

Impact of Police Budget Allocation on Regional Stability and Public Safety in Taiwan's Six Major Cities: A DSGE Model Analysis

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Abstract—This study examines the macroeconomic implications of police spending on economic growth and inflation within Taiwan's six major cities using a Dynamic Stochastic General Equilibrium (DSGE) model. By incorporating sector-specific characteristics and actual fiscal data from 2023, the research simulates various scenarios to explore how changes in police spending affect economic outcomes. The findings reveal that increased police spending can stimulate economic growth without causing substantial inflationary pressures, suggesting a nuanced impact on the regional economies. This study contributes to economic policy analysis by demonstrating the potential of targeted government expenditures in enhancing public safety and economic stability.. (Abstract)

Keywords—Police Management; Police Spending; DSGE Model; Regional Stability

I. INTRODUCTION

The fiscal decisions made by local governments play a pivotal role in shaping regional economic landscapes and the welfare of the communities they govern. Particularly in Taiwan, a region characterized by its robust economic dynamics and complex administrative structure, understanding the interplay between local government spending and macroeconomic indicators is crucial. Among various types of government expenditures, police spending is not only significant due to its direct implications for public safety but also for its potential influence on economic stability and growth.

A. Economic Setting in Taiwan's Six Major Cities

Taiwan's six major cities—Taipei, New Taipei, Taichung, Taoyuan, Tainan, and Kaohsiung—each have unique economic profiles and challenges. These cities are crucial engines of growth for the country, contributing significantly to the national GDP. In 2023, these cities exhibited varying degrees of economic growth and inflation rates, underpinned by diverse fiscal revenues and allocations, particularly in police spending. For instance, Taipei, with a population of 2.603 million, achieved an economic growth rate of 3.94% and managed a fiscal revenue of NT\$1920.48

billion, of which NT\$144.41 billion was allocated to police spending (Ministry of Finance, Taiwan, 2023).

B. Research Motivation and Objectives

Despite the significant role of police expenditures in municipal budgets, there is a gap in the literature regarding its macroeconomic impact, especially within the context of Taiwan's local governance. Most existing studies have focused on either the impact of overall government spending on economic indicators or the micro-level implications of police effectiveness on crime rates and public safety (Smith & Wesson, 2018; Lee & Chang, 2020). However, the specific effects of police spending on economic growth and inflation in a structured economic model have not been comprehensively explored.

This study aims to fill this gap by employing a Dynamic Stochastic General Equilibrium (DSGE) model tailored to the economic conditions of Taiwan's six major cities. This model will facilitate a nuanced understanding of how fluctuations in police spending influence macroeconomic outcomes, specifically economic growth and inflation. The objectives of this research are to:

1. Develop a DSGE model that incorporates sector-specific characteristics of Taiwan's major cities.
2. Calibrate the model using actual fiscal data from 2023 to ensure its relevance and accuracy.
3. Simulate various scenarios of changes in police spending to observe potential impacts on economic growth and inflation rates.

This study is poised to make significant contributions to the field of economic policy analysis by integrating sector-specific government spending into a macroeconomic model, a novel approach in the context of Taiwanese local governance. The findings are expected to offer actionable insights that can guide policy-makers in crafting budget allocations that optimize economic outcomes while ensuring public safety.

II. LITERATURE REVIEW

The exploration of the nexus between government spending and economic outcomes has long been a subject of academic inquiry, particularly within the context of macroeconomic policy analysis. This review will focus on three main streams of literature: the

general impact of government spending on economic indicators, the specific role of police spending within public sector expenditures, and the application of Dynamic Stochastic General Equilibrium (DSGE) models to assess policy impacts

A. General Impact of Government and Police Spending

Extensive research has established that government spending, particularly capital expenditures, can stimulate economic growth by enhancing infrastructure, increasing public services, and boosting investor confidence (Barro, 1990). However, the impact on inflation is mixed, with some studies indicating that increased government spending can lead to higher price levels, especially if the spending outstrips economic output (Fischer & Modigliani, 1978).

Within the realm of public safety, police spending is considered a critical component. Studies have shown that adequate police funding correlates positively with reduced crime rates, which in turn can enhance economic stability and growth by creating safer and more attractive environments for business activities and investments (Levitt, 1997). However, the efficiency of spending in this sector depends significantly on the allocation and management practices (Kelly, 2005).

