

EFFECTS OF TREND INFLATION ON MONETARY POLICY AND FISCAL POLICY SHOCKS IN VIETNAM

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Abstract

This paper analyzes variations in effects of monetary and fiscal shocks on responses of macroeconomic variables, determinacy region, and welfare costs due to changes in trend inflation by expanding the New-Keynesian model of Ha et al. (2020). We consider that while the central banks can employ either nominal interest rate (IR rule) or money supply (MS rule) to conduct monetary policies, they also use their budgets for capital and recurrent spending to conduct fiscal policies. By using Simulated Method of Moment for parameter estimation, we characterize Vietnam's economy during 1996Q1-2015Q1. The results report that consequences of monetary policy and fiscal policy shocks become more serious if there is a rise in trend inflation. Furthermore, the money supply might not be an effective instrument and using the government budget for recurrent spending produces severe consequences in the high-trend-inflation economy.

Keywords: *Trend inflation, determinacy region, capital and recurrent spending, Vietnam.*

1. Introduction

Lessons from previous crises have shown three weaknesses in policy implementations of the State Bank of Vietnam (SBV). First, SBV has always pursued the objective of stabilizing currency value, curbing inflation, and contributing to the economic development, which was too widely-targeted and lack of specification. Second, the policy implementation in Vietnam, which was a combination of the monetary and fiscal policies has still been inappropriate in the sense that it was used excessively, thus it reacted and became policy shocks. Third, the SBV lacked a commitment to consistently pursue a fixed inflation target. Table 1 reports these facts. Following Ha et al. (2020a), we also document the evidence of time-varying trend inflation in Vietnam during 1996-2015 period as in Figure 1. Therefore, the Vietnamese economy was simultaneously buffeted by inefficient implementations of monetary and fiscal policies as well as time-varying trend inflation.

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Table 1: Objectives and Performances of Monetary Policy in Vietnam (2000-2015)

		2000	2001	2002	2003	2004	2005	2006	2007
Inflation	Target	6	<5	3-4	< 5	< 5	< 6.5	< 8	< 8
	Performance	-1.7	-0.04	3.8	3.2	7.8	8.3	7.4	8.3
Output	Target	5.5-6	7.5-8	7-7.3	7-7.5	7.5-8	8.5	8	8.2-8.5
	Performance	6.8	6.89	7.08	7.34	7.79	8.44	8.23	8.46
		2008	2009	2010	2011	2012	2013	2014	2015
Inflation	Target	<10	<15	7-8	<7	<10	8	7	5
	Performance	23.1	7.1	8.9	28.7	9.1	6.59	4.09	0.63
Output	Target	8.5-9	5	6.5					
	Performance	6.31	5.32	6.78					

Source: SBV and Ha et al. (2020a)

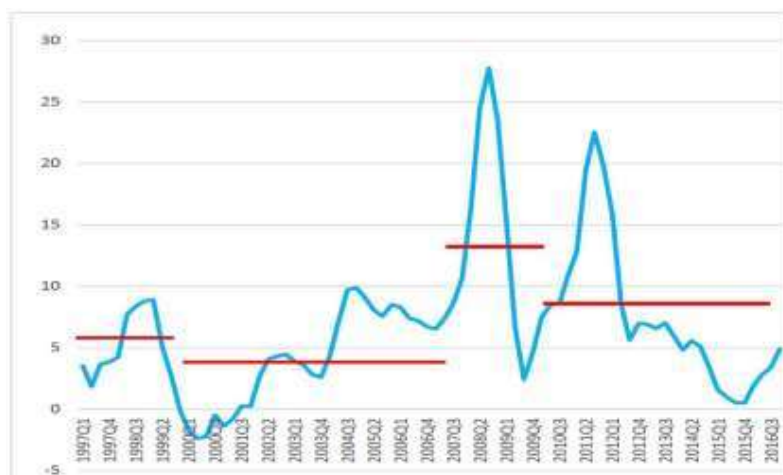


Figure 1: Vietnam CPI Inflation: 1996Q1-2015Q4 (annualized quarter-to-quarter percent changes)

Source: General Statistics Office of Vietnam and Ha et al. (2020a)

Previous papers have exploited various aspects of trend inflation. For example, changes in transmission mechanism of monetary policy and the dynamics of the economy in response to the shocks due to trend inflation are examined by Ascari and Sbordone (2014).

