A nexus between fiscal policy and inflation: a case study of Indonesia using SVAR model

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Article**
JEL: C32, E62, E63, H30
https://doi.org/10.3326/pse.47.4.5

* The author would like to thank Rudi Purwono, Unggul Heriqbaldi and the two anonymous reviewers for their very useful comments and suggestions.

** Received: March 22, 2023
Accepted: September 27, 2023

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Abstract

This paper investigates the dynamic effects of changes in three different government spending components – public sector wages and purchase of goods and services, energy and other subsidies, and transfers to households – on inflation and private consumption in Indonesia from 2001:Q1 to 2022:Q4, using a non-recursive structural VAR model. The model consists of eight endogenous variables: exchange rate, output gap, tax ratio, government spending, inflation, debt ratio, interest rate, and private consumption. Structural decompositions reveal that inflation responses differ across the three government spending components. Shocks to government subsidies are more likely to lead to higher inflation than shocks to other components. But even spending on subsidies does not always have a statistically significant effect on inflation. Surprisingly, government spending shocks – aggregate or by components – do not seem to have a statistically significant impact on private consumption. The main effect of fiscal expansions may thus be a deterioration in public finances.

Keywords: fiscal policy, government spending, structural VAR, inflation, Indonesia

1 INTRODUCTION

Monetary policy is widely believed to be the most effective tool of macroeconomic management, as it can help achieve both inflation and growth objectives efficiently (Campante, Sturzenegger and Velasco, 2021). For inflation targeting regimes in particular, there is a broad agreement about the effects of monetary policy on the economy through different transmission channels. Whenever monetary authorities perceive the inflation forecast as exceeding or falling below the target, monetary policy can be tightened or eased to steer inflation back towards the target relatively quickly and at relatively small cost in terms of potential output.

By comparison, fiscal policy is believed to be less effective in the fine tuning of "normal" cyclical developments. Arguments for its countercyclical use have been advanced, for instance, in the context of asymmetric shocks in a monetary union (Gootjes and de Haan, 2022; Kirsanova et al., 2007; Landmann, 2018) as individual countries cannot use monetary policy to respond to country-specific shocks. However, the Global Financial Crisis (GFC) in 2008-09 and, more recently, the Covid pandemic made macroeconomists and policymakers realise that monetary policy alone was not sufficient to stabilise the economy after very large shocks to the financial system or the supply side of the economy.

In Indonesia, for example, Bank Indonesia (BI) adopted inflation targeting in July 2005, with maintenance of rupiah stability as an overarching goal. As the GFC broke out in 2008, the rupiah depreciated sharply, the fall being exacerbated by a drastic decline of the Indonesia Stock Exchange index. BI initially responded to the crisis by increasing its policy rate to manage the volatility of the rupiah and defend it against depreciation pressure. However, the effectiveness of higher interest rates remained limited as the rupiah continued to weaken (Basri and Siregar,

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2009). BI consequently cut the policy rate and together with the government took actions to ensure adequate liquidity in the financial system. But despite the measures, the interbank market remained largely frozen. This led to the widening of interest spreads between the policy rate and key market rates, weakening monetary policy transmission (Basri and Rahardja, 2010) and making it difficult for the central bank to calibrate its policy response to inflation, output gap and exchange rate volatility (Basri and Siregar, 2009).

Given these limitations, the government implemented a countercyclical fiscal policy through income tax cuts, tax and import duty waivers, subsidies, and other government expenditure. A large share of the fiscal stimulus was provided through income tax cuts in order to boost spending by the household and corporate sectors. While this approach helped revive growth, it created a challenge for monetary policy in that it had to contain rising inflationary pressures without undermining economic recovery.

The motivation for this paper is to try to shed more light on the effects of fiscal expansion on inflation and private consumption. Since the GFC, the effectiveness of fiscal policy has been assessed mainly in terms of the size of fiscal multipliers. Several studies distinguish between tax and spending multipliers (Campante, Sturzenegger and Velasco, 2021; Fontana, 2009). Among the latter, many compare public consumption and investment multipliers (Ducanes et al., 2006; Hur, Mallick and Park, 2014). However, only a few have analysed multipliers associated with different components of current spending. For example, Jordà et al. (2022) and Li and Lin (2016) found that spending on social benefits may have contributed to a rapid rise in inflation and may even be potentially associated with stagflation. Makin and Layton (2021) questioned whether fiscal responses during the Covid pandemic were too comprehensive, of the right form, and whether generous cash handouts to encourage private consumption were appropriate in the first place.

This paper contributes to the literature by analysing how three different components of current government spending – public sector wages and purchase of goods and services, transfers to households, and energy and other subsidies – affected inflation and private consumption in Indonesia over the past two decades. The rationale for this decomposition is that the Indonesian government reformed the budget in 2015, moving to direct and targeted household subsidies and, recently, introducing unemployment insurance. The Covid pandemic led to additional transfers to vulnerable households.

Simulations using a non-recursive structural VAR model with eight endogenous variables – exchange rate, output gap, tax ratio, government spending components, inflation, debt ratio, interest rate, and private consumption – suggest that shocks to different government spending components generate different inflation paths. In particular, shocks to government spending on subsidies are more likely to lead to higher inflation than shocks to spending on government's own

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consumption (public sector wages and purchases of goods and services) or shocks to transfers to households. Interestingly, the estimated effects are not statistically significant in all periods. On the other hand, government spending shocks – aggregate or by components – do not seem to have any statistically significant impact on private consumption. These results suggest that fiscal and monetary authorities need to look carefully at the composition of changes in public expenditure when adjusting their countercyclical policy settings. While fiscal expansions in Indonesia may not affect inflation as much as often feared, they do not seem to affect private consumption either. The main effect of fiscal expansions may thus be a deterioration of public finances.

The remainder of the paper is structured as follows: Section 2 sets this paper within the broader context of the empirical literature on the effects of fiscal policy on inflation. Section 3 describes the empirical approach. Section 4 discusses the main findings of the analysis. Section 5 concludes.

2 LITERATURE REVIEW

To put the main findings of this paper into perspective, this section reviews some key results in the recent empirical literature on the effects of fiscal policy on growth and inflation in emerging market economies (EMEs) like Indonesia.

One general finding is that Asian EMEs tend to be fiscally conservative in normal times. Where this is not the case, e.g., the pro-cyclical fiscal expansion during the pre-GFC boom in Indonesia (Herrera, Kouame and Mandon, 2019), the outcome is usually lower economic growth, higher output volatility and higher inflation in the medium term (McManus and Ozkan, 2015). By contrast, counter-cyclical fiscal policy such as the boost in public spending and tax cuts to stimulate economic activity during the GFC are generally found to be effective (Abdurohman, 2013; Kraay and Serven, 2013). The relatively healthy fiscal positions of Asian EMEs contributed to the success of fiscal stimulus in boosting aggregate demand (Ducanes et al., 2006; Hur, Mallick and Park, 2014).

Another general finding is that fiscal expansions in EMEs tend to have significant effects on inflation depending on fiscal space and economic conditions (Cevik and Miryugin, 2023; IMF, 2023). For example, Asandului et al. (2021) and Ferrara et al. (2021) found that discretionary government spending could generate strong enough inflationary pressures to destabilise economic activity. Sriyana and Ge (2019) established an asymmetric effect of fiscal policy on inflation in both short and long run in Indonesia. For EMEs in Central and Eastern Europe, Asandului et al. (2021) found insignificant effects of fiscal policy on inflation and growth in the short run, and negative ones in the long run. Several studies highlighted the importance of supply-side effects of government spending: to the extent it boosts productivity growth, public expenditure may lower inflation in the long term (Di Giorgio, Nisticò and Traficante, 2018; Gabriel, Klein and Pessoa, 2023; Jørgensen and Ravn, 2022).