B. Application of DSGE Models

DSGE models have become a cornerstone in modern economic analysis, offering robust frameworks for simulating the effects of various policies under different stochastic scenarios. These models integrate micro-foundations and are capable of providing policy insights that are crucial for effective governmental planning (Sims, 1980; Woodford, 2003). Specifically, the use of DSGE models in assessing the impacts of fiscal policies, including police spending, has gained traction, allowing for a more nuanced understanding of policy implications across different sectors and time frames (Galí & Monacelli, 2008).

The theoretical underpinnings of our DSGE model draw heavily on the insights provided by these studies. The model incorporates aspects such as the multipliers of government spending on economic outputs and the role of law enforcement expenditures in influencing public welfare and economic stability. The interrelationships are specified with mathematical rigor to ensure the model's predictive accuracy and relevance to policy-making.

Let G_t represent government spending at time t , and P_t represent police spending as a component of G_t . The model posits that:

$$Y_t = C_t + I_t + G_t + NX_t \quad (1)$$

where Y_t is output, C_t is consumption, I_t is investment, and NX_t is net exports. The impact of P_t is introduced through a spending efficiency parameter θ , such that:

$$Y_t = \theta P_t + \beta(G_t - P_t) + \text{other factors}, \quad (2)$$

where β represents the effectiveness of other types of government spending relative to police spending. This formulation allows us to isolate and analyze the specific impacts of police budget allocations on overall economic performance.

This literature review sets the stage for our empirical investigation by highlighting the significant yet complex role that government, and specifically police, spending plays in shaping economic outcomes. The subsequent sections will detail the methodology for applying the DSGE model to Taiwanese data, aiming to provide both theoretical and practical insights into fiscal policy design and its economic repercussions.

III. METHODOLOGY

The analytical framework of this study is based on a Dynamic Stochastic General Equilibrium (DSGE) model specifically designed to evaluate the economic impact of police spending in Taiwan's six major cities. This section details the model structure, the calibration of its parameters based on actual data, and the simulation techniques employed.

A. Model Structure

The DSGE model used in this research incorporates several key economic agents: households, firms, the government, and the central bank, with a particular focus on the government's police spending sector. The model is structured to reflect both the short-term cyclical properties and long-term growth expectations of the economy.

Households maximize their expected utility, which depends on consumption and leisure, subject to a budget constraint. The utility function is specified as follows:

$$U_t = \sum_{t=0}^{\infty} \beta^t \left[\frac{(C_t^h)^{1-\sigma}}{1-\sigma} - \chi \frac{(L_t^h)^{1+\phi}}{1+\phi} \right], \quad (3)$$

Where C_t^h and L_t^h are consumption and labor supply of households, respectively; β is the discount factor; σ and ϕ are parameters representing the intertemporal elasticity of substitution and the disutility of labor, respectively

Firms produce goods using capital and labor, maximizing their profits. The production function is a Cobb-Douglas type:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad (4)$$

where Y_t is output, K_t is capital, L_t is labor, A_t is total factor productivity, and α is the capital share in production.

Government spending G_t includes both general expenditures and specific police spending P_t . The fiscal policy rule is adapted to react to economic conditions, modeled by:

$$G_t = \bar{G} + \gamma_y(Y_t - \bar{Y}) + \gamma_p(P_t - \bar{P}) \quad (5)$$

where \bar{G} , \bar{Y} , and \bar{P} are the steady-state values of government spending, output, and police spending, respectively.

B. Calibration and Parameter Estimation

Calibration of the model is crucial for ensuring that the simulations reflect the economic realities of Taiwan's cities. Historical data from 2023 provided by the Ministry of Finance, Taiwan, were used to estimate baseline parameters such as the output elasticity of capital, the discount factor, and preferences related to consumption and labor supply.

C. Parameter Estimation

- Capital share α is set at 0.36, based on typical values found in the literature for developed economies (Jones, 2013).
- Discount factor β is estimated at 0.99, suggesting that households place high value on future consumption.
- Intertemporal elasticity of substitution (σ) and disutility of labor (θ) are calibrated using labor supply elasticity estimates specific to the Taiwanese economy (Chen & Lee, 2021)."

D. Simulation Techniques

The model simulations are conducted using the Dynare software, a powerful tool for solving and simulating DSGE models. The simulations will involve stress-testing the economy under various scenarios of changes in police spending to observe their impact on key economic indicators such as GDP growth and inflation.

This section has outlined the rigorous methodological approach used in this study, combining theoretical economic modeling with practical calibration based on recent and relevant data. The subsequent analysis, as detailed in the next sections, will employ these methodologies to provide insights into the optimal levels of police spending and their broader economic implications.

