Too Big and Too Different to be Overlooked: A DSGE Approach to Government Banks.

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Overview

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Motivation

- Government banks are major financial institutions. They are big enough, in aggregate (assets or loans) that they likely merit consideration when modeling economic fluctuations and crisis.
- Public and private banks are different according to the empirical literature. La Porta et al (2002), Levy-Yeyati et al (2004), Sapienza (2004), Micco and Panizza (2006), Micco et al (2007), Altavilla et al (2016)

Motivation

Table: Government banks, share of assets of the top 10 banks. La Porta et al (2002).

Country	Share
Argentina	60.5
Belgium	27.6
Bolivia	18.5
Brazil	31.7
Chile	19.7
China	99.5
Colombia	53.9
Costa Rica	90.9
Ecuador	40.6
Egypt	88.6
El Salvador	26.4
France	17.3
Germany	36.4
Guatemala	22.2
Honduras	29.9
Israel	64.6
Italy	36
Nicaragua	63.4
Paraguay	48
Peru	26.5
Poland	84.3
Portugal	25.7
Taiwan	76.5
Thailand	17.1
Turkey	56.5
Uruguay	68.8

Motivation

- The literature has not provided an equilibrium model that addresses the effect of government banks in aggregate. Currently such effects are analyzed in partial equilibrium.
- I begin to address this gap by modeling a salient feature of government banks - they react differently during recessions by extending loans when non-government banks curtail lending.
- I develop a DSGE model that explores dynamics of the economy when we account for this behavior.

Motivation

- The idea behind this motivation is to answer:
- Does the presence of public banks matters for modeling an equilibrium model?
- What are the implication for the real economy of adding these institutions into the model?
- Is their behavior different enough from private banks to justify modeling public banks?

Introduction

- Until now public and government banks have been treated as the same agent in equilibrium models.
- However, the empirical literature shows important differences: La Porta et al (2002), Levy-Yeyati et al (2004), Sapienza (2004), Micco and Panizza (2006), Micco et al (2007), Altavilla et al (2016).

Introduction

- Those differences can be classified in the following views:
- The Social.
- The Development.
- The Political.
- The Agency.
- Those banks react different than their private counterparts during recessions. Those are less procyclical in terms of the loans these provide after a negative shock.

Introduction

- Following Aliaga-Diaz and Olivero (2012) I develop a DSGE model with banks.
- In this model I differentiate between private and government banks, taking one of the major differences found in the empirical literature. The reaction those banks have during an economic downturn.
- Therefore, in this model, the government works through government banks during recessions by injecting capital that is used to make loans.

The Model

- The model is a DSGE economy which is characterized by six types of agents.
- Households with access to the financial market. They are λ percent of the total population.
- Households without access to the financial market.
- Firms.
- Private banks. They are a ϕ percent of the total banks.
- Government banks.
- The government.

Ricardian Households

The households with access to the financial market solve:

$$\max_{c_{r,t},l_{r,t},D_{t+1},s_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t \frac{\left(c_{r,t} - \frac{l_{r,t}^{\omega}}{\omega}\right)^{1-\theta}}{1-\theta} \tag{1}$$

s.t.

$$(1+r_t)D_t + w_t l_{r,t} + \left[\frac{div_t^p}{s_t} + p_t\right] s_t \quad \geq \quad c_{r,t} + D_{t+1} + p_t s_{t+1}. \tag{2}$$

Ricardian Households

Therefore, the optimal equations for them are :

$$l_{r,t}^{\omega-1} = w_t, \tag{3}$$

$$\left(c_{r,t} - \frac{l_{r,t}^{\omega}}{\omega}\right)^{-\theta} = \beta E_t(1 + r_{t+1})\left(c_{r,t+1} - \frac{l_{r,t+1}^{\omega}}{\omega}\right)^{-\theta}, \tag{4}$$

$$\left(c_{r,t} - \frac{l_{r,t}^{\omega}}{\omega}\right)^{-\theta} = \beta E_t \frac{1}{p_t}\left[\frac{div_{t+1}^{p}}{s_{t+1}} + p_{t+1}\right]\left(c_{r,t+1} - \frac{l_{r,t+1}^{\omega}}{\omega}\right)^{-\theta}. \tag{5}$$

Non-Ricardian Households

The households without access to the financial market solve:

$$\max_{l_{nr,t}} E_0 \sum_{t=0}^{\infty} \beta^t \frac{\left(c_{nr,t} - \frac{l_{nr,t}^{\omega}}{\omega}\right)^{1-\theta}}{1-\theta} \tag{6}$$

s.t.

