**University of Rijeka**
**Faculty of Economics Rijeka**

**DOCTORAL THESIS**

# Macroeconomic effects of fiscal policy in a small open economy: the case of Croatia

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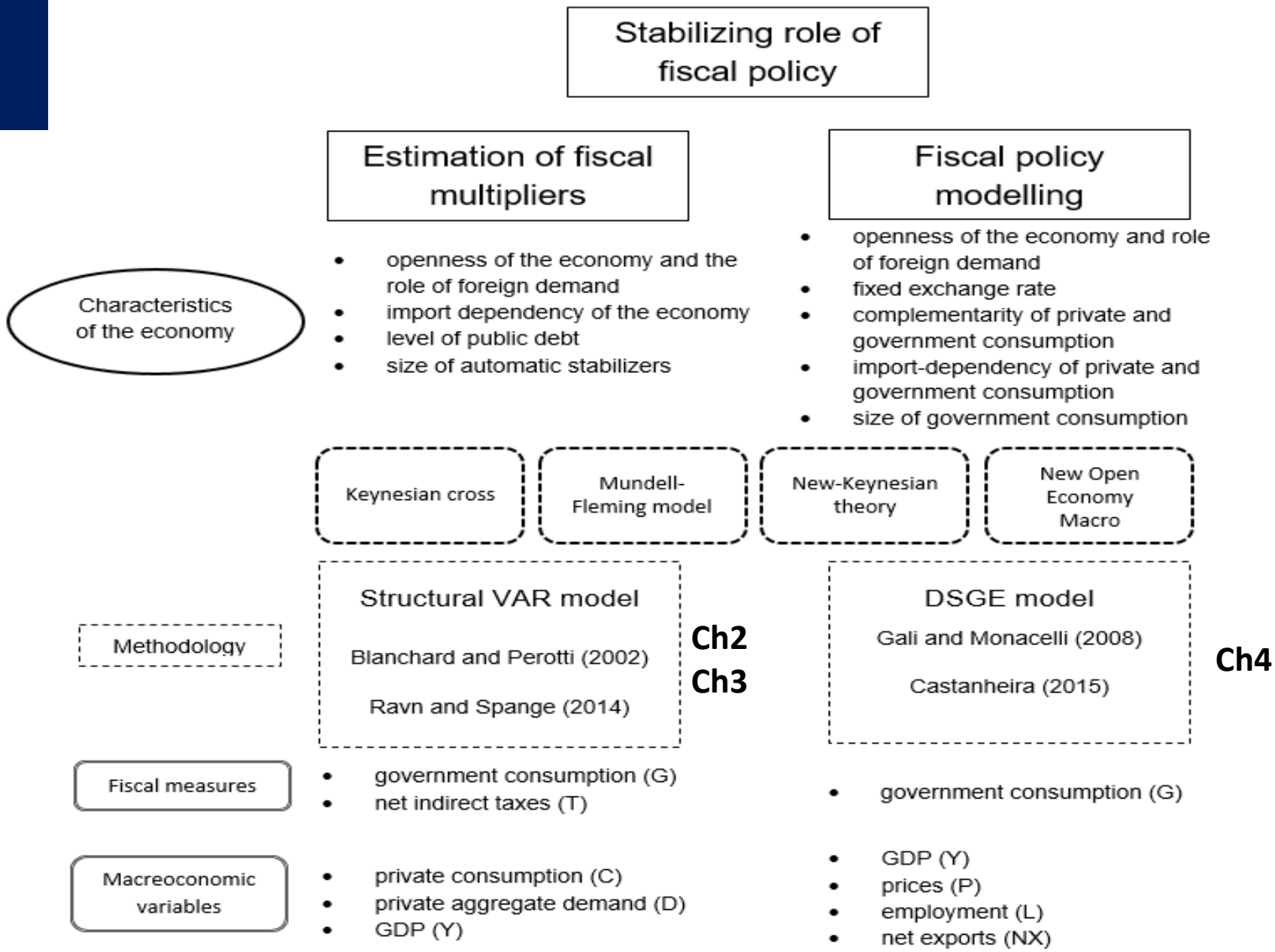
***"Perfectly reasonable economists can and do disagree on the basic theoretical effects of fiscal policy and on the interpretation of the existing empirical evidence"*** – Roberto Perotti (2007)

# Motivation

- **importance** of fiscal policy in Croatia
- **„filling a gap”** in the literature
  - previous research on macroeconomic effects of fiscal policy in Croatia based on the **closed economy analytical framework**
    - this dissertation introduces an **open economy analytical framework** for the analysis of macroeconomic effects of fiscal policy in Croatia
  - domestic literature on (macro) fiscal modelling **fairly scarce**
    - this dissertation proposes a **small open economy New-Keynesian DSGE model** for the analysis of fiscal (government consumption) shocks