The inflationary effects of the different government spending components, which we focus on in this paper, have received less attention to date. Existing studies typically focus on the fiscal multiplier effects on output or consumption (Abdurohman, 2013; Perotti, 2004; Sahminan et al., 2017). Klein and Linnemann (2023) found that positive shocks to public investment and public consumption both lead to persistent increases in GDP and productivity, but, somewhat counterintuitively, shocks to public consumption are associated with lower and shocks to public investment with higher inflation. In contrast, Bhattarai and Trzeciakiewicz (2017) found that positive expenditure shocks to public consumption and transfers to households both result in persistently higher inflation, but the effect of public investment shocks on inflation was temporary, as they raise total factor productivity fairly quickly.

The recent Covid pandemic renewed the interest in studying the counter-cyclical role of social protection spending, including the disaggregated analysis of the effects of different types of social benefits such as cash transfers, unemployment insurance, and pensions (Faria-e-Castro, 2021; Sanches and Carvalho, 2022), and the distinction between conditional and unconditional transfers (Bayer et al., 2020). Most findings point to an asymmetric response of private consumption to transfers across households. For example, in Germany and the United Kingdom, public transfer shocks led to higher consumption of liquidity-constrained (i.e., non-Ricardian) households, but lower consumption of optimising (i.e., Ricardian) households (Bhattarai and Trzeciakiewicz, 2017; Hinterlang et al., 2023).

Exploring the role of monetary policy for the transmission of fiscal expansion, Bayer et al. (2020) found that the public transfers multiplier was higher when monetary policy was less responsive to inflation. Budiman et al. (2022) found that monetary and fiscal policy coordination facilitated the economic recovery in Indonesia, and that fiscal policy shocks generated less inflation in the long run than monetary policy shocks.

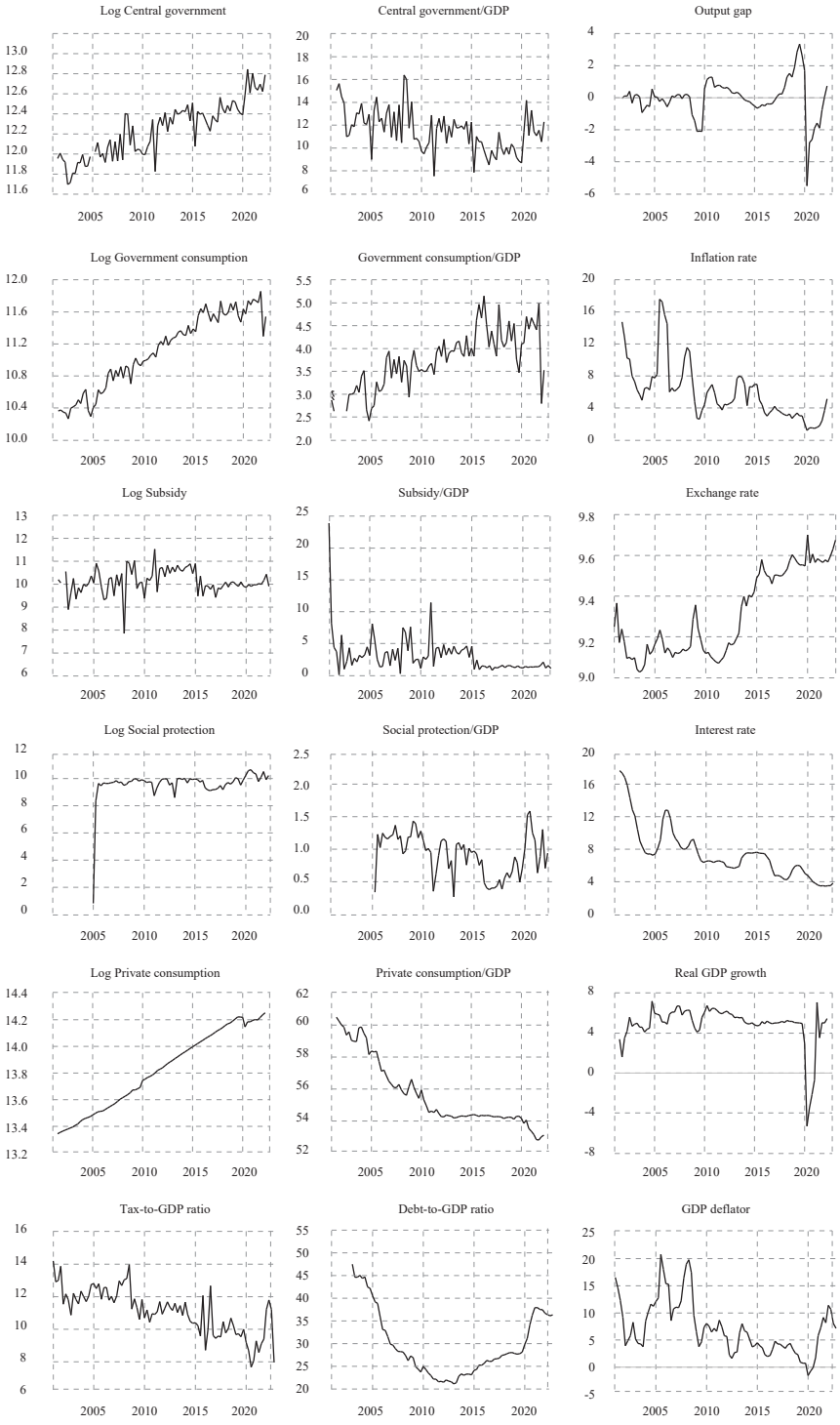
3 METHODOLOGY

3.1 DATA

To analyse the dynamic effects of central government spending on inflation and economic activity in Indonesia with an SVAR model, quarterly data from 2001:Q1 to 2022:Q4 are used. Earlier observations in this period are rebased to constant 2010 billion rupiahs to get a longer time series for national accounts. The variable output gap is derived by extracting the trend component of GDP using the Hodrick-Prescott filter. All series with the exception of output gap, inflation rate, interest rate, debt ratio and tax ratio are expressed in logarithms; nominal values are deflated with the GDP deflator, obtained from the ratio of nominal to real GDP at 2010 prices. Data definitions, sources, and summary statistics are shown in appendix tables A1 and A2. Graph 1 shows the main data series adjusted for seasonality using the US Census X-13 method.

GRAPH 1

Plot of variables



Source: Author's calculation based on data from sources indicated in appendix table A1.

Total central government expenditure in Indonesia amounts on average to 11.6% of GDP over the sample period. Of this, government´s own consumption (public sector wages and purchases of goods and services) accounts for 34% on average, but surges to more than 50% during the Covid pandemic. Transfers to households account for 9%, subsidies for 22% of total expenditure. The government spending reforms of 2014-15 saw the share of subsidies shrinking to 13%, and transfers to households growing. Indonesia has a low revenue base, with total tax revenue accounting for only around 11% of GDP over the sample period. The tax ratio fell sharply after the GFC in 2008 and again in 2016 following the spending reforms. The ratio of public debt-to-GDP was declining through 2012 as the government continued to dispose of assets taken over during the Asian Financial Crisis. The ratio has since steadily risen, although it remains relatively low compared with other EMEs, partly because of the debt limit rule adopted by the government.

Following the GFC, Indonesia experienced a negative output gap for about two years. The quantitative easing program in the United States contributed to a commodity boom, which boosted output growth in Indonesia. Financial sector activity expanded as well, leading to exchange rate appreciation. The recovery stalled after Indonesia and other EMEs were hit by the so-called “taper tantrum” about Fed policies in mid-2013. Private consumption amounted on average to 55.7% of GDP over the past two decades.

The annual inflation rate averaged 6.2% over the entire sample period. It declined from the high of 17.8% in 2005 to 1.2% during the Covid pandemic. The policy interest rate also declined, reflecting the central bank's efforts to keep inflation within the target range of 3-5%. The nominal rupiah/US dollar exchange rate has depreciated since 2011.

