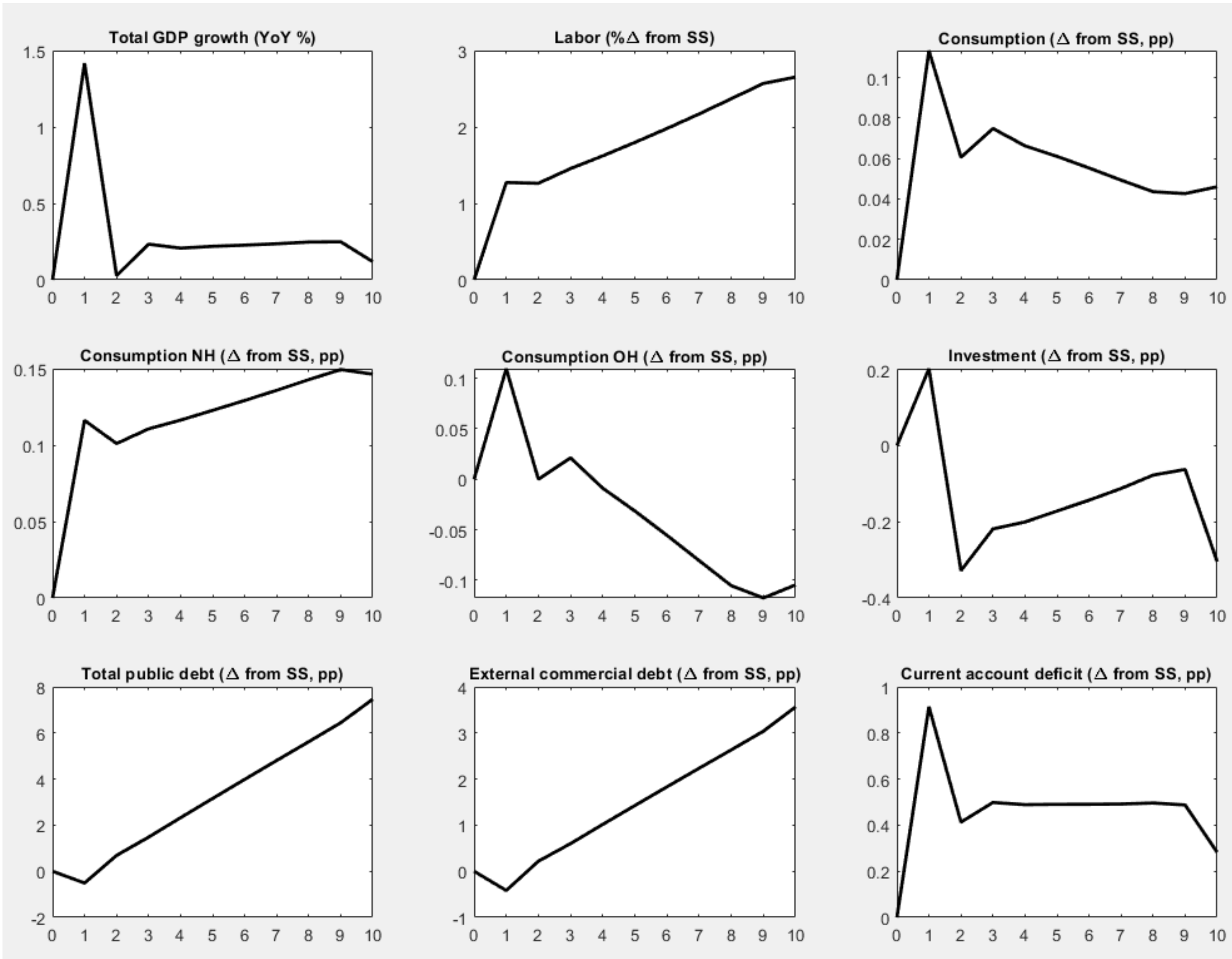

Figure 2: Public investment shock (1% of GDP)

5.3. Increase in public transfer

When compared to the multipliers indicated by other forms of government instruments in this study, the GDP multiplier associated with transfers is relatively lower (less than one). This result is rooted in the fact that the transfer multiplier receives a supporting contribution solely from the consumption of non-optimizer households, which represent only a certain segment of all households. Although their consumption increases, the escalating real interest rate forces optimizer households to limit their consumption.