Moreover, Kiley (2007), Ascari and Ropele (2009) and Coibion and Gorodnichenko (2011) have examined the relationship between trend inflation and the model's determinacy. Welfare analysis of trend inflation has also attracted attentions of many scholars such as Nakata (2014), Ascari et al. (2018) and Ha et al. (2019, 2020a, 2020b). These studies have emphasized the importance and necessity of research pertaining trend inflation.

Although previous works have investigated various aspects of trend inflation, there still exist gaps in the literature. First, the papers examining effects of trend inflation on the dynamics of the economy to the policy shocks, especially fiscal policies are very scarce. Regarding monetary policy shocks, the prior scholars mostly concentrate on the case that the central banks employ the nominal interest rate as an important instrument, while they have abstracted a comparison the efficiency in using the different tools in the economy with time-varying trend inflation. This analysis can provide the central bank with a guideline to improve the efficiency if there is a rise in trend inflation. Second, the impacts of trend inflation on consequences of ineffectively using the national budget for different purposes such as capital investment or recurrent spending have not been exploited. Furthermore, there has been a paucity of evidence about an association between trend inflation and policy shocks in developing countries.

In this paper, we expect that trend inflation causes consequences of monetary and fiscal policy shocks to be more severe. The reasons are as follows. First, the relationship between trend inflation and structural shocks has been investigated thus far. For example, the transmission mechanism of monetary policy and the dynamics of the economy in response to the monetary shocks are altered by trend inflation (Ascari and Sbordone, 2014). Variations in the parameters of the log-linearized model explain for these alternations. Ascari and Sbordone (2014) demonstrate that responses of macroeconomy to monetary policy shocks are affected by trend inflation since it reduces the slope of New Keynesian Phillip curve. The similar evidence on effects of trend inflation on marginal efficiency of investment (MEI) shocks or monetary policy uncertainty shocks are also provided by Ascari et al. (2018) and Ha et al. (2020b), respectively. Second, Ascari and Sbordone (2014) and Ha et al. (2020a) provide empirical evidence that changes in trend inflation are associated with the ability of the monetary authority to guarantee a determinacy region and macroeconomic stability. However, this paper only concentrates on the interest rate rule while the change in determinacy regions when the monetary authority uses the money supply instrument have not been argued so far. In this paper, we follow Woodford (2003) to prove that the determinacy region that is derived from the Taylor principle when the central banks adopt the money supply rule narrow when trend inflation is higher². Third, the literature has also provided empirical evidence that trend inflation influences welfare costs of shocks (Nakata,

² Let see the details in Section 5.2.

2014; Ha et al., 2019, 2020a) and volatility shocks (Ha et al., 2020b). However, the previous scholars have not paid enough attention to the effects of trend inflation on welfare costs of policy shocks.

We, therefore, attempt to fill these gaps in the literature by expanding the model of Ha et al. (2020a) in two dimensions. First, we consider that monetary authorities conduct the monetary policies by using two instruments: the nominal interest rate (IR rule, henceforth) and money supply (MS rule, henceforth). Second, we assume that the SBV uses its budget for capital and recurrent spending. This study employs Simulated Method of Moment (SMM) for the quarterly data in Vietnam during the 1996Q1-2015Q4 period to characterizes Vietnamese economy. This paper aims at investigating influences of trend inflation on policy implementations in Vietnam. To obtain this goal, we concentrate on analysing how trend inflation causes variations in impacts of monetary and fiscal shocks in term of responses of macroeconomic variables, determinacy region, and welfare costs. This study, therefore, provide a multi-dimension analysis on this issue.

With these expansions, we provide empirical evidence to support the view that trend inflation is associated with consequences of policy shocks in Vietnam. In particular, impacts of monetary and fiscal shocks on responses of macroeconomic variables, determinacy region, and welfare costs are signified if there is a proposal to raise trend inflation. In other words, consequences of ineffectively implementing policies are more serious if there is a rise in trend inflation. We also document the fact that the money supply might not be an effective instrument and using government budget for recurrent spending produces severe consequences if trend inflation is higher.

The rest of this paper is organized as follows. The discussion over related papers is presented in Section 2. The extended model will be discussed in Section 3 while Section 4 explains how to measure welfare costs. Section 5 shows the estimated parameters and main results and some conclusions are provided in Section 6.