# Contents

# Conceptual framework


Stabilizing role of fiscal policy
Estimation of fiscal multipliers
Fiscal policy modelling
Characteristics of the economy
openness of the economy and the role of foreign demand
import dependency of the economy
level of public debt
size of automatic stabilizers
openness of the economy and role of foreign demand
fixed exchange rate
complementarity of private and government consumption
import-dependency of private and government consumption
size of government consumption
Keynesian cross
Mundell-Fleming model
New-Keynesian theory
New Open Economy Macro
Methodology
Structural VAR model
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Ravn and Spange (2014)
Ch2
Ch3
DSGE model
Gali and Monacelli (2008)
Castanheira (2015)
Ch4
Fiscal measures
government consumption (G)
net indirect taxes (T)
government consumption (G)
Macreoconomic variables
private consumption (C)
private aggregate demand (D)
GDP (Y)
GDP (Y)
prices (P)
employment (L)
net exports (NX)

# Research goals and hypotheses

# Research goals

**Main goals** of this doctoral dissertation are:

- to empirically determine and analyze the **effects** of discretionary measures of fiscal policy on various **macroeconomic variables in Croatia**
  - GDP, private consumption, private aggregate demand
  - CPI
  - trade balance
  - employment
- to calculate and compare fiscal multipliers in Croatia in a **closed economy and an open economy analytical framework**
- to calculate and compare fiscal multipliers **in Croatia and comparable SOEs**
- to test the **adequacy of a small open economy New-Keynesian DSGE model** for the analysis and simulations of the effects of fiscal policy in Croatia

# Hypotheses

**H1:** Government consumption has a **significant effect** on macroeconomic developments in Croatia

- **H1a:** Government consumption has positive effect on GDP, private consumption and private domestic demand
- **H1b:** Government consumption has positive effect on employment
- **H1c:** Government consumption has negative effect on trade balance
- **H1d:** Government consumption has positive effect on CPI

**H2:** Government consumption multipliers in Croatia estimated in **the open economy** analytical framework are **lower compared to** multipliers estimated in the **closed economy** analytical framework

**H3:** Trade openness and public debt level have **significant effect** on the size of government consumption multipliers in Croatia

**H4:** Net indirect taxes have **negative effect** on private consumption and aggregate demand

**H5:** New-Keynesian DSGE models **can be used** for simulations of the effects of fiscal policy in Croatia

## Structure of the dissertation

# Structure – three central chapters

- **Chapter 2**
  - effects of government consumption and indirect taxes on private consumption and private aggregate demand in Croatia in the **open economy analytical framework**
- **Chapter 3**
  - effects of **openness** and level of public debt on the size of fiscal multipliers in Croatia and **two comparable small open economies** (Slovenia and Serbia)
- **Chapter 4**
  - calibration of the **small open economy NK DSGE** model with fiscal authority and import share of private and government consumption
  - analysis of the **adequacy** of this model for the simulation of the effects of fiscal policy in Croatia by comparing the impulse response functions from the calibrated model and the empirical vector autoregression model

# **Methodology** and results

# Methodology (Chapter 2 and Chapter 3)

- structural VAR model with Blanchard and Perotti (1999) identification strategy, augmented by Ravn and Spange (2012)

Blanchard and Perotti (1999)

$$Y_t = A(L,q)Y_{t-1} + U_t$$

RF

$$Y_t = [T_t, G_t, X_t]$$

$$U_t = [t_t, g_t, x_t]$$

$$\begin{aligned} t_t &= a_1\, x_t + a_2\, e_t^g + e_t^t \\ g_t &= b_1\, x_t + b_2\, e_t^t + e_t^g \\ x_t &= c_1\, t_t + c_2\, g_t + e_t^x \end{aligned}$$

$e^t, e^g, e^x$ - structural shocks

9 restrictions (6 from baseline model)

elasticites assumptions

Ravn and Spange (2012)

no t, introduction of c and f

$$t_t = a_1 c_t + a_2 f_t + \beta_2 e_t^G + \beta_1 e_t^t,$$

$$g_t = b_1 c_t + b_2 f_t + \beta_4 e_t^T + \beta_3 e_t^g,$$

$$c_t = c_1 t_t + c_2 g_t + c_3 f_t + \beta_5 e_t^c,$$

$$f_t = d_1 t_t + d_2 g_t + d_3 c_t + \beta_6 e_t^f$$

$e^t, e^g, e^c, e^f$ - structural shocks

22 restrictions (16 from baseline model)

elasticites assumptions

# Methodology (Chapter 4)

**Three steps**

1. Calibration of a small open economy New-Keynesian DSGE model based on data sutaible for the analysis of Croatian economy

2. Estimation of VAR model

3. Comparison of model impulse responses with empirical impulse responses from VAR model

# Main characteristics of SOE NK DSGE model

- Benchmark Gali (2008) model - *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework and Its Applications (Chapter 7)*

- Castanheira (2015) extended Gali (2008) model

  - **government consumption** in the **utility function**
  - **non-separable preferences** over **private** consumption and **government** consumption
  - private consumption and government expenditure with **asymmetric propensities to import**