A sharp increase in the consumption of non-optimizer households initially triggers an increase in aggregate demand. Higher demand contributes to increased capital utilization, raising capital interest rates. Interestingly, labor support from the transfer policy is the weakest compared with other policies, showing that households choose to work less when they receive extra income through transfers (Figure 3).

Therefore, the current transfer policies in Mongolia appear to have only a limited stimulus effect on output. In addition to the weakest support for labor and output, public debt surged by 8.7% in this scenario. Overall, the effectiveness of the transfer policies seems weak. It appears that the cash delivery program, with a large share of fiscal expenses, serves not as much as a stimulus for economic activity but instead acts as a redistributive instrument.

The study's results indicate that the Mongolian government must consider well-designed, targeted transfer policies that support education, training, and skill development. This approach may bolster human capital, improve productivity, and contribute to long-term economic growth.

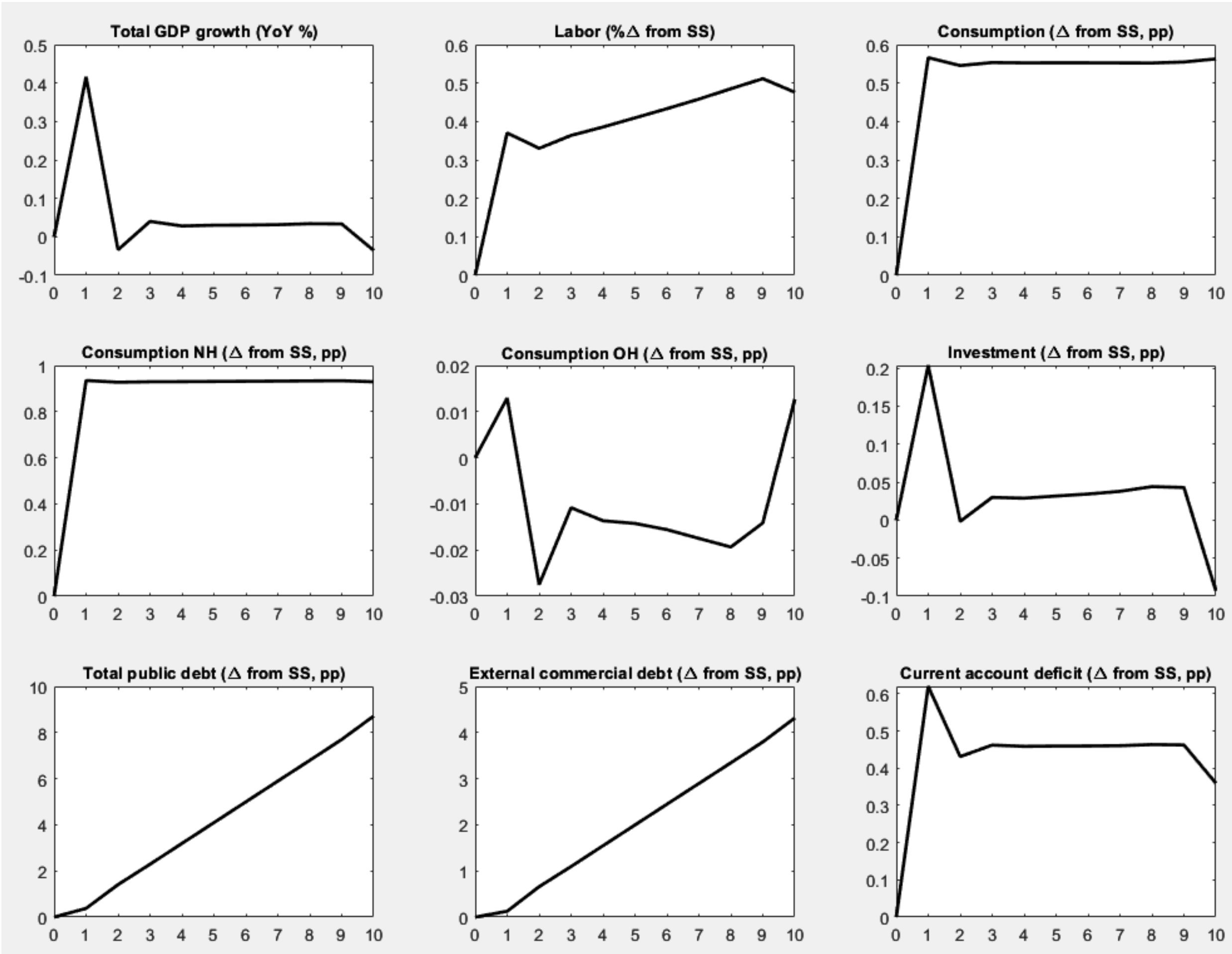

Figure 3: Public transfer shock (1% of GDP)

5.4. Decrease in consumption tax

Reducing the consumption tax rate produces an increase in disposable income of consumers. Different from previous policy options, both optimizer and non-optimizer households permanently increase their consumption, leading to a surge in aggregate consumption (Figure 4). In this scenario, the private consumption response is nearly 0.9% above the steady state and stabilizes at that level. Increased consumer spending contributes to output expansion or GDP growth. Although the consumption tax initially generates a multiplier of 1.2, this effect vanishes from the second year, causing the GDP multiplier to fade over a longer horizon. Among the various tools examined in this study, the most substantial increase in public debt is observed in this scenario (rising by 9.4% over the next decade). This elevated level of public debt, combined with changes in trade patterns toward more attractive foreign goods, also yields the highest current account deterioration compared with other fiscal tools. Thus, if a reduction in consumption tax leads to persistent budget deficits, it may have long-term negative consequences for government debt sustainability and overall economic stability. Therefore, the government needs to be cautious about the potential impacts of a consumption tax-reducing policy on its long-term fiscal position and current account deficit.