2. Method

We develop the model that consists of four classes of agents: the household indexed by $j \in [0,1]$, the final-goods producing firms, a continuum of intermediate-goods producing firms indexed by $i \in [0,1]$, and the authority.

2.1. The Household

In the model, we assume that given a budget constraint, households determine the level of consumption (C_t) and working hours (H_t) to maximize their expected discounted present value of future period utility. Their period utility function can be expressed as follows:

$$\sum_{t=0}^{\infty} \beta^t (\ln(C_t - \gamma C_{t-1}) - \frac{\omega}{1+v} H_t^{1+v}), \quad (1)$$

where β and γ denotes the discount factor and the habit formation parameter, which are restricted as $0 < \beta < 1$, $0 \leq \gamma < 1$. v is the inverse Frisch elasticity of labor supply. The flow budget constraint is given as:

$$P_t C_t + \frac{B_t}{R_t} + M_t = B_{t-1} + M_{t-1} - P_t T_t + W_t H_t + D_t. \quad (2)$$

Equation (2) illustrate distinct sources of income of households. Households can supply $h_t(i)$ units of labor to each intermediate-goods producing firm $i \in [0,1]$ to earn $W_t h_t(i)$ at the beginning of each period. By owning the intermediate goods, they also receive a nominal profit, D_t , and receive lump-sum government transfer, T_t . And then they decide to distribute their income in diverse ways. During each period t , households purchase consumption goods, C_t , from the final-goods producing firms at the nominal price, P_t . They also purchase the one-period bond, B_t , from the intermediate-goods producers at the price $1/R_t$ as saving. Suppose that the households carry M_{t-1} units of money. Therefore, households choose labor supply, h_t , bond holding, B_t , money holding M_t , and consumption, C_t , to maximize the lifetime utility subject to the budget constraint.

2.2. The Final-Goods Producing Firm

Final-goods producing firms employ the constant-return-to-scale technology to maximize profits. They use $Y_t(i)$ units of intermediate goods sold at a nominal price $P_t(i)$ in order to manufacture Y_t units of final products, as follows:

$$[\int_0^1 Y_t(i)^{\frac{\theta_p-1}{\theta_p}} di]^{\frac{\theta_p}{\theta_p-1}} = Y_t, \quad (3)$$

where θ_p denotes the price elasticity of demand for intermediate goods. The profit maximization problem of the final goods-producing firms is demonstrated as follows:

$$P_t [\int_0^1 Y_t(i)^{\frac{\theta_p-1}{\theta_p}} di]^{\frac{\theta_p}{\theta_p-1}} - \int_0^1 P_t(i) Y_t(i) di. \quad (4)$$

We derive the first order condition for the problem of final-goods producing firms that is represented as:

$$Y_t(i) = \left[\frac{P_t(i)}{P_t} \right]^{-\theta_p} Y_t. \quad (5)$$

Due to the zero profit in the equilibrium of the competitive final-goods firms, we can represent the final good price as follows:

$$P_t = \left[\int_0^1 P_t(i)^{1-\theta_p} di \right]^{\frac{1}{1-\theta_p}}. \quad (6)$$

2.3. The Intermediate-Goods Producing Firm

During the period t , a continuum of intermediate-goods producing firms indexed by $i \in [0, 1]$ hire $h_t(i)$ units of labor supplied by households to produce Y_t units of intermediate

goods (i). Their constant-returns-to-scale technology is expressed as follows:

$$Z_t h_t(i) = Y_t(i). \quad (7)$$

The logarithm of aggregate technology shock, Z_t , follows a stationary stochastic process

$$\ln(Z_t) = \rho_Z \ln(Z_{t-1}) + \epsilon_{Z_t}, \quad (8)$$

where ϵ_{Z_t} denotes the serially uncorrelated innovation, which is characterized by a normal distribution with mean zero and standard deviation σ_Z . The intermediate-goods producers are presumed to follow staggered Calvo price fashion to set nominal. Specifically, a fixed fraction, η_p , of firms, which cannot re-optimize its nominal prices, still set their prices according to the indexation rule (Calvo, 1983). We can represent the way that those firms reset their prices as follows:

$$P_t(i) = (\pi_{t-1}^{\mu_p} \bar{\pi}_t^{1-\mu_p}) \chi_p P_{t-1}(i), \quad (9)$$