3.2 ECONOMETRIC ESTIMATION

The VAR (p) model used for estimation can be written in reduced form as:

$$y_t = \upsilon + A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t = A Y_{t-1} + u_t \quad (1)$$

where $Y_{t-1}^{'} \equiv \left(1, y_{t-1}^{'}, \cdots, y_{t-p}^{'}\right)$ is (Kp + 1)-dimensional, $A \equiv \left[\upsilon, A_1, \cdots, A_p\right]$ is K × (Kp + 1)-dimensional, and $u_t \sim \left(0, \Sigma_u\right)$ is a K-dimensional white noise residual process. The y_t is a (Kp + 1)-dimensional vector of variables that may be integrated of order 1 and possibly cointegrated, p is the prespecified maximum autoregressive lag order, and the K × 1 vector υ is a fixed, non-stochastic intercept term.

The VAR (p) model in structural form can be generally formulated as:

$$\mathrm{A} y_t = \mathrm{A}\upsilon + A_1^* y_{t-1} + \cdots + A_p^* y_{t-p} + \varepsilon_t = A^* Y_{t-1} + \varepsilon_t \quad (2)$$

where $A_i^* \equiv \mathrm{A} A_i (i = 1, \ldots, p)$, A is an invertible K × K matrix, and $\varepsilon_t \sim (0, \Sigma_\varepsilon)$. Structural shocks or innovations ε_t are assumed to be serially uncorrelated

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("orthogonal") and have a diagonal covariance matrix Σ_ε of full rank, such that the number of shocks coincides with the number of variables (see Kilian and Lütkepohl, 2017). This assumption is required to consider the dynamic impact of an isolated shock (Breitung, Brüggemann and Lütkepohl, 2004). A and A^* represent the matrix of contemporaneous and lagged coefficients, respectively.

This specification implies that each variable can be affected by current and past realisations of the other variables. The identifying restrictions in this model are imposed on both matrix A and matrix B, which represent the instantaneous relations between the variables and the impact or short-run effects of the structural shocks, respectively. The reduced-form disturbances u_t are linked to the underlying structural shocks ε_t expressed in the relationship $u_t = A^{-1}B\varepsilon_t$ where $u_t = \mathrm{A}^{-1}\varepsilon_t \sim (0, \Sigma_\varepsilon)$ is a white noise error term with positive definite covariance matrix $\Sigma_u = \mathrm{A}^{-1}\Sigma_\varepsilon \mathrm{A}^{-1\prime}$. This identification strategy is known as the "AB" model (following Amisano and Giannini, 1997):

$$Au_t = B\varepsilon_t \qquad \varepsilon_t \sim (0, I_K) \tag{3}$$

The structural VAR model used in this paper consists of eight endogenous variables: exchange rate (ER), output gap (GAP), tax revenue to GDP ratio (TAX), government spending components (GOV), inflation rate (INF), debt-to-GDP ratio (DEBT), interest rate (INT), and private consumption (PC). Four models of government spending shocks are estimated: a baseline model of total central government expenditure (CG); government's own consumption (GC), i.e., spending on public sector wages and government purchases of goods and services; social protection spending, i.e., transfers to households for social protection (SP); and spending on energy and other subsidies (SUB). The model for policy shocks is specified as:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & a_{23} & a_{24} & 0 & 0 & 0 & 0 \\ 0 & a_{32} & 1 & a_{34} & 0 & a_{36} & a_{37} & 0 \\ 0 & 0 & 0 & 1 & 0 & a_{46} & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 & 0 \\ a_{61} & 0 & 0 & a_{64} & a_{65} & 1 & a_{67} & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & 0 & 1 & 0 \\ a_{81} & a_{82} & a_{83} & a_{84} & a_{85} & a_{86} & a_{87} & 1 \end{bmatrix} \begin{pmatrix} u_t^{ER} \\ u_t^{GAP} \\ u_t^{TAX} \\ u_t^{GOV} \\ u_t^{INF} \\ u_t^{DEBT} \\ u_t^{INT} \\ u_t^{PC} \end{pmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & b_{88} \end{bmatrix} \begin{pmatrix} \varepsilon_t^{ER} \\ \varepsilon_t^{GAP} \\ \varepsilon_t^{TAX} \\ \varepsilon_t^{GOV} \\ \varepsilon_t^{INF} \\ \varepsilon_t^{DEBT} \\ \varepsilon_t^{INT} \\ \varepsilon_t^{PC} \end{pmatrix} \tag{4}$$

The matrix of contemporaneous variables (i.e., matrix A) in equation (4) is identified by non-recursive short-run restrictions. The SVAR model is "just-identified", with 92 restrictions imposed, that is $2K^2 - K(K+1)/2$ restrictions. Restrictions on A and B take the form of assumptions about the structure of contemporaneous feedback of variables in the SVAR and assumptions about the correlation structure of the errors, respectively. These assumptions are drawn from economic theories and institutional knowledge. Both VAR Granger causality / block exogeneity Wald tests, and pairwise Granger causality tests are used to guide the ordering of variables and the

setting of restrictions. For example, a variable that Granger-causes another variable (when the null hypothesis of no Granger-causality is rejected at the 5% level of significance) is considered more exogenous with respect to the latter.

Exchange rate is considered the most exogenous of all variables, driven mainly by external factors such as global shocks, terms of trade changes, and capital flows. It is ordered first in the model because it influences in turn other macroeconomic variables such as output, inflation, and interest rates.

Fiscal shocks are ordered before the other variables given that the paper focuses on their effects. Tax to GDP ratio is ordered in the upper row because it does Granger-cause the succeeding variables across several lag periods, based on pairwise Granger causality tests. Note, however, the $a_{43} = 0$ restriction, as we assume that policymakers set public expenditure before taxes. This assumption reflects decision and implementation lags in fiscal policy, which suggest non-instantaneous or even no discretionary response of fiscal policy to unexpected contemporaneous movements in activity (Blanchard and Perotti, 2002; Kilian and Lutkepohl, 2017). Conversely, tax revenue responds to exogenous government spending shocks, i.e., $a_{34} \neq 0$ whenever such shocks lead to an increase in interest rate, subsequently raising the level of public debt (Juhro, Narayan and Njindan Iyke, 2022).

To contain political pressure to overspend and thereby ensure fiscal responsibility and debt sustainability, the Indonesian government adopted in 2004 budget deficit and debt rules, which cap annual deficits at 3 percent of GDP and gross outstanding public debt at 60 percent of GDP.[1] As debt levels are also affected by factors over which the government has less control, such as the exchange rate and interest rates, this study follows the composite fiscal rule given by equation (5):

$$\tau_t = \tau_{t-1} + \left\{ \Omega \left[\left(g_t - \tau_t y_t + R_t B_{t-1} \right) - \Psi_1 y_t \right] + \phi \left[B_{t-1} - \Psi_2 y_t \right] \right\} \Big/ y_t \qquad (5)$$

where $\tau_t y_t$ is tax revenue; g_t is government spending; R_t is the nominal interest rate; B_{t-1} is the nominal value of outstanding government debt; and $\Psi_1 \geq 0$ and $\Psi_2 > 0$ are the deficit- and debt-to-GDP ratio targets.[2] The first term in brackets refers to the budget balance rule and the second to the debt rule: the fiscal authority is assumed to respond to deviations of the budget deficit and public debt from their target values by adjusting taxes by fractions Ω and ϕ. Before the Covid pandemic, Indonesia's fiscal performance was not constrained by fiscal rules, but after exceeding the budget deficit ceiling of 3% of GDP in 2020 and 2021, the government had to suspend the rules temporarily. Stronger than expected growth in tax revenue has since helped the government consolidate its finances.