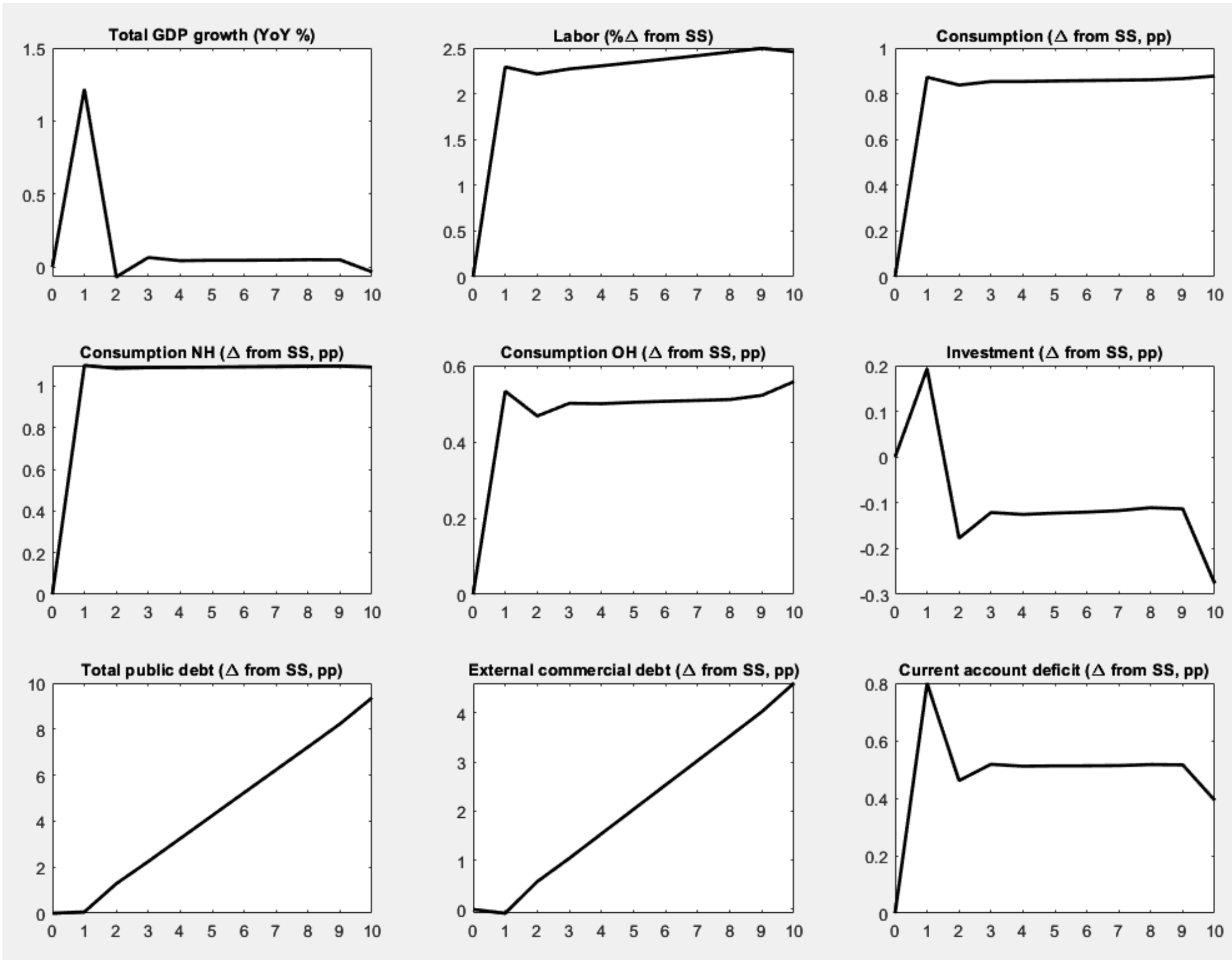

Figure 4: Consumption tax shock (1% of GDP)

5.5. Decrease in labor tax

The instant effect of a decrease in labor taxes is the reallocation of production inputs from capital to labor, which increases labor demand (Figure 5). Although a positive wealth effect results in falling labor, the model shows that substitution effects dominate. The rise in labor due to higher returns has a positive impact on GDP and household disposable income. The consumption of both types of households increases. The increase among non-optimizer households is stronger because labor income is a primary determinant of their consumption. The GDP multiplier is similar to that observed for the consumption tax. However, reducing labor taxes results in a gradual accumulation of government debt, reaching 6.8% over the course of the decade. This increase in government debt is relatively modest compared with the effects observed under alternative policy choices. In this scenario, the real exchange rate (the price ratio of tradable to non-tradable goods) exhibits a robust level of stability. This result is primarily attributed to the fact that the current account deterioration is the least pronounced among all the policy alternatives examined in this study.