where χ_p and μ_p express a degree of price indexation and the relative weight on lagged inflation, respectively. The inflation, π_t , is computed as $\frac{P_t}{P_{t-1}}$ and we interpret $\bar{\pi}_t$ as the central bank's inflation target. By contrast, there is a fraction $(1 - \eta_p)$ of firms, which have ability to set their price. They select the price P_t^* to maximize the present value of future profits:

$$E_t \sum_{t=0}^{\infty} \beta^s \frac{\lambda_{t+s}}{\lambda_t} \eta_p^s [P_t^*(i) (\bar{\pi}_t^{\chi_p s})^{(1-\mu_p)} (\pi_{t-1, t+s-1}^{\chi_p})^{\mu_p} - \frac{W_{t+s}}{Z_{t+s}}] Y_{t+s}(i), \quad (10)$$

such that

$$Y_{t+s}(i) = \left[\frac{P_t^*(i) (\bar{\pi}_t^{\chi_p s})^{(1-\mu_p)} (\pi_{t-1, t+s-1}^{\chi_p})^{\mu_p}}{P_{t+s}} \right]^{-\theta_p} Y_{t+s}, \quad (11)$$

where $\pi_{t+s-1} = \left(\frac{P_{t+2}}{P_{t+1}}\right) \dots \left(\frac{P_{t+s}}{P_{t+s-1}}\right)$ if $s = 1, 2, 3, \dots$, λ_t is the same as the Lagrangian multiplier on the household's budget constraints, and W_t denotes the nominal wage.

2.4. Authority's policy

2.4.1. Monetary Policy

Regarding IR rule, the authority sets the short-term nominal interest rates (R_t) to deviations of inflation (π_t) from the central bank's inflation target ($\bar{\pi}$) and deviations of output (y_t) from the steady state (\bar{y}) as follows:

$$\frac{R_t}{\bar{R}} = \left(\frac{R_{t-1}}{\bar{R}}\right)^{\rho_R} \left[\left(\frac{\pi_t}{\bar{\pi}}\right)^{\phi_\pi} \left(\frac{y_t}{\bar{y}}\right)^{\phi_y}\right]^{1-\rho_R} \exp(\epsilon_{R_t}). \quad (12)$$

The parameter ρ_R illustrates the degree of interest rate smoothing. ϵ_{R_t} is an i.i.d monetary policy shock.

Regarding MS rule, we follow Zhang (2009) to represent the central bank's money supply (M_t^S) mechanism as follow:

$$M_t^S = (g_{m,t})M_{t-1}^S, \quad (13)$$

$$\frac{M_t^S}{P_t} = (g_{m,t}) \frac{M_{t-1}^S P_{t-1}}{P_t P_{t-1}}. \quad (14)$$

Money growth rule can be expressed as

$$\frac{gm_t}{gm} = \left(\frac{gm_{t-1}}{gm}\right)^{p_{gm}} \left(\frac{\pi_{t+1}}{\bar{\pi}_t}\right)^{-s_1} \left(\frac{y_t}{y}\right)^{-s_2} \delta_r e^{mt}, \quad (15)$$

$$e_{mt} = p_{em} e_{mt-1} + \epsilon_{mt}. \quad (16)$$

This rule bases on the idea that the central bank implements monetary policies by using the money supply. In the equation (4), gm_t is the growth rate of money, p_{gm} illustrates the persistence of the money growth, and s_1, s_2 are responses of money growth to deviation of inflation from the target and output from the steady state, respectively.

The evolution of trend inflation is described as a persistent AR(1) process as

$$\ln(\bar{\pi}_t) = (1 - \rho_{\bar{\pi}})\ln(\bar{\pi}^*) + \rho_{\bar{\pi}}\ln(\bar{\pi}_{t-1}) + \epsilon_{\bar{\pi}_t}, \quad (17)$$

where $\rho_{\bar{\pi}}$ denotes the degree of shock persistence and $\epsilon_{\bar{\pi}_t}$ is a standard normally distributed shock which is independent of time.

2.4.2 Fiscal Policy

The public spending is written as

$$G_t = \left(1 - \frac{1}{g_t}\right)Y_t, \quad (18)$$

where g_t is an exogenous disturbance following the stochastic process

$$\ln(g_{t+1}) = (1 - \rho_g)\ln(\bar{g}) + \rho_g\ln(g_t) + \epsilon_{g_t}, \quad (19)$$

where $\left(1 - \frac{1}{\bar{g}}\right)$ represents the steady-state value of government spending relative to output. In this paper, we consider that the government uses the budget for different purposes: capital and recurrent spending, and then measure their impacts.