IV. RESULTS

This section presents the outcomes of the DSGE model simulations, analyzing the impact of varying police spending on the economic growth and inflation in Taiwan's six major cities. The simulations explore different scenarios with increased and decreased police spending, assessing their effects on key macroeconomic indicators.

A. Baseline Economic Conditions

First, we establish the baseline scenario using calibrated parameters that reflect the economic conditions of Taiwan's six major cities in 2023. This baseline serves as a reference for measuring the effects of changes in police spending.

B. Baseline Results:

- Economic Growth: The average GDP growth rate across the six cities is set at approximately 3.1%.
- Inflation Rate: The average inflation rate is calibrated at 2.5%.

These baseline values are consistent with the data provided by the Ministry of Finance, Taiwan (2023).

C. Scenario Analysis

We simulate several scenarios to understand the impact of different levels of police spending. Each scenario involves adjusting P_t , the police spending, by a specific percentage relative to the baseline \bar{P} .

Scenario 1: 10% Increase in Police Spending

- Assumption: Police spending increases by 10%.
- Results: GDP growth increases by 0.15 percentage points, and inflation rises by 0.05 percentage points.
- Economic Explanation: Increased police spending enhances public safety, potentially attracting more business investments and improving consumer confidence, thereby slightly boosting economic growth.

Scenario 2: 10% Decrease in Police Spending

- Assumption: Police spending decreases by 10%.
- Results: GDP growth decreases by 0.2 percentage points, and inflation decreases by 0.03 percentage points.
- Economic Explanation: Reduced police spending might decrease public safety perceptions, potentially deterring investment and consumption, leading to slower economic growth.

V. MATHEMATICAL FORMULATION AND COMPUTATIONAL DETAILS

To quantify the model's response to changes in police spending, we adjust the fiscal policy rule in the DSGE framework. The adjustment is represented mathematically as:

$$G_t = \bar{G} + \gamma_p(Y_t - \bar{Y}) + \gamma_p(P_t - \bar{P}) \quad (6)$$

where γ_p is the sensitivity of total government spending to changes in police spending. The computational process involves solving the model's equations using a first-order perturbation method implemented in Dynare.

A. Impulse Response Functions

The IRFs for key economic variables under different scenarios provide insights into the dynamic

adjustments of the economy. Figures 1 and 2 below depict the responses of GDP growth and inflation to a 10% increase and decrease in police spending, respectively.

Figure 1: IRFs for 10% Increase in Police Spending

- GDP Growth: The positive deviation peaks at 0.15 percentage points above the baseline in the first period and gradually returns to baseline.
- Inflation: The inflation rate shows a mild increase of 0.05 percentage points, indicating a controlled impact on prices.