# Model – only few main equations

Utility function

$$E_0 \sum_{t=0}^{\infty} \beta^t U(\widehat{C}_t, N_t) = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{\hat{C}_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi}\right)$$

$$\widehat{C}_t \equiv \begin{cases} \left[(1-\vartheta) C_t^{1-\nu} + \vartheta G_t^{1-\nu}\right]^{\frac{1}{1-\nu}}, & \text{for } \nu \neq 1, \\ C_t^{(1-\vartheta)} G_t^{\vartheta}, & \text{for } \nu = 1. \end{cases}$$

$$C_t = \left[(1-\alpha)^{\frac{1}{\eta}} (C_{H,t})^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}} (C_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}}$$

$$G_t = \left[(1-\chi)^{\frac{1}{\eta}} (G_{H,t})^{\frac{\eta-1}{\eta}} + \chi^{\frac{1}{\eta}} (G_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}}$$

Government consumption shock

$$g_t = \rho_g g_{t-1} + \varepsilon_t^g$$

Output developments

$$Y_t(j) = (1-\vartheta)\left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon}\left[(1-\alpha)\left(\frac{P_{H,t}}{P_t^C}\right)^{-\eta} C_t + \alpha \int_0^1 \left(\frac{P_{H,t}}{\varepsilon_{i,t} P_{F,t}^i}\right)^{-\gamma}\left(\frac{P_{F,t}^i}{P_t^{C,i}}\right)^{-\eta} C_t^i \, di\right]$$
$$+ \vartheta\left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon}\left[(1-\chi)\left(\frac{P_{H,t}}{P_t^G}\right)^{-\eta} G_t + \chi \int_0^1 \left(\frac{P_{H,t}}{\varepsilon_{i,t} P_{F,t}^i}\right)^{-\gamma}\left(\frac{P_{F,t}^i}{P_t^{G,i}}\right)^{-\eta} G_t^i \, di\right]$$

Net exports

$$nx_t = \frac{NX_t}{Y} \approx \frac{1}{Y}\left[Y_t - \frac{P_{H,t}}{P_t^C} C_t - \frac{P_{H,t}}{P_t^G} G_t\right]$$