2.5. Market Clearing Condition

The market clearing condition in the labor market, the goods market and the bond can be expressed in turn as

$$H_t = \int H_t(i) di, \quad (20)$$

$$Y_t = C_t + G_t, \quad (21)$$

$$B_t = 0. \quad (22)$$

2.6. Method for Quantifying Welfare Costs

The present article follows Ha et al. (2019, 2020a, 2020b) to use the perturbation method to compute the approximation to the policy functions around the deterministic steady-state. We then use those to quantify the welfare. The welfare can be decomposed into three diverse component as follows:

$$\begin{aligned} E\left[\sum_{t=0}^{\infty} \beta^t u(x_t)\right] & \approx \sum_{t=0}^{\infty} \beta^t u(\bar{x}) + \sum_{t=0}^{\infty} \beta^t Mu(\bar{x})E[x_t - \bar{x}] + \sum_{t=0}^{\infty} \beta^t Nu(\bar{x})E[(x_t - \bar{x}) \otimes (x_t \\ & - \bar{x})] \\ & = U_d + U_l + U_v, \end{aligned}$$

where $x_t = [C_t, C_{t-1}, H_t]$; and $Mu(\bar{x})$ and $Nu(\bar{x})$ denote vectors which express the first and second derivative of $u(\cdot)$ evaluated at the deterministic steady state of x_t (\bar{x}). Three components are respectively the deterministic component, $U_d = \sum_{t=0}^{\infty} \beta^t u(\bar{x})$, the level component, $U_l = \sum_{t=0}^{\infty} \beta^t Mu(\bar{x})E[x_t - \bar{x}]$, and the volatility component, $U_v = \sum_{t=0}^{\infty} \beta^t Nu(\bar{x})E[(x_t - \bar{x}) \otimes (x_t - \bar{x})]$.

Then we can quantify the welfare cost as follows

$$\begin{aligned} & E\left[\sum_{t=0}^{\infty} \beta^t u\left(\left(1 + \frac{wc}{100}\right)C_{A,t}, \left(1 + \frac{wc}{100}\right)C_{A,t-1}, H_{A,t}\right)\right] = \\ & E\left[\sum_{t=0}^{\infty} \beta^t u(C_{B,t}, C_{B,t-1}, H_{B,t})\right], \end{aligned}$$

where $C_{A,t}, H_{A,t}$ are consumption and labor supply in the economy with $\sigma_{\bar{\pi}} > 0$ and $C_{B,t}, H_{B,t}$ are in economy with $\sigma_{\bar{\pi}} = 0$.

2.7. Data

The system consists of five observable variables, including output growth (g_t^y), inflation (π_t), short-term nominal interest rate (r_t), money supply growth (g_t^M), and government spending growth (g_t) that is either capital or recurrent spending. This study uses quarterly Vietnam data collected from 1996Q1 to 2015Q4. We collect the raw data from the database available at General Statistics Office of Vietnam (GSO) and International

Financial Statistics (IFS). The data for government spending growth are available at the website of State Bank of Vietnam. We also divide seasonally-adjusted figures for real GDP by the total population, which is to GDP per capital. This indicator then serves as a measure of output growth. We also obtain measures of inflation and nominal interest rate, respectively by making quarterly changes in seasonally-adjusted figures for Consumer Price Index and quarterly lending rate. All data are de-trended prior to the estimation of the model.

3. Results

In this analysis, we examine the effects of trend inflation on welfare costs of policy shocks. These policy shocks include monetary and fiscal policy that may distort the economic welfare to produce welfare costs. A high level of trend inflation then magnifies these costs and lead to more severe consequences. Previous scholars such as Nakata (2014), Ha et al. (2019, 2020a) concentrate on measuring welfare costs of trend inflation. Ascari et al. (2014) and Ascari et al. (2018) pay attention to cyclical effects of trend inflation. Ha et al. (2020) investigate interactions between trend inflation and policy risk shocks in term of welfare costs and dynamic responses of variables to policy risk shocks. To our best knowledge, however, there is no paper that studies effects of trend inflation on welfare costs of policy shocks. Therefore, this article serves to fill this gap in the literature.