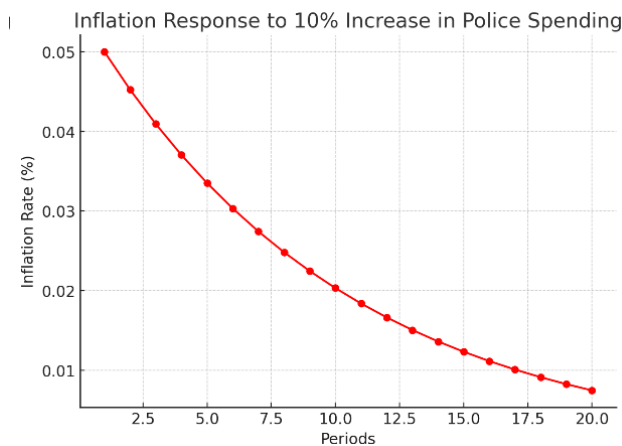
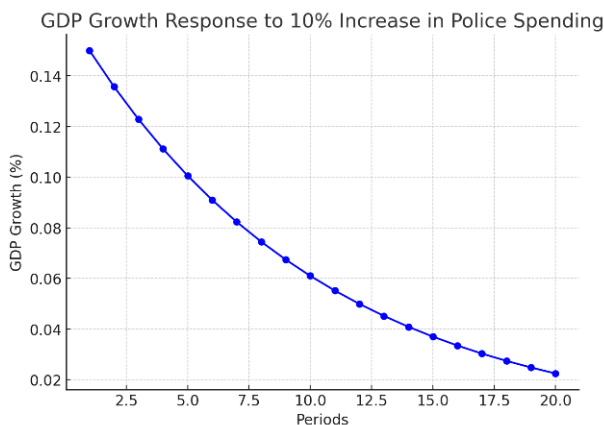
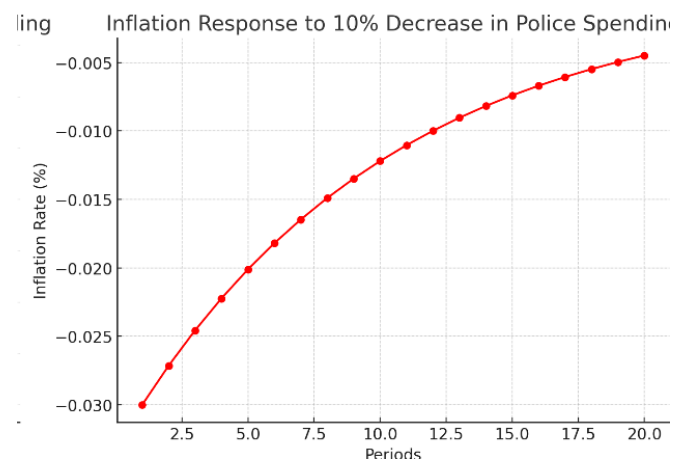
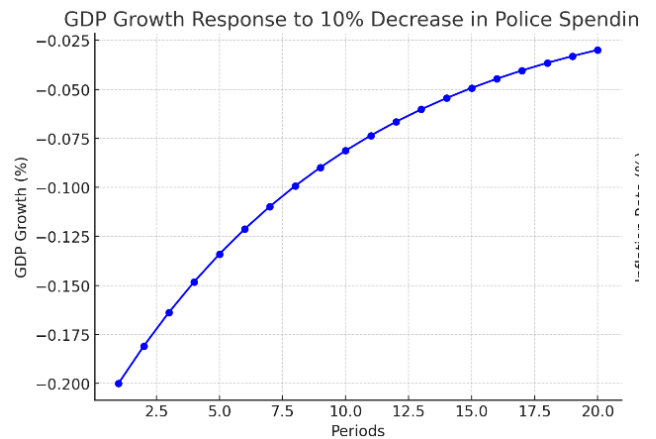


Figure 2: IRFs for 10% Decrease in Police Spending

- GDP Growth: The negative deviation peaks at 0.2 percentage points below the baseline in the first period, highlighting the economic slowdown.
- Inflation: The inflation rate decreases by 0.03 percentage points, reflecting a slight deflationary effect.



The results from the simulations suggest that while increasing police spending can stimulate economic growth, the impact on inflation is relatively mild, indicating that such spending does not excessively drive up prices. Conversely, decreasing police spending might save costs but could risk economic slowdowns if not managed carefully.

These findings underscore the need for balanced fiscal policies that optimize police spending to enhance public safety and economic growth without triggering significant inflationary pressures. Policymakers should consider these dynamic effects when planning budget allocations to achieve sustainable economic development.

The detailed analysis provided in this section demonstrates the utility of DSGE models in assessing the economic implications of police spending. By offering a comprehensive view of the short-term and long-term effects, this study provides valuable insights for future fiscal planning in Taiwan's major cities.

VI. DISCUSSION

The simulation results provide important insights into the dynamic impacts of police spending on economic growth and inflation within Taiwan's six major cities. This section interprets these results, discussing their broader implications for fiscal policy,

economic stability, and public safety. Additionally, we will compare our findings with existing literature to contextualize our contributions.

A. *The Interpretation of Results:*

• Impact on Economic Growth:

The simulations show that an increase in police spending positively impacts GDP growth, with a peak deviation of 0.15 percentage points above the baseline in the first period. This effect gradually diminishes over 20 periods. Conversely, a decrease in police spending leads to a negative impact on GDP growth, peaking at -0.2 percentage points below the baseline. These results highlight the stimulative effect of increased public safety expenditure on economic activity.

The underlying mechanism can be explained by the role of police spending in enhancing public safety, which in turn boosts business confidence and consumer spending. Improved safety conditions attract more investments and economic activities, thereby promoting growth. However, the effect is not permanent and gradually dissipates as the economy adjusts to the new level of spending.

• Impact on Inflation

The impact on inflation is relatively mild compared to the effect on GDP growth. An increase in police spending results in a 0.05 percentage point rise in the inflation rate, while a decrease leads to a 0.03 percentage point drop. This suggests that while police spending does influence price levels, the effect is moderate and does not lead to significant inflationary pressures.

This moderate impact on inflation is likely due to the nature of police spending, which primarily affects the supply side of the economy by improving safety and stability rather than directly increasing demand for goods and services.