[1] These rules draw on the European Union's Stability and Growth Pact.

[2] Nominal values are used for both budget deficit rule and public debt rule. Railavo (2004), from whom this rule is adopted, used real values to assess the effects of monetary policy on fiscal variables through the price level.

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The use of fiscal rules is modelled in the third row of matrix A: some shocks, such as output, government spending, debt ratio, and interest rates, are assumed to have contemporaneous effects on the tax to GDP ratio. By construction, changes in the debt ratio can influence government's fiscal choices, including changes in spending.

Output gap and inflation are ordered prior to the interest rate, as the central bank is assumed to follow the Taylor rule (6):

$$i_t^T = \overline{r} + \pi^* + \alpha_1 \left(\pi_t - \pi^* \right) + \alpha_2 \left(y_t - y_t^* \right) \tag{6}$$

where i_t^T, $\overline{r}$, π_t, π^*, and $y_t - y_t^*$ denote, respectively, the policy interest rate, the equilibrium interest rate, the inflation rate, the inflation target, and output gap. In Indonesia, the central bank adjusts its policy interest rate (a_{71}) whenever there are sharp movements in the rupiah exchange rate, as exchange rate stability is an integral part of its efforts to support low and stable inflation.

Private consumption is modelled so as to capture aggregate demand shocks. Neoclassical models predict a negative effect of government spending on private consumption as they assume Ricardian behaviour of consumers, while Keynesian models predict a positive effect.

4 RESULTS AND DISCUSSION

Appendix table A3 shows the results of the Augmented Dickey-Fuller (ADF) test for the presence of unit roots, and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test for trend-stationarity. Government's own consumption, debt-to-GDP ratio, exchange rate and private consumption are found to be I(1) or difference-stationary. The total central government expenditure, tax-to-GDP ratio and interest rate are found to be I(0) but trend-stationary. The public debt ratio remains non-stationary under the KPSS test after first differencing. A structural break was found after performing the breakpoint unit root test (appendix table A4). Where the deterministic trend and the dummy breaks are found to be statistically significant, they were included in the regression equation to generate the fitted line and residual series. The residual series was also checked for stationarity and was then included as an adjusted variable in the SVAR model.[3]

The SVAR model can accommodate both I(0) and I(1) variables. As some variables are I(1), they were tested for cointegration. Neither the Engle-Granger nor the Phillips-Ouliaris tau statistics indicated any cointegration between the I(1) variables (appendix table A5).

In the SVAR estimation different lag lengths were used in sub-models based on the Hannan and Quin (1979) recommended lag order. For stationary variables, the presence of autocorrelation for different lag orders was checked for each model

[3] Another option to adjust for trend-stationarity and structural breaks – include deterministic trend and/or dummy directly in the VAR as an exogenous variable – was not used because of the limited sample size.

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with the Lagrange multiplier statistic in VAR residual serial correlation LM tests (so-called bottom-up sequential testing). The null hypothesis was no correlation in lag order. Normality test of the innovations of VAR sub-models, i.e., normality of the observed variables, is not required for the validity of most of the asymptotic procedures related to VAR modelling (Kilian and Lutkepohl, 2017). The VAR systems of all sub-models are stable, with modulus smaller than 1.

4.1 IMPULSE RESPONSE FUNCTIONS

Graph 2 shows the impulse responses of endogenous variables to shocks ("innovations") to the individual components of government spending.

Panel A shows impulse responses to an increase in total central government spending. The output gap and the tax-to-GDP ratio rise on impact. The inflation rate jumps initially but falls back quickly although the impact is not statistically significant. This result is surprising but is in line with Surjaningsih, Diah Utari and Trisnanto (2012), who found that government spending shocks in Indonesia had a persistent negative effect on inflation beginning with the fourth quarter. A few other studies also found flat or even negative effects of government spending shocks on inflation (Jørgensen and Ravn, 2022; Mountford and Uhlig, 2009; Perotti, 2004). Kühn, Muysken and van Veen (2010) argued that direct and indirect productivity effects of government spending could boost aggregate demand without a major impact on inflation. Relatedly, a recent study of Gabriel, Klein and Pessoa (2023) found that an increase in regional government spending led to a significant fall in inflation in the impact period and one year after the fiscal intervention.

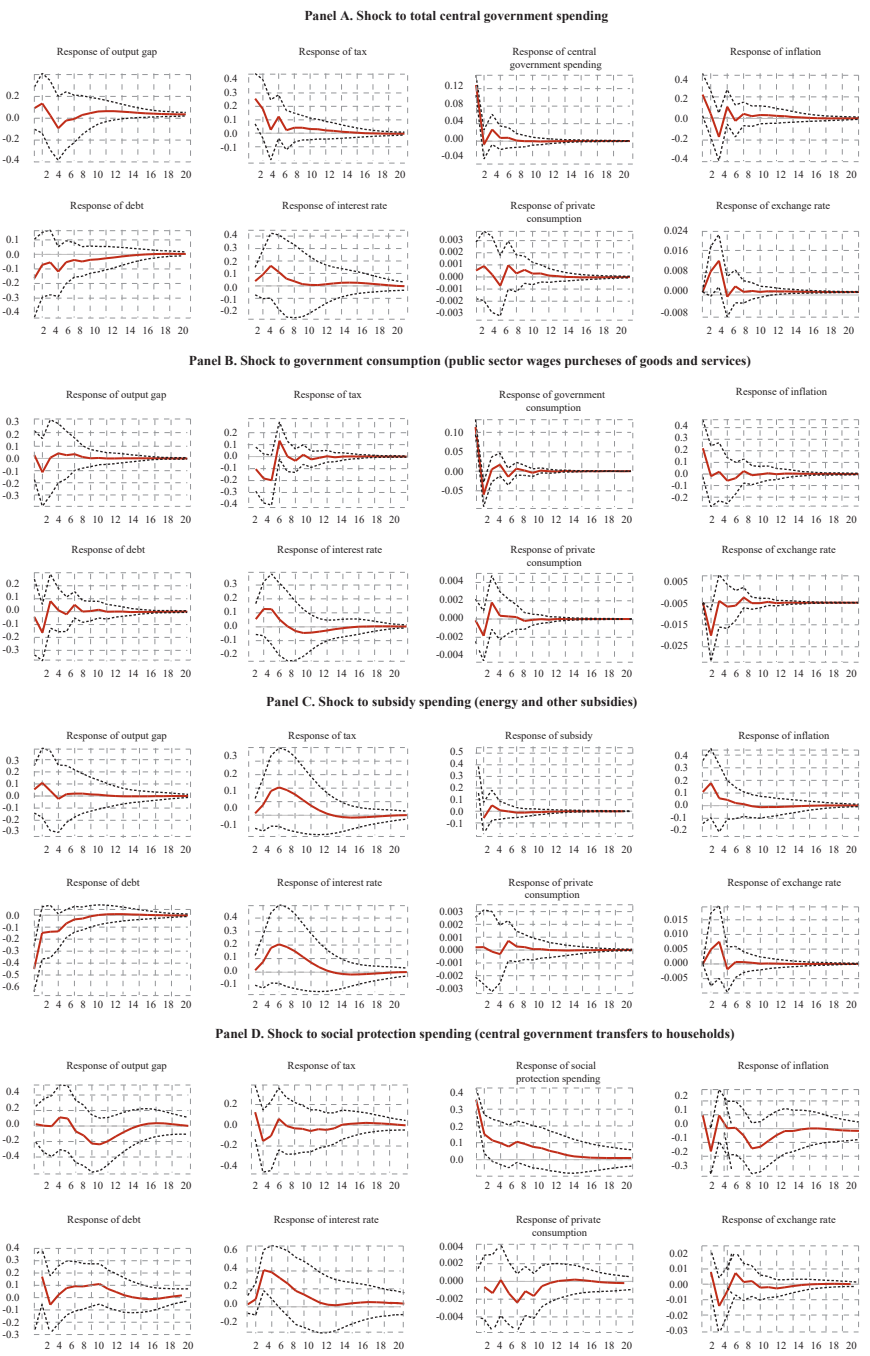
Another surprising result is the initial fall in debt-to-GDP ratio. This could partly reflect the longer-term trend of declining debt-to-GDP ratio through 2012, and partly the subsequent use of fiscal rules, which limited the increases in central government spending to tax revenue growth over the medium term. Auerbach and Gorodnichenko (2017) also found cases of expansionary fiscal policy in downturns that reduced the debt-to-GDP ratio.