We firstly quantify welfare costs of monetary shocks in Vietnam and report the results in Table 4. With an assumption that the central bank sets inflation target at 2%, welfare costs of monetary shocks is modest (0.015%). An increase in trend inflation level produces higher welfare costs. Furthermore, we compare welfare changes due to trend inflation when the central bank uses distinct instruments. Figure 4 indicates trends of output and welfare when using the IR (Figure 4a) and MS (Figure 4b) rule. Both rules show that welfare decline nonlinearly. However, adopting MS rule causes welfare to decline more considerably but this negative effect seems to diminish when trend inflation is higher, as indicated on the convex downward curve. On the other hand, the welfare follows the concave downward curve under IR rule implying that welfare fall more substantially when trend inflation rises.

Table 4: Welfare Costs of Monetary Shocks

	$\bar{\pi}^* = 1.02^{0.25}$		$\bar{\pi}^* = 1.06^{0.25}$	
Welfare Cost		0.015%		0.069%
Welfare	-213.03	-213.05	-219.08	-219.22
U_d	-211.15	-211.15	-212.11	-212.11
U_l	-0.43	-0.45	-4.81	-4.95
U_v	-1.44	-1.45	-2.16	-2.16

C_{SS}	0.82	0.82	0.81	0.81
H_{SS}	1.05	1.05	1.05	1.05
$E(C)^*$	-0.34	-0.36	-0.01	0.04
$E(H)^*$	0.01	0.01	0.06	0.17
$100\sigma_C$	1.66	1.66	1.33	2.01
$100\sigma_H$	1.63	1.63	1.95	1.95

Note: (*) expressed as percentage deviation from the deterministic steady-state. U_d , U_l and U_v are the deterministic steady-state, level and volatility component, respectively.

Source: Author's calculation.

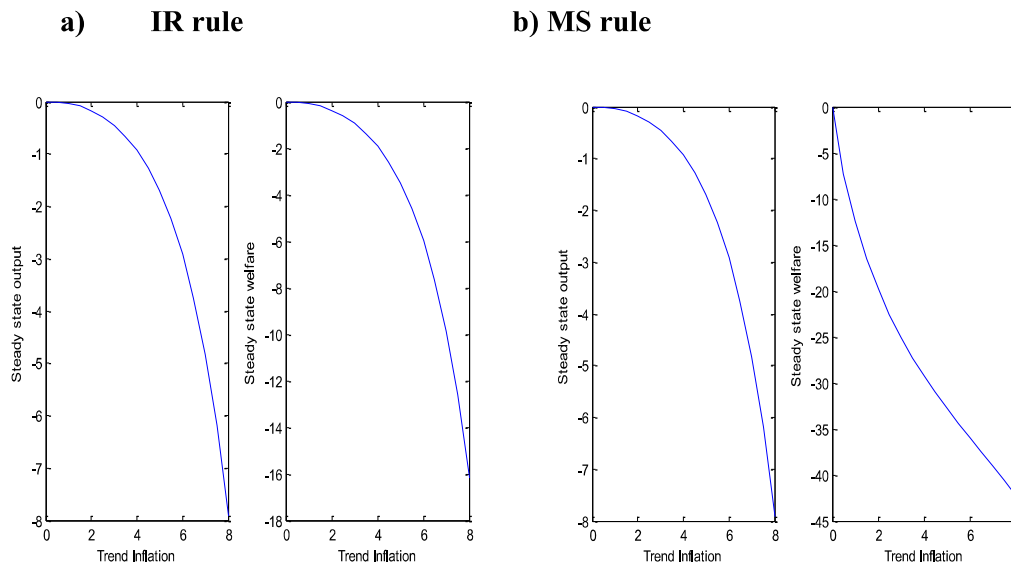


Figure 4: Trend Inflation and Welfare

Source: Author's calculation.

Welfare Costs of Fiscal Shocks

This section concentrates on welfare costs of fiscal shocks. We consider that the government uses the budget for various purposes: capital and recurrent spending. By using the actual data in Vietnam taken from SBV, we estimate respective values of fiscal shocks, including \bar{g} ; ρ_g ; and σ_g . We report the results in Table 5 and 6.