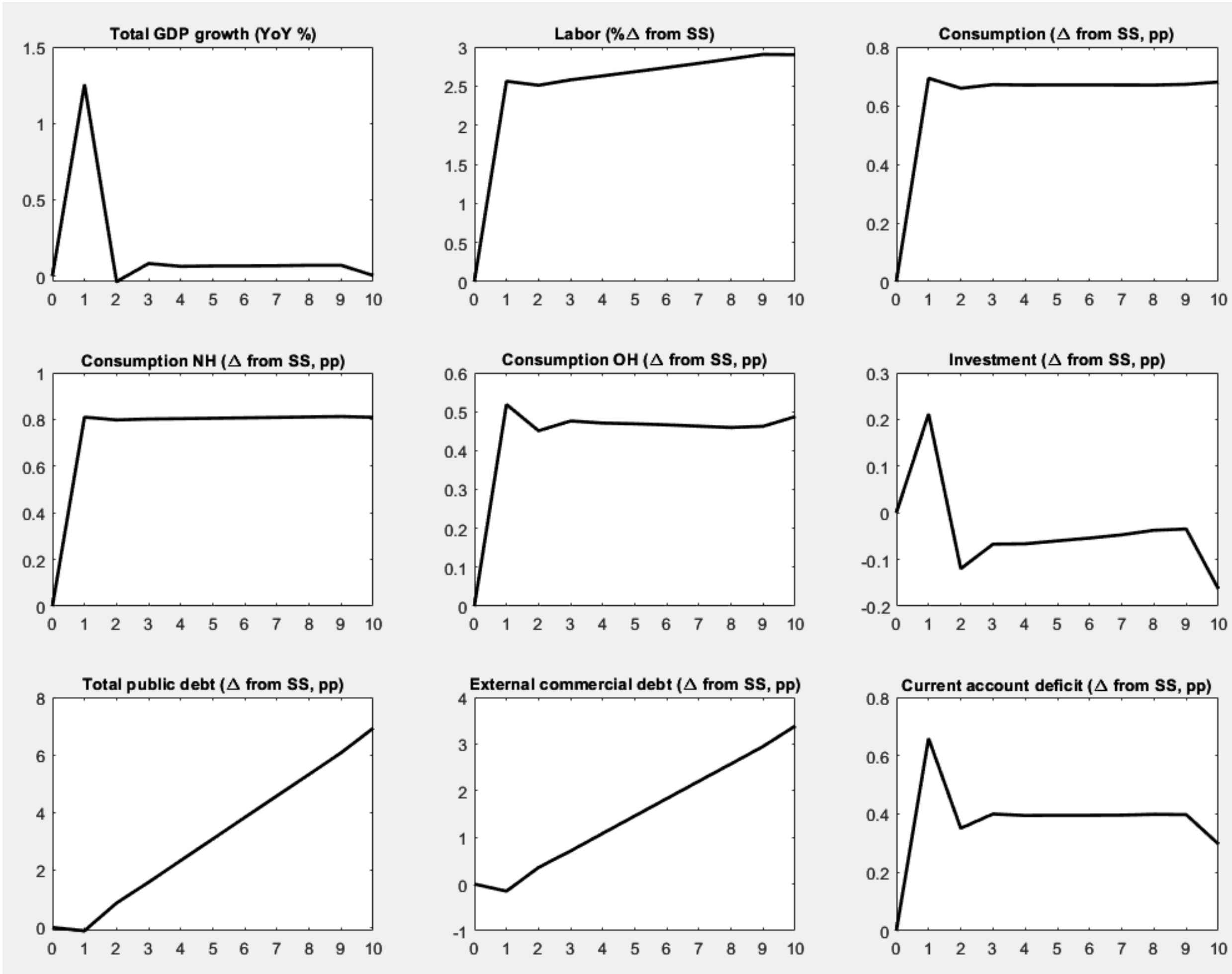

Figure 5: Labor tax shock (1% of GDP)

5.6. Comparison of fiscal policy shocks

Conducting real-life experiments on fiscal policies is costly, time-consuming, and unfeasible. Therefore, the role of simulation analysis is significant. Building on the existing literature, this study simulates the possible consequences of expansionary fiscal policy alternatives in Mongolia. By comparing the simulation outcomes, I highlight the fiscal policy strategies aligned with government policy priorities (Figure 6).

"Public investment" approach for productivity improvement and higher output. Public investment is a strategic choice when a government focuses on enhancing productivity. This approach aims to channel resources into projects yielding long-term economic benefits such as infrastructure development and technological advancement. The country bolsters tradable-sector production and promotes economic diversification by strengthening its competitive advantage in the global market.

"Labor tax" plan for sustaining macroeconomic stability. Reducing labor taxes has demonstrated effectiveness when the policy objective is to maintain macroeconomic stability for the longer horizon through fostering sharp labor growth, minimizing debt accumulation, and ensuring low current account balance and exchange rate volatility.

Escaping the "consumption tax" strategy assists in limiting debt expansion. Implementing a decrease in the consumption tax policy yields the most significant influence when the government aims to amplify private consumption. Lowering taxes on goods and services encourages consumers to spend more and drives sharp economic growth. However, this strategy leads to a rapid escalation in public debt and the most pronounced deterioration in current accounts over the next decade.

"Public consumption" is more likely to have a negative impact on the private sector. When the government is primarily concerned about crowding-out effects on private consumption and investment, it should not rely heavily on government consumption expenditure as a primary strategy. While public consumption initially leads to increased output, this effect rapidly diminishes due to increased real interest rates, triggering the crowding-out of both private consumption and investment.

Reconsidering "transfers" to bolster labor supply. Reducing transfers may be a valuable strategy if the government's reforms are designed to reinforce the labor supply. In 2022, a quarter of average household income has come from transfers and social allowances to Mongolia. This transfer inadvertently discourages individuals from seeking employment as they may receive financial support without working. By reducing and restructuring these transfers, the government may incentivize more people to actively participate in the labor market, potentially resulting in a larger workforce.