Importantly, policy interest rates increase in response to higher government spending, which is consistent with the predictions of most macroeconomic models. Private consumption increases slightly, but is not statistically significant. The nominal exchange rate depreciates, contrary to the standard view that higher interest rates strengthened the exchange rate.[4] Ravn, Schmitt-Grohe and Uribe (2012) suggested that higher domestic demand provided an incentive for firms to lower markups, making the domestic economy more competitive relative to the rest of the world. Di Giorgio, Nisticò and Traficante (2018) argued that productive government spending made the private sector more competitive, lowering marginal costs and inflation, and ultimately improving competitiveness.

[4] Unlike most literature, which uses real exchange rates, this study follows Juhro, Narayan and Njindan (2022) in using nominal exchange rates. In the case of Indonesia, the real and nominal effective exchange rates of the rupiah follow practically the same trend. Higher government spending increases aggregate demand, which leads the central bank to raise interest rates and thereby strengthens the domestic currency.

GRAPH 2

Impulse responses to structural VAR innovations in government spending



Note: The size of the shock is one unit or one percentage point. The solid line refers to the impulse response of the structural decomposition; dashed lines refer to the ± 2 standard error bands. Lag length is 2 across government spending components, except for social protection, where lag length is 3.

Panel B shows impulse responses to an increase in the first subcomponent of government spending studied here, i.e., public sector wages and purchases of goods and services. Output gap is practically negative over the first three quarters, indicating a lagged response to fiscal expansion. Similarly, the tax-to-GDP ratio increases only after three quarters. Inflation rises on impact with the spending shock, but falls after three quarters. Debt-to-GDP ratio initially falls but starts rising from the third quarter. Higher public sector consumption triggers a tightening of the monetary policy rate. The impact on private consumption is positive but negligible. In contrast to the response to an increase in *total* central government spending, nominal exchange rate appreciates for this sub-component.

Panel C shows impulse responses to an increase in the sub-component energy and other subsidies. The effect on output gap is generally positive, suggesting that higher subsidies boost aggregate demand. This is not surprising given that subsidies accounted for about 25% of total central government spending before the 2014-15 energy subsidy reform. The tax-to-GDP ratio rises on impact and tapers off through the eighth quarter. While this suggests that subsidies might be partly self-financed, macroeconomic evidence suggests that in the medium term higher subsidies weaken the fiscal balances (Jazuli, Steenmans and Mulugetta, 2021). As expected, subsidies increase inflation: the effect is quite persistent, lasting six quarters. This finding has not been documented in the literature so far. De Castro and Hernández (2006), for instance, found large positive effects on inflation only for *total* government spending. Monetary policy tightens in response to higher subsidy spending. But the debt-to-GDP ratio falls initially and rises gradually to reach the pre-shock level only after eight quarters. Private consumption increases modestly as a result of higher subsidies. The nominal exchange rate depreciates.

Panel D shows impulse responses to an increase in social protection spending, i.e., transfers to households. The output gap does not respond to an increase in transfers to households until the third quarter, and even then the rise is temporary. The tax-to-GDP ratio increases on impact but subsequently falls below the pre-shock level. The response of inflation is volatile but largely positive over the first six quarters; thereafter inflation turns negative for six quarters. Debt-to-GDP ratio grows over the years. The monetary authorities tighten policy rates in response to higher spending on social protection, as expected. Surprisingly, the impact on private consumption is negative, albeit not statistically significant. Although social protection expenditure in Indonesia accounts for only 1.7 percent of private consumption over the sample period, this counterintuitive result might reflect Ricardian behaviour of consumers. Expectations about duration of social protection schemes and possible future tax increases to finance higher social protection spending might deter households from spending the transfers they receive. This behaviour has also been observed in Germany and United Kingdom (Bhattarai and Trzeciakiewicz, 2017; Hinterlang et al., 2023). The nominal exchange rate is quite volatile in response to higher household transfers over the first six quarters.

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4.2 ROBUSTNESS CHECKS

Three sets of robustness checks against benchmark results for each government spending component were performed. First, government spending and private consumption were redefined in terms of percentages of real GDP. Second, real private consumption was redefined in terms of real per capita consumption. Third, output gap was replaced with industrial production gap, CPI inflation with GDP deflator inflation, and the central bank's seven-day policy rate with Bank Indonesia lending rate.[5]

When government spending and private consumption are expressed in percentages of GDP, the results do not deviate from the benchmark model, with the exception of shocks to social protection and subsidies (appendix graph A1). The negative impact of higher transfers to households on inflation is more pronounced, i.e., more persistent relative to the benchmark model. In response to a positive subsidy shock, inflation still rises, but falls by the third quarter compared with sixth quarter in the benchmark model. The response of debt-to-GDP ratio to shocks across all government spending components remains virtually the same relative to the benchmark model. The response of private consumption as a percentage of GDP to the shocks in individual component shocks is amplified (i.e., higher multiplier). Still, there is no evidence of higher household consumption in response to an increase in social protection spending. Surprisingly, shocks to government spending components lead in some cases to lower policy rates, at the earliest by the fifth quarter in response to higher social protection spending. In the baseline model, policy rates normally increase in response to higher spending.

When private consumption is redefined in per capita terms, the results remain robust; the main difference is that the impact of shocks on private consumption is smaller.

In the third set of robustness checks, the model was estimated using alternative indicators for output gap, interest rate and inflation (appendix graph A2). The benchmark results shown in appendix graph A3 remain robust to replacement of output gap with industrial production gap and CPI inflation with GDP deflator across all sub-models. The main difference is that inflation measured by GDP deflator responds less to government spending shocks than CPI inflation. Full robustness checks could not be performed for model specifications using the central bank lending rate instead of the seven-day policy rate due to the presence of serial correlation in some sub-models. Where serial correlation was not an issue, the results were robust to the change in definition of interest rate.

[5] The alternative variables have also been tested for unit roots, structural breaks, etc.

5 CONCLUSION

This paper attempted to fill the gap in the empirical literature on the effects of government spending on inflation and other macroeconomic variables by estimating a structural VAR model that disaggregated central government expenditure in Indonesia to three components: government consumption (public sector wages and purchases of goods and services), energy and other subsidies, and transfers to households. Overall, the impulse responses show that transfers to household have the most persistent effects.

For total central government spending, the inflation rate jumps initially but falls back quickly. The impact is not statistically significant, however. A few other studies also found flat or even negative effects of a government spending shock on inflation. Shock to public sector wages and purchases of goods and services has in general a small effect on inflation. In contrast, there seems to be evidence of persistent effects of higher energy and other subsidies on inflation. The response of inflation to increases in social protection transfers to households is largely positive over the first six quarters, but weakens thereafter.

Surprisingly, government spending shocks do not seem to have a statistically significant impact on private consumption. What impact can be detected seems to be transitory, with only government subsidies leading to somewhat more persistent increases in consumption. In particular, transfers to households do not seem to stimulate private consumption at all. Perotti (2004) reported similar findings for a sample of five OECD countries: he found no evidence that transfers to households, even if disbursed quickly, were superior in boosting consumption to increases in other government spending components. For Indonesia, Saraswati and Wahyudi (2018) argued that transfers to households failed to stimulate household consumption in both short- and long-run because, in contrast to regular wage increases, they failed to raise labour productivity. Other possible effects of transfers reported in the literature – e.g., an easing of credit constraints allowing households to invest in human capital accumulation (Bayer et al., 2020; Hannan, Honjo and Raissi, 2022; Perotti, 2004) – could not be verified within our empirical framework.