Regarding capital spending, we obtain the estimated parameters: $\bar{g} = 1.07$; $\rho_g = 0.85$; $\sigma_g = 0.007$. Table 5 reports welfare costs of government capital spending shocks on the economy. We show that welfare costs of government's capital spending is very small

(0.08%). The variation in inflation target levels does not cause any change in these costs. Table 5 reports no significant change in the business cycle properties. Thus, the increase in capital spending does not cause severe issues to the economy and the signifying effects of trend inflation are also not recognized.

Table 5: Welfare Costs of Fiscal Shocks (Capital Spending)

Welfare Cost	$\bar{\pi}^* = 1.02^{0.25}$		$\bar{\pi}^* = 1.06^{0.25}$	
		0.08%		0,08%
Welfare	-193.43	-193.61	-199.61	-199.78
U_d	-192.79	-192.79	-193.66	-193.66
U_l	-0.44	-0.45	-4.37	-4.41
U_v	-0.20	-0.37	-1.60	-1.71
C_{SS}	0.93	0.93	0.93	0.93
H_{SS}	1.0008	1.0008	1.0008	1.0008
E(C)*	-0.40	-0.41	-0.394	-0.397
E(H)*	0.01	0.01	0.14	0.14
$100\sigma_C$	0.68	0.93	1.97	2.04
$100\sigma_H$	1.28	1.54	1.66	1.90

Note: (*) expressed as percentage deviation from the deterministic steady-state. U_d , U_l and U_v are the deterministic steady-state, level and volatility component, respectively. $\bar{g} = 1.07$; $\rho_g = 0.85$; $\sigma_g = 0.007$.

Source: Author's calculation.

By using the data for recurrent spending, we achieve estimated values for fiscal shocks given as: $\bar{g} = 1.23$; $\rho_g = 0.46$; $\sigma_g = 0.034$. Table 6 reports welfare costs of recurrent spending shocks, which is significantly higher than capital spending shocks. More importantly, a higher trend inflation level signifies these costs. The results suggest that recurrent spending might produce more severe consequence as compared to capital spending, especially there is a rise in trend inflation.

Table 6: Welfare Costs of Fiscal Shocks (Recurrent Spending)

	$\bar{\pi}^* = 1.02^{0.25}$		$\bar{\pi}^* = 1.06^{0.25}$	
Welfare Cost	0.45%		0.69%	
Welfare	-207.63	-208.53	-213.91	-215.34
U_d	-206.99	-206.99	-207.93	-207.93
U_l	-0.44	-0.94	-4.40	-5.46
U_v	-0.21	-0.60	-1.58	-1.95
C_{SS}	0.84	0.84	0.84	0.84
H_{SS}	1.04	1.04	1.04	1.04
E(C)*	-0.36	-0.79	-0.35	-0.44
E(H)*	0.01	0.01	0.15	0.15
$100\sigma_C$	0.61	0.85	1.77	1.83
$100\sigma_H$	1.32	3.91	1.72	4.34

Note: (*) expressed as percentage deviation from the deterministic steady-state. U_d , U_l and U_v are the deterministic steady-state, level and volatility component, respectively. $\bar{g} = 1.23$; $\rho_g = 0.46$; $\sigma_g = 0.034$

Source: Author's calculation.

4. Discussion and Conclusion

This paper extended the New-Keynesian model in Ha et al. (2020a) by two dimensions. We assumed that the monetary authorities employ two instruments: nominal interest rate and money supply to conduct the policies. In the specific analysis regarding fiscal policy, we decomposed the government spending into capital and recurrent spending. The main purpose of this article is to investigate impacts of trend inflation on consequences of policy shocks in Vietnam. While prior scholars focused on the cyclical effects of trend inflation, our attention is paid to changes in welfare costs of policy shocks due to trend inflation. Although a few papers investigated changes in welfare costs of policy risk caused by trend inflation, there is no paper to study interaction between trend inflation and policy shocks. A change in determinacy region when the central banks use the nominal interest rate and money supply was another interest. Our paper also made the further contribution by distinguish the effects of shocks to capital and recurrent spending on the economy and examining effects of trend inflation on these effects.

Our result illustrated that trend inflation leads to changes in effects of monetary and fiscal shocks on the economy. In particular, trend inflation signifies impacts of monetary and

fiscal shocks on responses of macroeconomic variables, determinacy region, and welfare costs. In other words, trend inflation causes consequences of policy shocks to be more severe. The empirical results also suggested that with a rise in trend inflation, the money supply might not be an effective tool and using government budget for recurrent spending produces severe consequences.

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