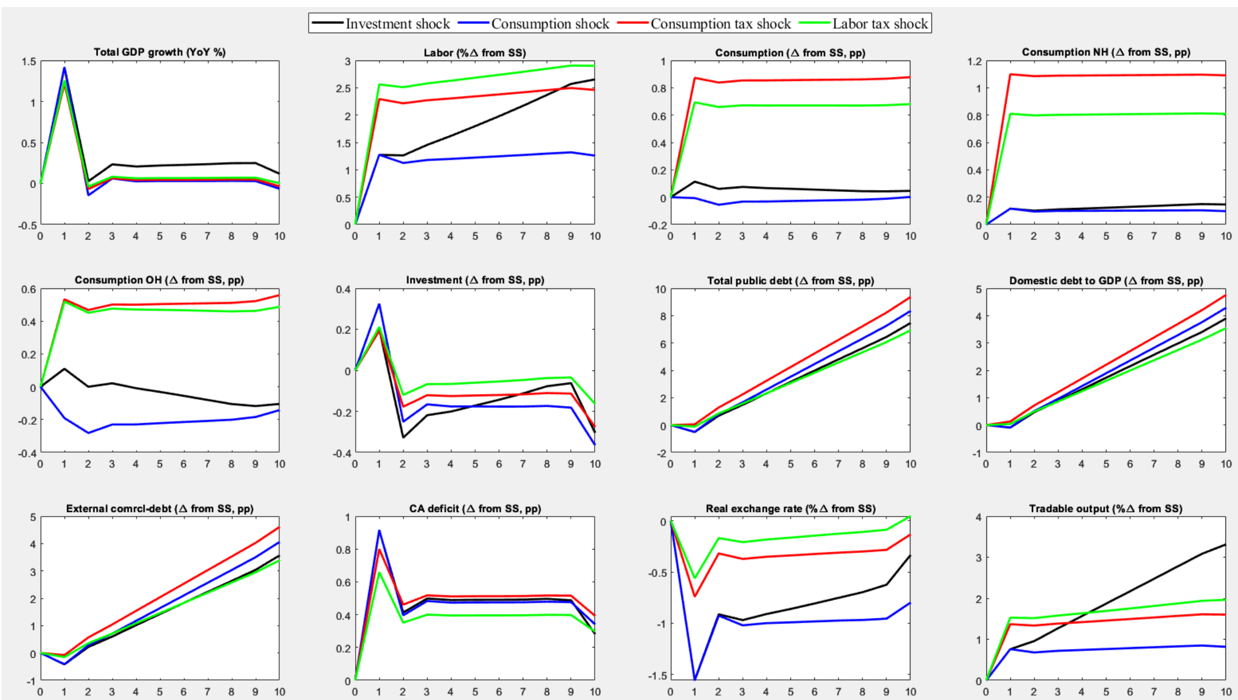

Figure 6: Comparison between outcomes (policies with positive multipliers)

This study found that public-investment-based fiscal stimulus has a persistent productivity gain, reflecting a positive effect on national competitiveness. Public-consumption-based fiscal stimulus, on the other hand, has a stimulative effect in the short-run, but the effect decreases significantly over time. The result is consistent with Baxter and King [14], and Blanchard and Perotti [15], Gali et al. [16], Drygalla et al. [30], Buffie et al. [44], Berg et al. [45], Melina et al. [46, 47], and Gurara et al. [48].

Consumption-tax-based stimulus measures have the most harmful effect on macroeconomic stability, having long-run negative consequences for government debt sustainability and economic growth. The result is consistent with Drygalla et al. [30] and Adrian et al. [36]. The study also revealed a lower multiplier for fiscal transfer, showing a huge discouraging effect on labor supply, which is contrast to the models by

Giambattista and Pennings [32] and Adrian et al. [36], but is consistent with other empirical studies such as Oh and Reis [12] and Leeper et al. [53].

Contrary to the main findings of most studies (e.g., Stähler and Thomas [27], Drygalla et al. [30], Bhattarai and Trzeciakiewicz [31], Adrian et al. [36]), this research illustrated that labor-income-tax-based fiscal stimulus creates greater macroeconomic stability for longer horizon. This is evidenced by modest increases in the public debt and the least deterioration in the current account.