In terms of shocks to total central government spending, a surprising result is the persistent fall in debt-to-GDP ratio. This could partly reflect the declining debt-to-GDP ratio through 2012, and partly the subsequent use of fiscal rules, which limited increases in central government spending to tax revenue growth over the medium term. By components, debt-to-GDP ratio falls initially after a shock to public sector wages and purchases of goods and services, but rises after the third quarter. Central government transfers to households feed a persistent rise in debt-to-GDP ratio until the twelfth quarter. More surprisingly, following a spending shock in terms of energy and other subsidies, debt-to-GDP ratio declines persistently.

These findings suggest that, in adjusting their countercyclical policy settings, fiscal and monetary authorities need to consider carefully the composition of changes

in public spending. While fiscal expansions in Indonesia may not affect inflation as much as often feared, they do not affect private consumption either. The main effect of fiscal expansions since the mid-2010s may thus have been a deterioration in public finances, as indicated by rising central government expenditure and debt-to-GDP ratios on the one hand, and falling tax revenue to GDP ratio on the other, despite the use of fiscal rules.

Separately, Demid (2018) and Juhro, Narayan and Njindan Iyke (2022) argued that monetary and fiscal policies in Indonesia often had not been well coordinated, with monetary authorities occasionally tightening in order to offset the inflationary effect of increases in government spending.[6] Petrevski, Bogoev and Tevdovski (2016) and Haug and Power (2022) identified similar episodes in Bulgaria and New Zealand, respectively. The need for policy coordination increases in periods of high uncertainty such as the current global inflation episode with spillovers from the war in Ukraine. Divergent policy goals and lack of policy coordination could hinder the achievement of macroeconomic policy objectives (Demid, 2018; Juhro and Rummel, 2022), and lead to higher inflation and faster growth of public debt (Leeper and Leith, 2016).

Future research could further analyse the impact of public spending on private consumption by using more sophisticated models allowing for household heterogeneity, e.g., between Ricardian and non-Ricardian households. Public investment could also be added as a component of government spending to examine its impact on inflation via its indirect effect on productivity.

Disclosure statement

There is no conflict of interest.

[6] After the GFC, policy coordination initiatives contributed to a better alignment of policies in Indonesia (Juhro, Narayan and Njindan Iyke, 2022).

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APPENDIX

TABLE A1

Data definitions and sources [a]

Variable	Definition	Source
Central government expenditures (CG)	Central government expenditures	Ministry of Finance's State Revenue and Expenditure Budget (Anggaran Pendapatan dan Belanja Negara or APBN)
Government consumption (GC)	Central government expenditures on employee compensation and use of goods and services	
Social protection (SP)	Central government spending on social benefits in the form of transfers of money, goods or services	
Subsidy (SUB)	Central government spending on energy and non-energy items	
Exchange rate (ER)	Bilateral nominal rupiah per US$ exchange rate	Bank Indonesia's Indonesian Economic Financial Statistics (Statistik Ekonomi dan Keuangan Indonesia or SEKI)
Debt-to-GDP ratio (DEBT)	Ratio of central government debt to nominal GDP	Indonesian Public Sector Debt Statistics (Statistik Utang Sektor Publik Indonesia)
Output gap (GAP)	Difference between log of real GDP and log of potential GDP	Indonesian Bureau of Statistics (Badan Pusat Statistik or BPS)
IPI gap	Difference between log of the real and log of potential total production of large and medium non-oil manufacturing establishments	
Tax (TAX)	Ratio of tax revenue to nominal GDP	Government Finance Statistics
Inflation rate (INF)	First difference of logarithm of the consumer price index: all items[b]	Federal Reserve Bank of St. Louis
GDP deflator	First difference of logarithm of the GDP deflator index: all items[b]	
Interest rate (INT)	Short-term interest rate based on the BI 7-Day Reverse Repo Rate	Bank Indonesia's Indonesian Economic Financial Statistics (SEKI)
Investment lending rate	Investment lending rates of the reporting banks' branches located in Indonesia	
Private consumption (PC)	Household consumption expenditures	Indonesian Bureau of Statistics (BPS)

[a] *All data series cover the period from 2001:Q1 – 2022:Q4 except for debt ratio and social protection which only started in 2003:Q1 and 2005:Q1, respectively. Some fiscal data covering the period 2017:Q1 – 2022:Q4 are collected from the APBN Kita monthly reports of the Ministry of Finance.*

[b] *This definition of inflation rate is the one used for SVAR modeling. The ones shown in the descriptive statistics and graph refer to the published inflation rates.*

Table A2

Descriptive statistics

Statistic	CG[a]	GC[a]	SUB[a]	SP[a]	TAX[a]	DEBT[a]	GAP	INF	INT	ER	PC[a]
Mean	11.6	3.7	3.1	0.9	11.1	32.1	0.0	6.2	7.6	11,307	55.7
Median	11.4	3.8	2.4	1.0	11.2	29.8	0.1	5.4	7.0	10,250	54.4
Max.	18.0	5.2	23.9	2.0	14.2	52.0	3.4	17.8	17.7	16,359	60.5
Min.	7.5	2.4	0.0	0.0	7.7	22.6	-5.5	1.2	3.5	8,310	52.6
Std. dev.	1.97	0.62	3.02	0.36	1.39	7.93	1.22	3.63	3.36	2,367	2.20
Skewness	0.56	0.08	4.19	0.01	-0.25	0.87	-0.93	1.24	1.34	0.40	0.82
Kurtosis	3.42	2.49	27.62	3.32	2.71	2.65	z.41	4.26	4.40	1.59	2.38
Jarque-Bera	5.18	1.04	2,478	0.31	1.25	10.50	83.81	28.26	33.3	9.69	11.35
P-value	0.07	0.59	0.00	0.86	0.54	0.01	0.00	0.00	0.00	0.01	0.00
Obs.	88	88	88	72	88	80	88	88	88	88	88

[a] *Figures are in percent of GDP.*

Table A3

Unit root tests

Variable	ADF t-statistic				KPSS (LM-Stat)				Status
	Ho: series has unit root				Ho: series is stationary				
	Intercept only		Intercept with Trend		Intercept only		Intercept with Trend		
Log Central government	-0.732 (2)		-4.878 (1)	***	1.112	***	0.058		TS
Log Government consumption	-1.551 (1)		-2.725 (1)		1.162	***	0.249	***	
D(Log Government consumption)	-9.709 (1)	***	-9.767 (1)	***	0.185		0.113		I(1)
Log Subsidy	-5.169 (1)	***	-5.270(1)	***	0.186		0.167	**	I(0)
Log Social protection	-20.745 (0)	***	-20.931 (0)	***	0.512	**	0.119		I(0)
As Percent of GDP									
Central government/GDP	-3.850 (1)	***	-4.315 (1)	***	0.830	***	0.117		I(0)
Government consumption/GDP	-2.760 (1)	*	-5.712 (0)	***	1.080	***	0.186	**	
D(Government consumption/GDP)	-14.342	***	-14.316	***	0.095		0.081		I(1)
Subsidy/GDP	-6.788 (1)	***	-12.153 (0)	***	0.862	***	0.069		I(0)
Social protection/ GDP	-4.859 (0)	***	-5.023 (0)	***	0.219		0.147	**	I(0)
Debt ratio	-1.678 (1)		-1.248 (1)		0.356	*	0.301	***	
D(Debt ratio)	-5.817 (0)	***	-7.017 (0)	***	0.825	***	0.071		I(1)
Tax ratio	-1.979 (2)		-6.659 (0)	***	1.179	***	0.063		TS
Log Exchange rate	-0.554 (0)		-2.915 (0)		0.995	***	0.208	**	
D(Log Exchange rate)	-11.315 (0)	***	-11.570	***	0.185		0.056		I(1)
Inflation rate	-6.709 (0)	***	-8.060 (0)	***	0.963	***	0.042		I(0)
Interest rate	-3.967 (2)	***	-5.137 (1)	***	1.029	***	0.124	*	TS
Output gap	-4.051 (0)	***	-4.023 (0)	**	0.038		0.038		I(0)
GDP growth	-3.79 (0)	***	-3.94 (0)	**	0.31		0.15	**	I(0)