New-Keynesian Phillips curve

$$\pi_{H,t} = \beta E_t\{\pi_{H,t+1}\} + \kappa_\alpha \tilde{y}_t,$$

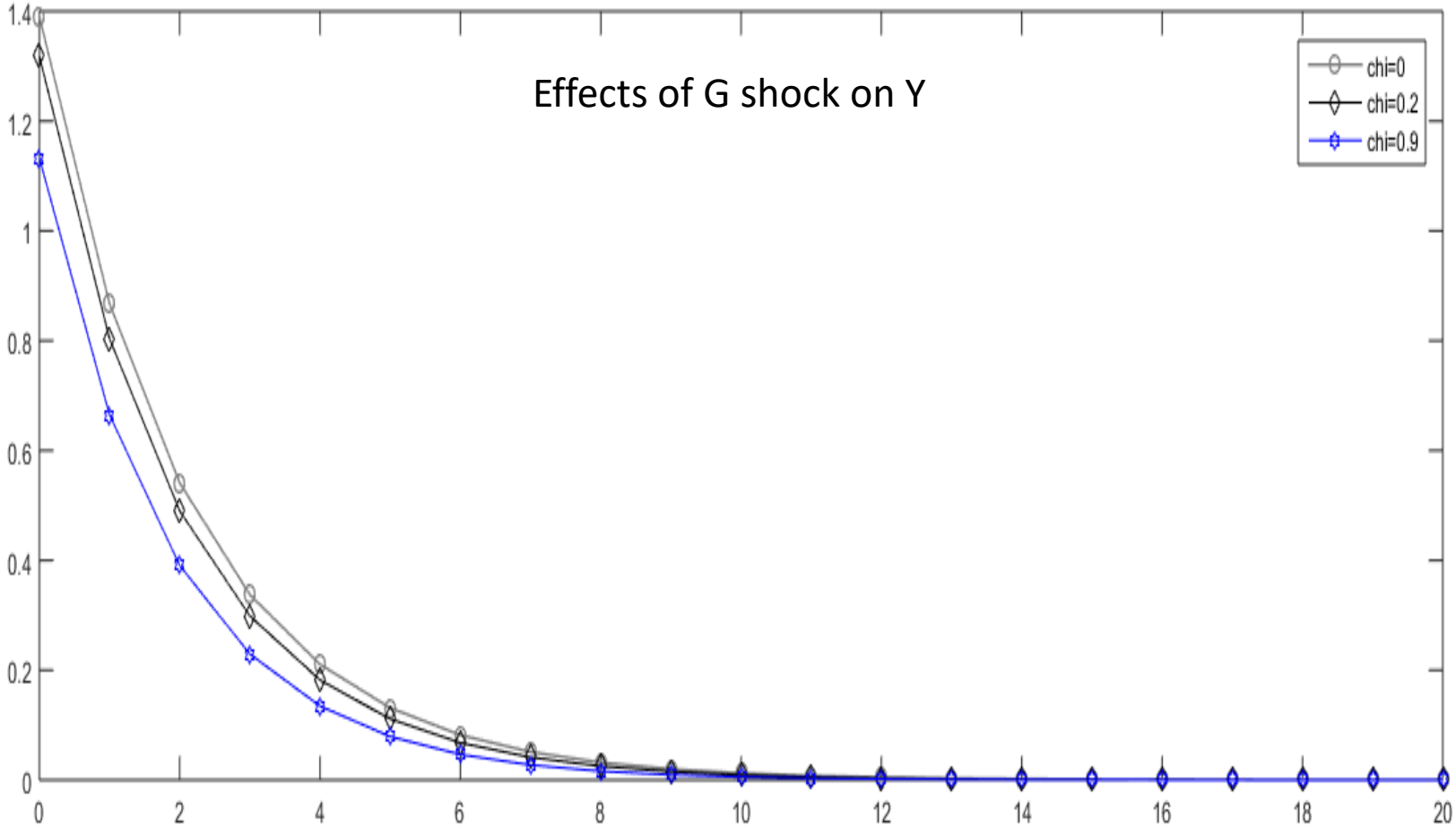
# Calibration – deep parameters

| Parameter | Description | Value | Source |
|---|---|---|---|
| $\alpha$ | share of private imports | 0.26 | authors calculations |
| $\chi$ | share of public imports | 0.14 | Mikulić (2018) |
| $\vartheta$ | share of government expenditures in effective consumption | 0.25 | authors calculations |
| $\varphi^{-1}$ | elasticity of labour supply | 0.33 | Bokan et al. (2010) |
| $\upsilon^{-1}$ | intratemporal elasticity of sub. btw private and public consumption | 0.33 | Bouakez & Rebei (2007) |
| $\sigma^{-1}$ | intertemporal elasticity of substitution of effective consumption | 0.50 | Havranek et al. (2013) |
| $\gamma$ | substitutability between goods produced in different foreign countries | 1.00 | assumption |
| $\eta$ | substitutability between domestic and foreign goods | 1.00 | assumption |
| $\varepsilon$ | elasticity of substitution between varieties produced within countries | 4.00 | Bokan et al. (2010) |
| $\beta$ | time discount factor | 0.99 | Bokan et al. (2010) |
| $\theta$ | share of firms unable to reset prices | 0.72 | Pufnik & Kunovac (2013) |
| $\rho_g$ | autocorrelation of government expenditures | 0.80 | authors calculations |
| $e$ | monetary policy regime | 0 | assumption |



Source: author

## No home bias in government consumption?

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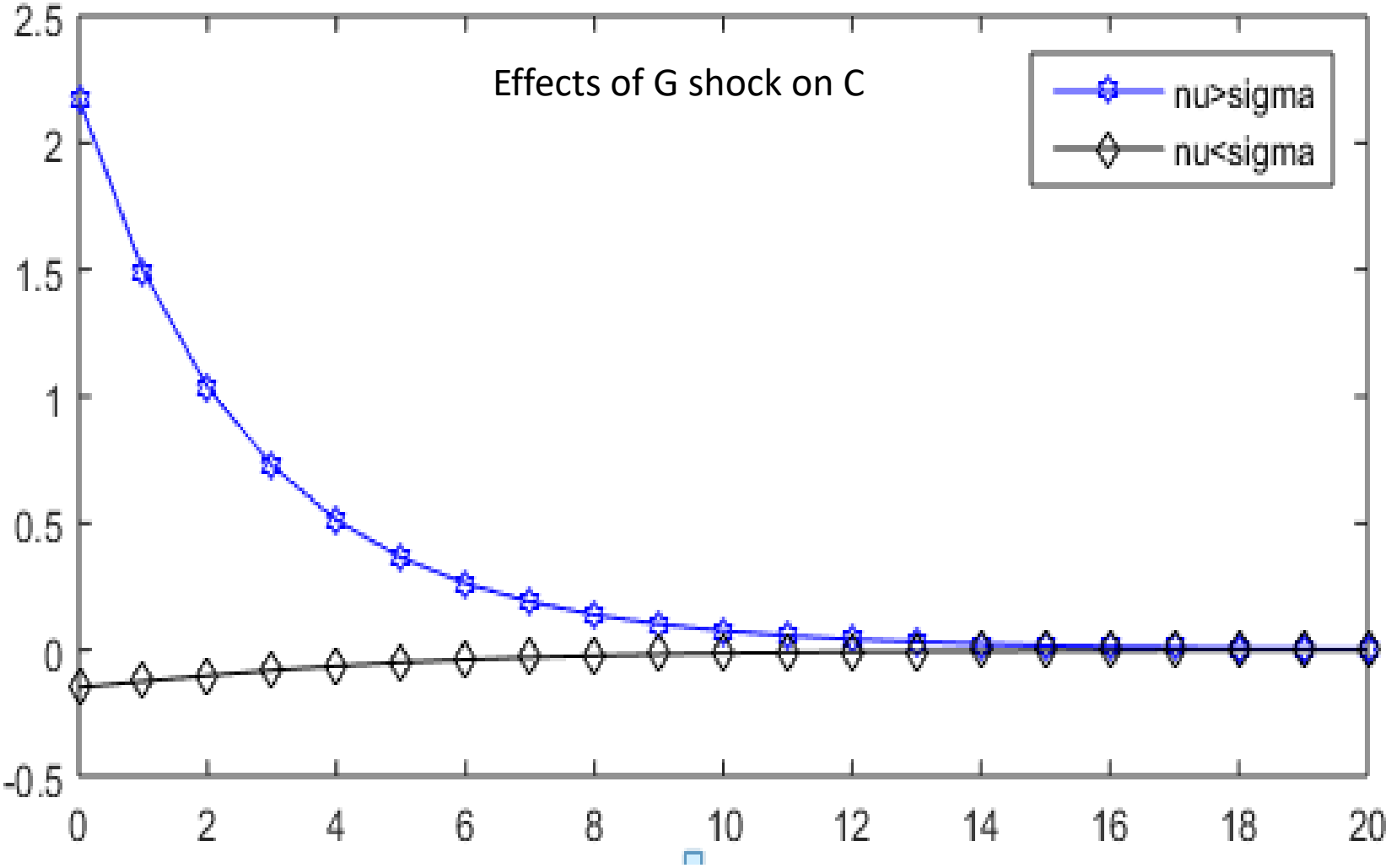
## Private and government consumption – complements of substitutes?