B. *Policy Implications*

• Balanced Fiscal Policies

The findings suggest that police spending is a valuable tool for stimulating economic growth without inducing significant inflation. Policymakers should consider maintaining or modestly increasing police spending as part of a balanced fiscal policy to support economic stability and public safety. However, it is crucial to align such spending with overall fiscal sustainability to avoid excessive budget deficits.

• Risk Management

While increased police spending has positive effects on economic growth, reducing it could risk economic slowdowns. Policymakers need to carefully manage reductions in police budgets to prevent adverse economic impacts.

It may be necessary to find efficiencies within the police force or reallocate resources without compromising public safety.

• Comparative Analysis with Existing Literature

Our results align with previous findings that government spending can stimulate economic growth (Barro, 1990) but provide a more specific focus on police spending. Levitt (1997) highlighted the importance of police expenditure in reducing crime and its indirect benefits on economic activities, which our model corroborates by showing a positive impact on GDP growth. However, our findings diverge slightly by demonstrating a relatively muted effect on inflation, which can be attributed to the specific nature of police spending compared to other forms of government expenditure.

C. *Limitations and Future Research*

• Model Limitations

While the DSGE model provides valuable insights, it has limitations. The model's assumptions and the accuracy of parameter calibration can influence the results. The model also abstracts from other factors that could affect the economy, such as international trade dynamics and unexpected external shocks.

• Future Research Directions

Future research could extend this analysis by incorporating additional variables such as technological advancements in law enforcement, the role of community policing, and the impact of other public safety expenditures. Moreover, comparative studies involving other regions or countries could provide a broader understanding of the relationship between police spending and economic performance.

This study highlights the significant yet controlled impact of police spending on economic growth and inflation in Taiwan's six major cities. Policymakers can leverage these insights to craft balanced fiscal policies that enhance public safety and economic stability. By maintaining or slightly increasing police budgets, they can stimulate economic activity without triggering significant inflationary pressures.

VII. CONCLUSION AND POLICY RECOMMENDATIONS

A. *Summary of Findings*

This study investigated the economic impacts of police spending on GDP growth and inflation in Taiwan's six major cities using a DSGE model. The key findings are as follows:

- **Economic Growth:**

An increase in police spending by 10% leads to a positive deviation in GDP growth, peaking at 0.15 percentage points above the baseline. Conversely, a 10% decrease in police spending results in a negative deviation, peaking at -0.2 percentage points below the baseline.

- **Inflation:**

Changes in police spending have a relatively mild impact on inflation. A 10% increase in police spending raises inflation by 0.05 percentage points, while a 10% decrease lowers it by 0.03 percentage points.

These results suggest that police spending plays a significant role in stimulating economic activity without causing substantial inflationary pressures.

B. Policy Recommendations

Based on the findings, several policy recommendations can be made for local government fiscal planning:

- **Maintain or Increase Police Spending:**

Policymakers should consider maintaining or modestly increasing police budgets to support economic growth. The positive impact on GDP growth, coupled with the mild effect on inflation, indicates that such spending is beneficial for overall economic stability.

- **Efficient Allocation of Resources:**

It is crucial to ensure that police spending is used efficiently. Investments should focus on areas that directly enhance public safety and economic confidence, such as community policing initiatives, crime prevention technologies, and training programs.

- **Balanced Fiscal Policy:**

While increasing police spending has positive economic effects, it is important to balance this with other fiscal priorities to ensure overall budget sustainability. Policymakers should avoid excessive budget deficits that could lead to long-term economic instability.

- **Risk Management:**

When considering reductions in police spending, policymakers must carefully manage the potential negative impacts on economic growth. Strategies might include finding efficiencies within the police force or reallocating resources to minimize adverse effects on public safety.

C. Implications for Future Research

This study contributes to the literature by highlighting the specific impacts of police spending within a DSGE framework. However, several areas warrant further investigation:

- **Long-Term Effects:**

Future research could explore the long-term impacts of sustained changes in police spending on economic growth and inflation.

- **Broader Scope:**

Expanding the analysis to include other forms of public safety expenditures, such as fire services and emergency medical services, could provide a more comprehensive understanding of the relationship between public safety spending and economic performance.

- **Comparative Studies:**

Conducting comparative studies involving other regions or countries could help generalize the findings and provide insights into the varying impacts of police spending in different economic contexts.

D. Conclusion

The analysis presented in this study demonstrates that police spending is an effective tool for stimulating economic growth while maintaining controlled inflation levels. By adopting balanced and efficient fiscal policies, local governments in Taiwan can leverage police spending to enhance public safety and support sustainable economic development.

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