Variable	ADF t-statistic				KPSS (LM-Stat)				Status
	Ho: series has unit root				Ho: series is stationary				
	Intercept only		Intercept with Trend		Intercept only		Intercept with Trend		
Log Private consumption	-1.026 (0)		-0.937 (0)		1.202	***	0.184	**	
D(Log Private Consumption)	-9.988 (0)	***	-10.046 (0)	***	0.239		0.149	**	I(1)
Private Consumption/GDP	-1.101 (0)		-1.585 (0)		1.066	***	0.263	***	
D(Private Consumption/GDP	-8.775 (0)	***	-8.782 (0)	***	0.144		0.097		I(1)
IPI gap	-5.603 (0)	***	-5.570 (0)	***	0.039		0.039		I(0)
GDP deflator	-4.023 (1)	***	-7.403 (0)	***	0.659	**	0.103		I(0)
Lending rate	-1.501 (1)		-4.425 (1)	***	1.115	***	0.122	*	TS

****, ** and * denote 1%, 5% and 10% significance levels of null hypothesis rejection, respectively. Values inside parentheses refer to lag lengths based on Schwarz Information Criterion. The KPSS output only provides the asymptotic critical values. TS stands for trend-stationarity.*

Table A4

Test for structural breaks

Variable	Break date		Deterministic component	Status
Log Central government			Constant + Trend	Level
Log Government consumption			Constant	FD
Log Subsidy	2008Q2	*	Constant	Level
	2015Q2	*	Constant	
Log Social protection			Constant	Level
As Percent of GDP				
Central government/GDP	2009Q2	*	Constant	Level
Government consumption/GDP			Constant	FD
Subsidy/GDP	2015Q2	*	Constant	Level
Social protection/GDP			Constant	Level
Exchange rate			Constant	FD
Tax ratio	2008Q3		Constant + Trend	Level
Debt ratio	2011Q4	*	Constant	FD
Output gap	2019Q4		Constant	Level
Inflation rate	2008Q3	*	Constant	Level
Interest rate	2005Q2		Constant + Trend	Level
	2013Q3	*		
Log Private consumption			Constant	FD
Private consumption/GDP			Constant	FD
IPI gap	2019Q4		Constant	Level
GDP deflator	2008Q3	*	Constant	Level
Lending rate	2014Q1	*	Constant + Trend	Level

*Bai-Perron multiple breakpoint tests used F-statistic. * denotes that the statistic is significant at the 5% level. FD stands for first-difference.*

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TABLE A5

Cointegration test

Null hypothesis: Series are not cointegrated

Paired Series	Engle-Granger tau-statistic	Phillips-Ouliaris tau-statistic	Decision
DEBT and LER	-1.555 (1)	-2.342	Do not reject null
DEBT and PCGDP	-0.011 (1)	-0.633	Do not reject null
LER and PCGDP (with trend)	-3.996 (0)**	-4.004**	Reject null
LER and PCGDP (without trend)	-1.801 (0)	-1.769	Do not reject null
LER and LPC	-2.771 (0)	-2.770	Do not reject null

*Series are expressed in logarithmic form (except for PCGDP and DEBT which are in percent) and are seasonally adjusted. Automatic lag specification (in parentheses) is based on the Schwarz information criterion. Unless stated otherwise, the cointegrating equation deterministics used is simply the constant (level). ** denotes rejection of the null hypothesis of no cointegration in the series at 5% level of significance, based on MacKinnon (1996) p-values.*

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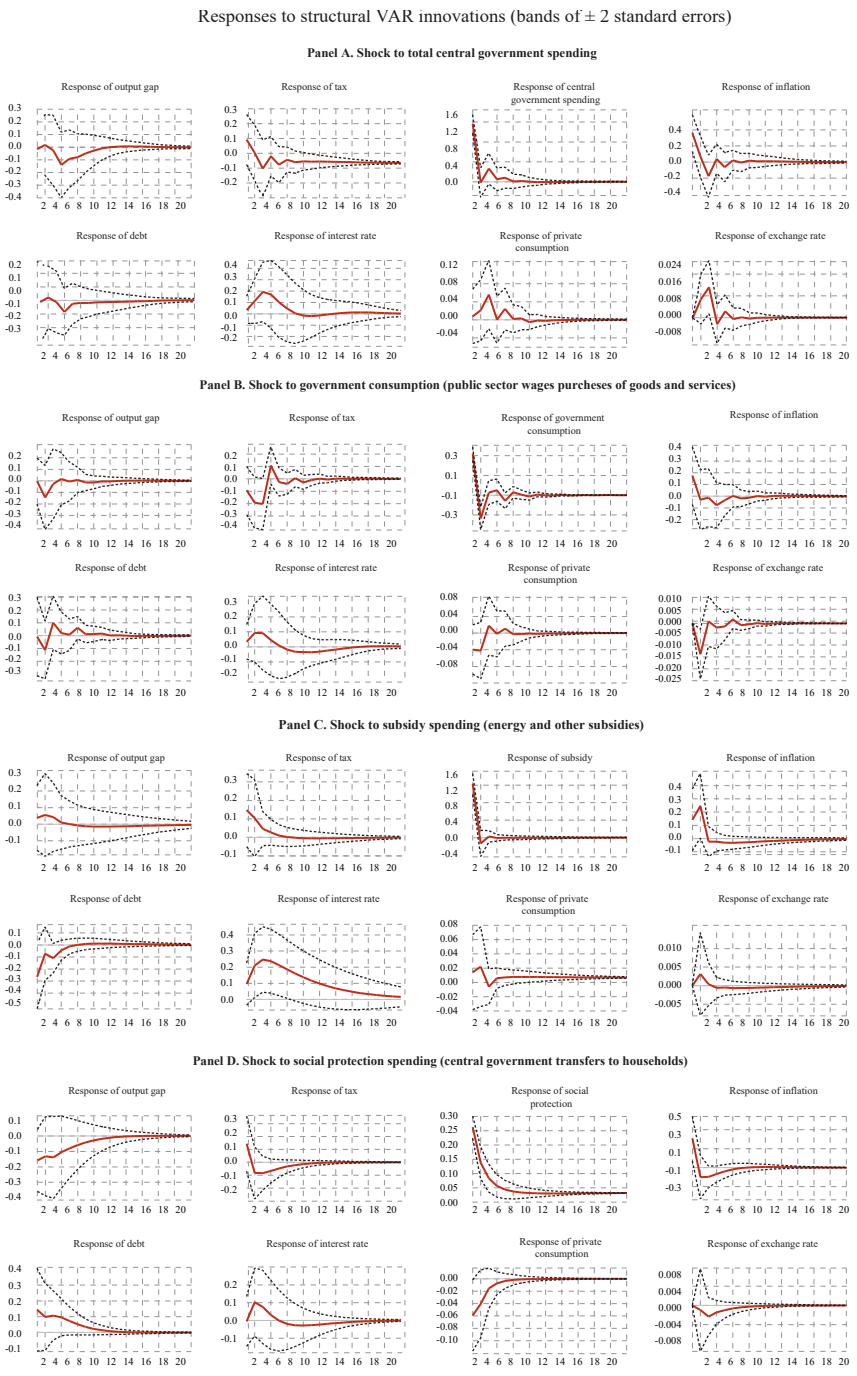
Graph A1

Robustness check: Impulse responses to structural VAR innovations in government spending as percentage of GDP



Note: The size of shock is one unit or one percentage point. The solid line refers to the impulse response of the structural decomposition; dashed lines refer to the ± 2 standard error bands. Lag length is 2 for central government spending and government consumption spending, lag length for subsidy and social protection spending is 1.