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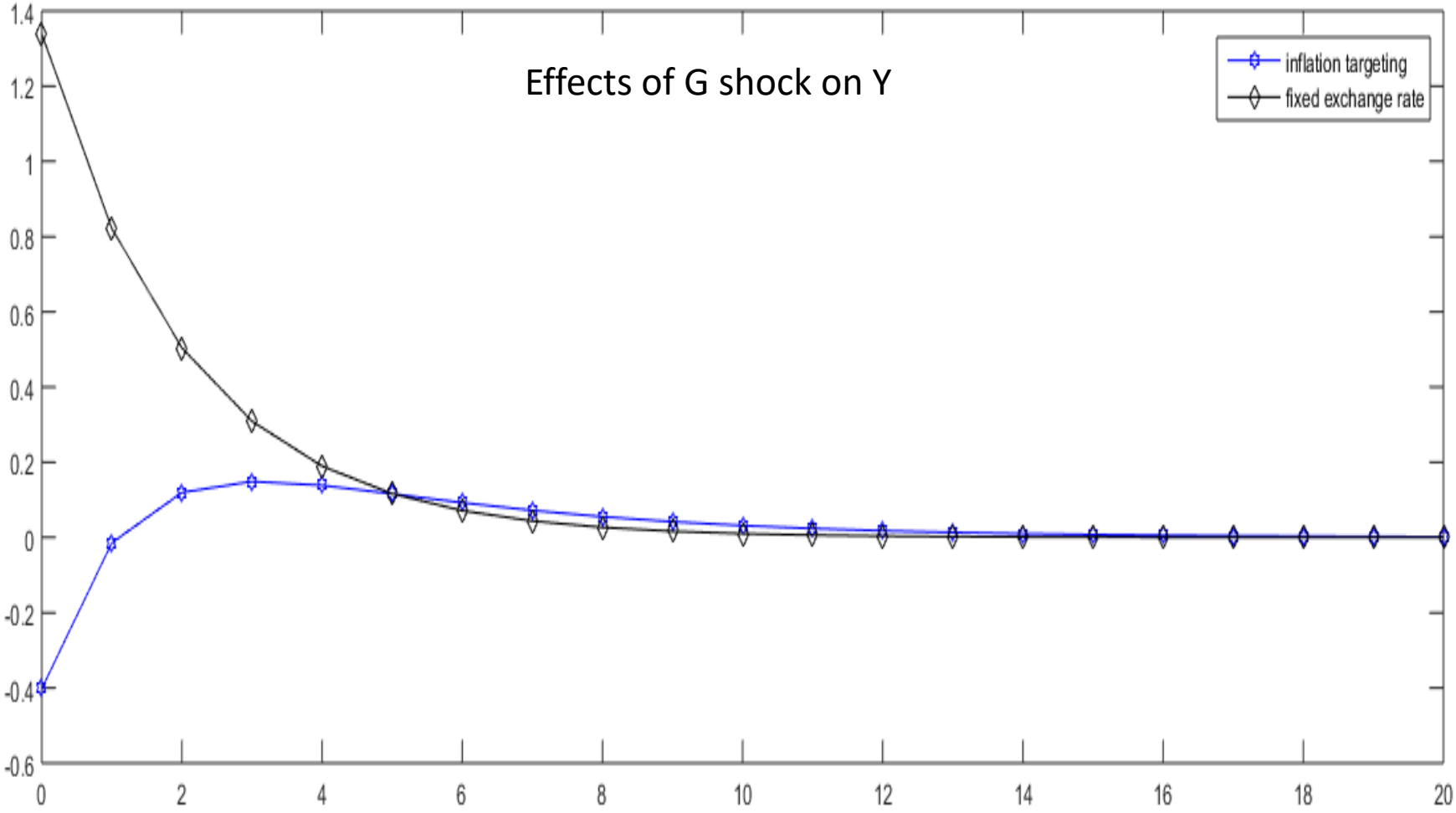
## Importance of the monetary policy regime