Regarding the model specification, the model of Melina et al. [46] is the closest to my benchmark specification. However, the model was modified for a wide range of fiscal policy analysis for countries characterized by substantial dependence on imports, large reliance on mining sector, a high percentage of rule-of-thumb consumers, and a small-scale economy. On this framework, I found that fiscal adjustments that rely primarily on increases in public investment and cuts in labor taxes have a better chance of keeping macroeconomic stability for the long-run. On the contrary, fiscal adjustments that rely primarily on increases in public consumption and transfers, and reductions in consumption taxes are less likely to contribute to long-run sustainability.

6 Conclusion

This study contributes to the current understanding of the consequences of expansionary fiscal policy in the context of a small open economy by utilizing a DSGE model. The proposed model provides a holistic view of the economy and allows us to evaluate different exogenous fiscal policy tools. By simulating various fiscal policy options, this study provides insight into the macroeconomic effects of government policies and addresses the existing research gap in fiscal policy analysis, specifically for Mongolia. The findings of this study have implications for policymakers willing to design effective fiscal policies in the country.

The simulation results indicate that government consumption increases aggregate demand, rising non-optimizer household consumption. Initially, I observe an increase in private investment driven by firms' demand for capital utilization. A rise of 1% in government spending as a proportion of the GDP results in a 1.4% increase in real GDP growth, indicating a positive multiplier effect. However, this effect is temporary and gradually diminishes with an increase in the real interest rate. Policies exerting their effects through public consumption channels accelerate GDP growth in the short term but lead to crowding out both consumption and investment.

An increase in public investment shows a similar short-term output gain as an increase in public consumption, delivering a similar amount of fiscal investment multiplier. However, an increase in public investment has a more positive effect on long-term economic growth than public consumption, permanently lifting potential output by 0.3%. This result is due to the gradual increase in private sector productivity through public capital stock. The simulation suggests an increase in total private consumption, confirming the crowding-in effect. In addition to an expansionary effect on output, public investment leads to the highest increase in tradable-sector production, thereby positively contributing to national competitiveness.

The GDP multiplier associated with transfers is the lowest (less than one) because the transfer multiplier only receives a supporting contribution from the consumption of non-optimizer households. In addition, labor support from the transfer policy is the weakest compared with other policies, showing that households choose to work less when they receive extra income through transfers. Therefore, the current transfer policies in Mongolia appear to have a limited stimulus effect on output. The government must consider well-designed targeted transfer policies that support education, training, and skill development, which may enhance the human capital of the workforce and productivity in the long term.

Reducing the consumption tax rate triggers an increase in disposable income of consumers. In contrast to previous policy options, both optimizer and non-optimizer households increase their consumption, leading to a surge in aggregate consumption. However, the current account deterioration is the highest compared with other fiscal policies. This result is because lower consumption taxes lead to shifts in trade patterns by making foreign consumption goods more attractive. Moreover, public debt growth under this scenario is the highest; hence, policymakers should be cautious about external debt sustainability and balance of payment issues.

The instant effect of a decrease in labor tax is the reallocation of production inputs from capital to labor, which increases labor demand. The consumption of both types of households increases, with a sharp increase among non-optimizer households since labor income is the primary determinant of their consumption. The GDP multiplier is similar to that in the consumption tax case. However, this instrument preserves macroeconomic stability for a longer horizon by fostering sharp labor growth, minimizing debt accumulation, and ensuring a low current account balance and exchange rate volatility.

Overall, the simulation results confirm that reform in transfer policies should be oriented toward supporting individuals actively engaged in employment rather than having general coverage for everyone, suggesting that tax expenditure is a more favorable policy choice than lump-sum transfers.

This study analyzes fiscal policy tools in small, open, and developing economies that are abundant in commodities. However, it cannot directly answer policymakers' desire to find an optimal policy mix to sustain higher growth, create more jobs, and control debt levels. The research findings may also have limitations stemming from the model's assumptions, such as responsiveness to fiscal policy, elasticities, and investment adjustments, which may be challenging to apply to the real lives of many developing economies. Moreover, the effects of tax and spending measures may fluctuate across different business cycles and development phases of the country; however, these aspects have not been addressed in the present analysis.

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