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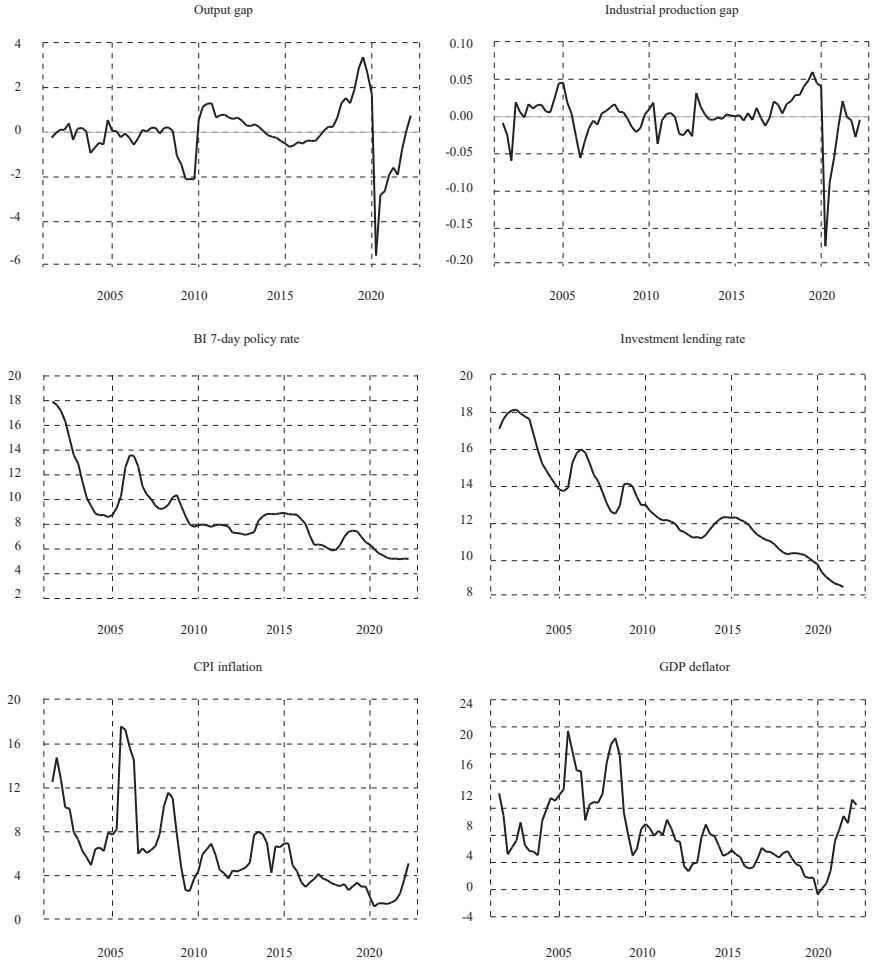
GRAPH A2

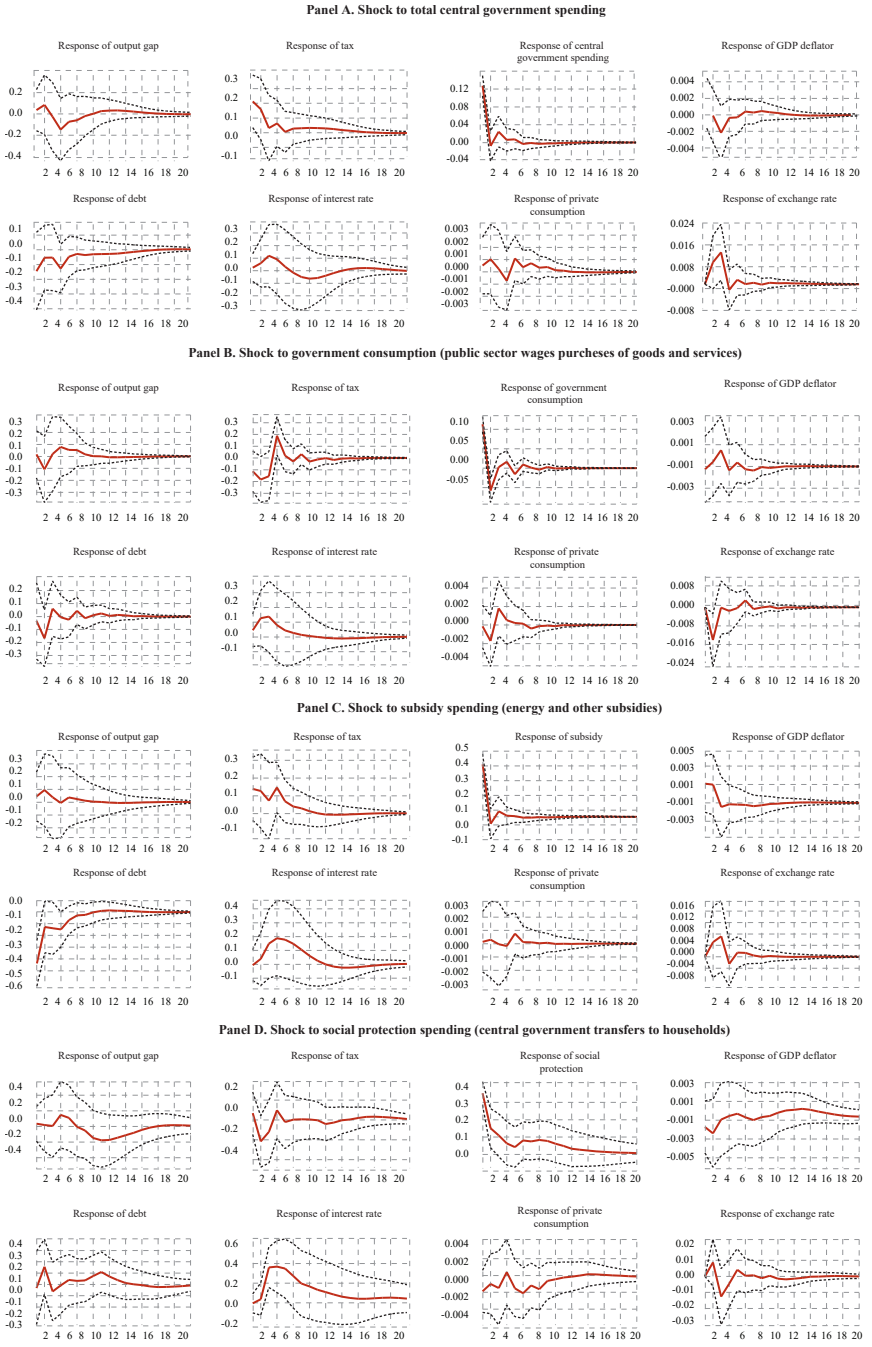
Alternative robustness check indicators for some variables[a]



[a] *Definition and sources are shown in table A1.*

Graph A3

Robustness check: Impulse responses to structural VAR innovations in government spending (with GDP deflator as indicator for inflation)



Note: The size of shock is one unit or one percentage point. The solid line refers to the impulse response of the structural decomposition; dashed lines refer to the ± 2 standard error bands. Lag length is 2 across government spending instruments, except for social protection, where lag length is 3.