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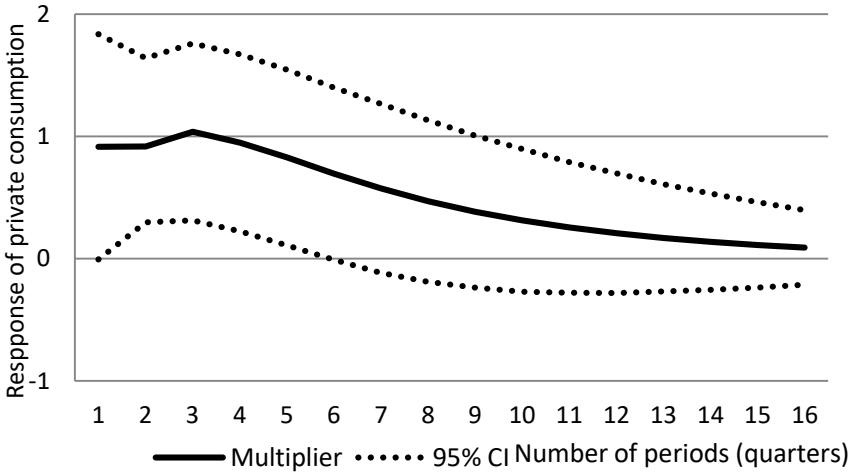
# Methodology and **results**

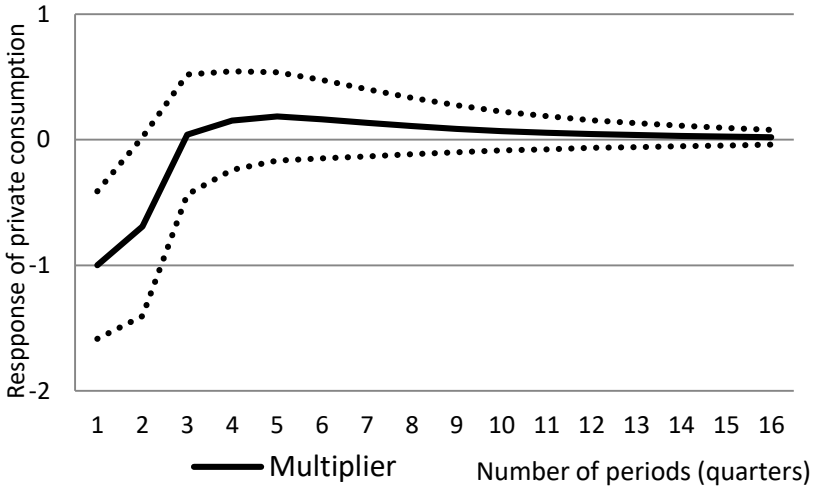
# Chapter 2 results

Effects of G shock

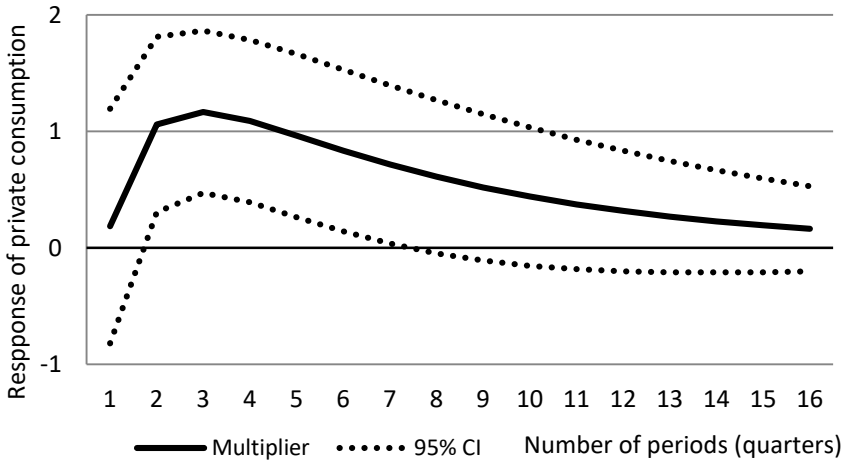
Effects of T shock

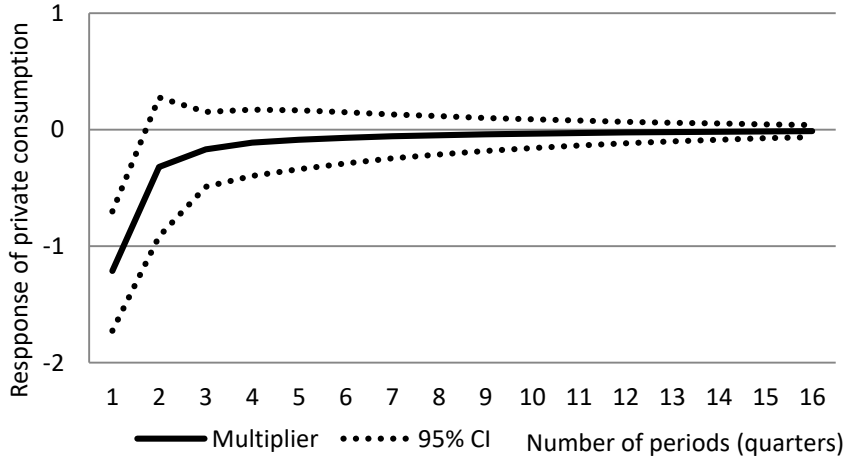
C




AD

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# Chapter 3 (main) results

Effects of government consumption shock on domestic demand in Croatia

| Quarter/Model | Closed model | Closed model with public debt | Open model with foreign demand | Open model with imports ratio |
|---|---|---|---|---|
| 4 | 1.05 | 0.86 | 0.80 | 0.91 |
| 8 | 1.66 | 0.6849* | 1.30 | 1.42 |
| 12 | 1.88 | 0.4131* | 1.51 | 1.64 |
| 16 | 1.96 | 0.3808* | 1.57 | 1.73 |

** implies that the impulse is not statistically significant*

Effects of government consumption shock on domestic demand – international comparison

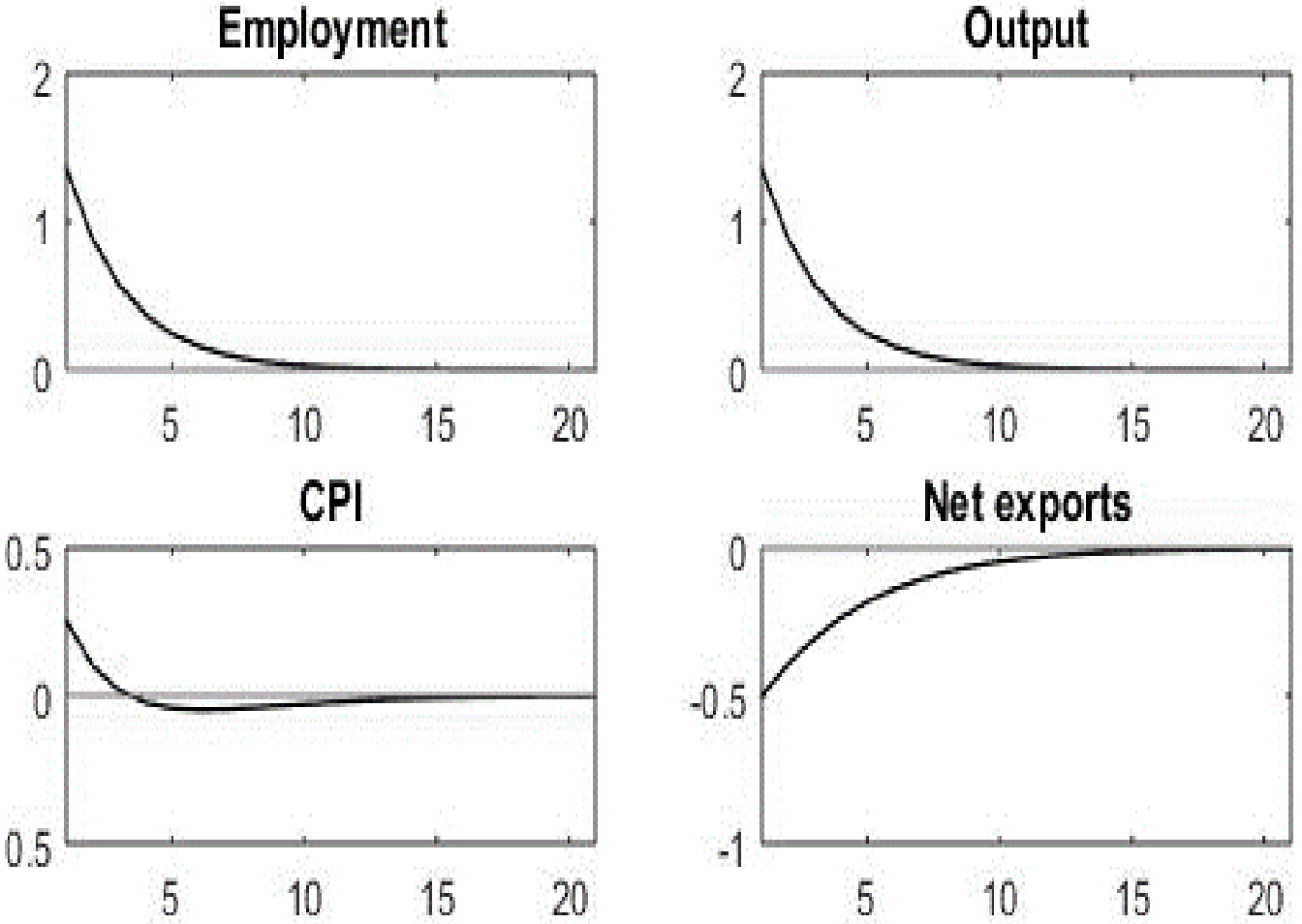
| Quarter/Model | Closed model | Closed model with public debt | Open model with foreign demand | Open model with imports ratio |
|---|---|---|---|---|
| Croatia | 1.05 | 0.86 | 0.80 | 0.91 |
| Serbia | 1.28 | 0.84 | 0.37* | 1.15 |
| Slovenia | -0.89 | -0.97 | -0.53 | -0.61 |

** implies that the impulse is not statistically significant*

Source: author

# Chapter 4 results

Effects of government consumption shock – model simulation

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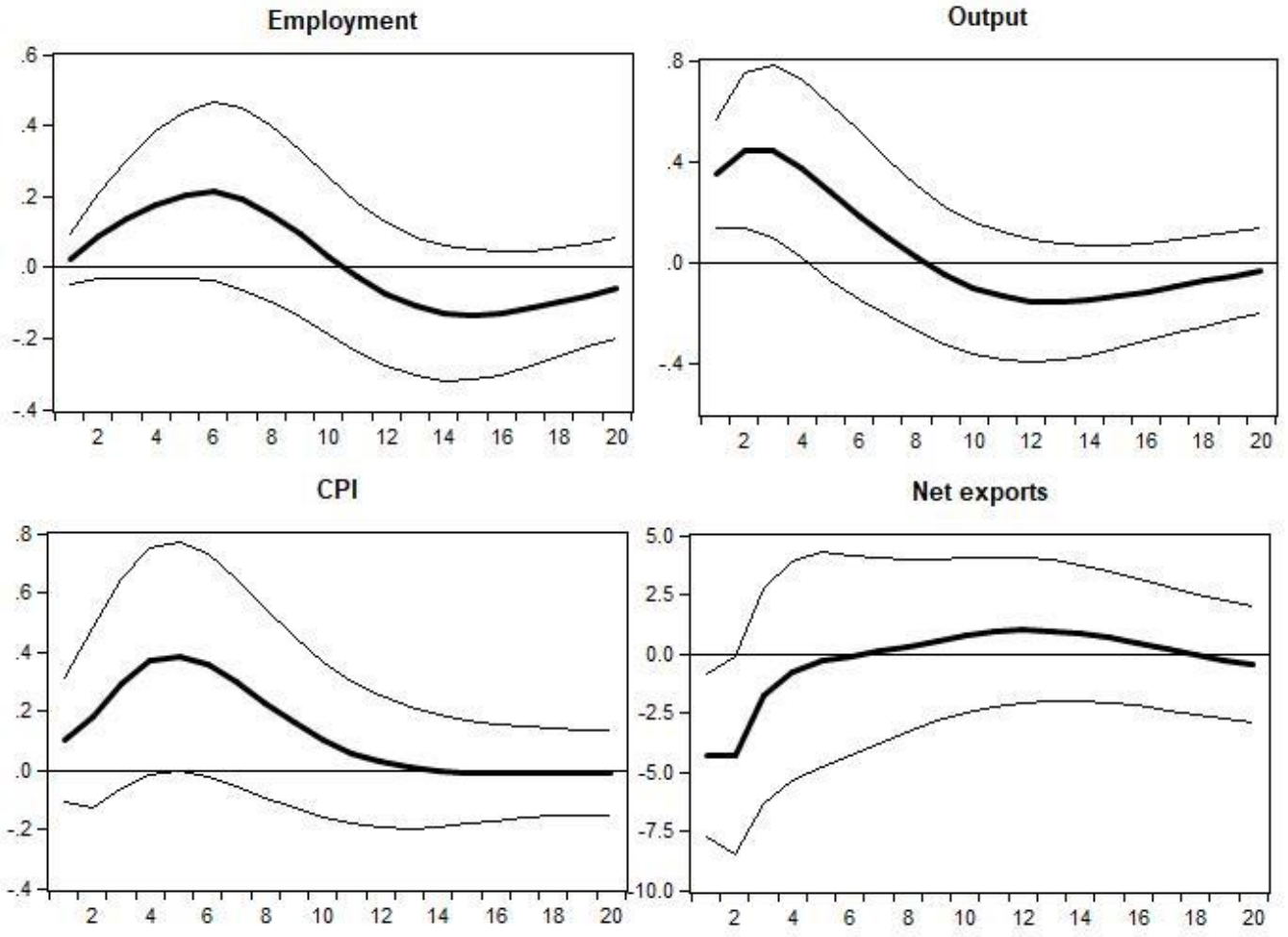
# Chapter 4 results

Effects of government consumption shock – VAR results

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# **Conclusions** and contributions

# Summary of results

- **Effects of fiscal policy in Croatia are Keynesian** in nature – Keynesian theoretical framework adequate for policy discussions (no evidence of Ricardian equivalence)

- Openess of the economy has **notable effect on the size of fiscal multiplier** in Croatia – open economy framework more suitable for the analysis

- Government and private consumption in Croatia can be seen as **complements** – important policy and theoretical/empirical repercussions

- Fiscal policy has statistically significant effect on **trade balance and inflation** - important policy repercussions

- Small open economy **New-Keynesian DSGE** model with fiscal shocks suitable for analysis of fiscal policy shocks in **Croatia**

# Summary of results and **contributions**

# Contributions to exisitng literature

- First **estimation** of fiscal multipliers in **Croatia** in a **small open economy analytical framework**
- First **direct comparison** of the size of fiscal multipliers in **Croatia** in a **closed economy** and **open economy** analytical frameworks
- First **comparison** of the size of fiscal multipliers in **Croatia** and **peer countries**, based on the **comparable methodology**
- First analysis of the effects of fiscal policy on **trade balance** in **Croatia**
- First **calibration** of a small open economy **New-Keynesian DSGE** model with fiscal shocks for **Croatia**

Thank you!