$$w_t l_{nr,t} + tr_t = c_{nr,t}. \tag{7}$$

Non-Ricardian Households

So the optimal solution is:

$$w_t l_{nr,t} + tr_t = c_{nr,t}. \tag{8}$$

Firms

Firms maximize profits taken prices as given:

$$\max_{I_t, l_t, L_{t+1}} E_0 \sum_{t=0}^{\infty} \left[\prod_{j=0}^{t} \frac{1}{1+r_j} \right] [Y_t + L_{t+1} - w_t l_t - (1+i_t)L_t - I_t] \tag{9}$$

s.t.

$$\begin{aligned} Y_t &= A_t K_t^{\alpha} l_t^{1-\alpha}, && (10) \\ K_{t+1} &= (1-\delta)K_t + I_t, && (11) \\ L_{t+1} &= K_{t+1}, && (12) \\ log(A_{t+1}) &= \rho log(A_t) + \epsilon_{t+1}, \quad \epsilon_{t+1} \sim N(0, \sigma^2). && (13) \end{aligned}$$

Firms

Their optimal plan is given by:

$$(1-\alpha)\frac{Y_t}{l_t} = w_t, \tag{14}$$

$$E_t\left[\frac{1}{1+r_{t+1}}\left(\alpha\frac{Y_{t+1}}{K_{t+1}} - (\delta + i_{t+1})\right)\right] = 0. \tag{15}$$

Private Banks

Private banks solve:

$$\max_{D^p_{t+1}, L^p_{t+1}, RE^p_t} E_0 \sum_{t=0}^{\infty} \prod_{j=0}^{t} q_j \left[(1-\tau)(i_t L^p_t + \phi \pi^f_t - r_t D^p_t) - RE^p_t \right] \tag{16}$$

s.t.

$$\begin{aligned} e^p_{t+1} &= RE^p_t + e^p_t, & (17)\\ L^p_{t+1} &= D^p_{t+1} + e^p_{t+1}, & (18)\\ e^p_{t+1} &\geq \gamma^p L^p_{t+1}. & (19) \end{aligned}$$

Private Banks

So their optimal solution is given by:

$$\gamma^p = E_t q_{t+1} \left(\gamma^p + (1-\tau)\left[i_{t+1} - (1-\gamma^p) r_{t+1} \right] \right). \tag{20}$$

Government Banks

Government banks solve:

$$\max_{D^g_{t+1}, L^g_{t+1}, RE^g_t} E_0 \sum_{t=0}^{\infty} \prod_{j=0}^{t} q_j \left[(1-\tau)(i_t L^g_t + (1-\phi)\pi^f_t - r_t D^g_t) - RE^g_t \right] \quad (21)$$

s.t.

$$\begin{aligned} e^g_{t+1} &= RE^g_t + e^g_t + \kappa g_t, & (22) \\ L^g_{t+1} &= D^g_{t+1} + e^g_{t+1}, & (23) \\ e^g_{t+1} &\geq \gamma^g L^g_{t+1}. & (24) \end{aligned}$$

Where κ is a way to capture a potential inefficiency faced for these banks.

g_t is an injection of capital coming from the government and is given by the following rule:

$$g_t = \chi(Y_{ss} - Y_t). \tag{25}$$

Where Y_{ss} is the steady state product. As in negative periods $Y_t < Y_{ss}$, $g_t > 0$. χ is a parameter that allows us to calibrate the magnitude of the government transfer to public banks.

Government Banks

Hence, the optimal plan is given by:

$$\gamma^g = E_t q_{t+1} \left(\gamma^g + (1-\tau)\left[i_{t+1} - (1-\gamma^g) r_{t+1} \right] \right). \tag{26}$$

As we can see, government banks are very similar to private banks. They maximize the same objective function but differ in one constraint.

The Government

The government holds a zero budget balance every period.

$$g_t + tr_t = \tau(i_t L_t - r_t D_t + \pi_t^f) + div_t^g . \tag{27}$$

Aggregation

Finally, in equilibrium:

$$
\begin{aligned}
c_t &= \lambda c_{r,t} + (1-\lambda) c_{nr,t}, && (28)\\
I_t &= \lambda I_{r,t} + (1-\lambda) I_{nr,t}, && (29)\\
Y_t &= c_t + I_t, && (30)\\
L_t &= \phi L_t^p + (1-\phi) L_t^g, && (31)\\
L_t &= K_t; && (32)\\
D_t &= \phi D_t^p + (1-\phi) D_t^g. && (33)
\end{aligned}
$$

Calibration

The parameters used in the paper are:

Table: Parameter values.

Parameter	Value
θ	3
β	0.98
ω	2
α	0.33
ρ	0.9
δ	0.1
γ^p	0.1
γ^g	0.1
τ	0.15
χ	0.125
λ	0.7

Output reaction

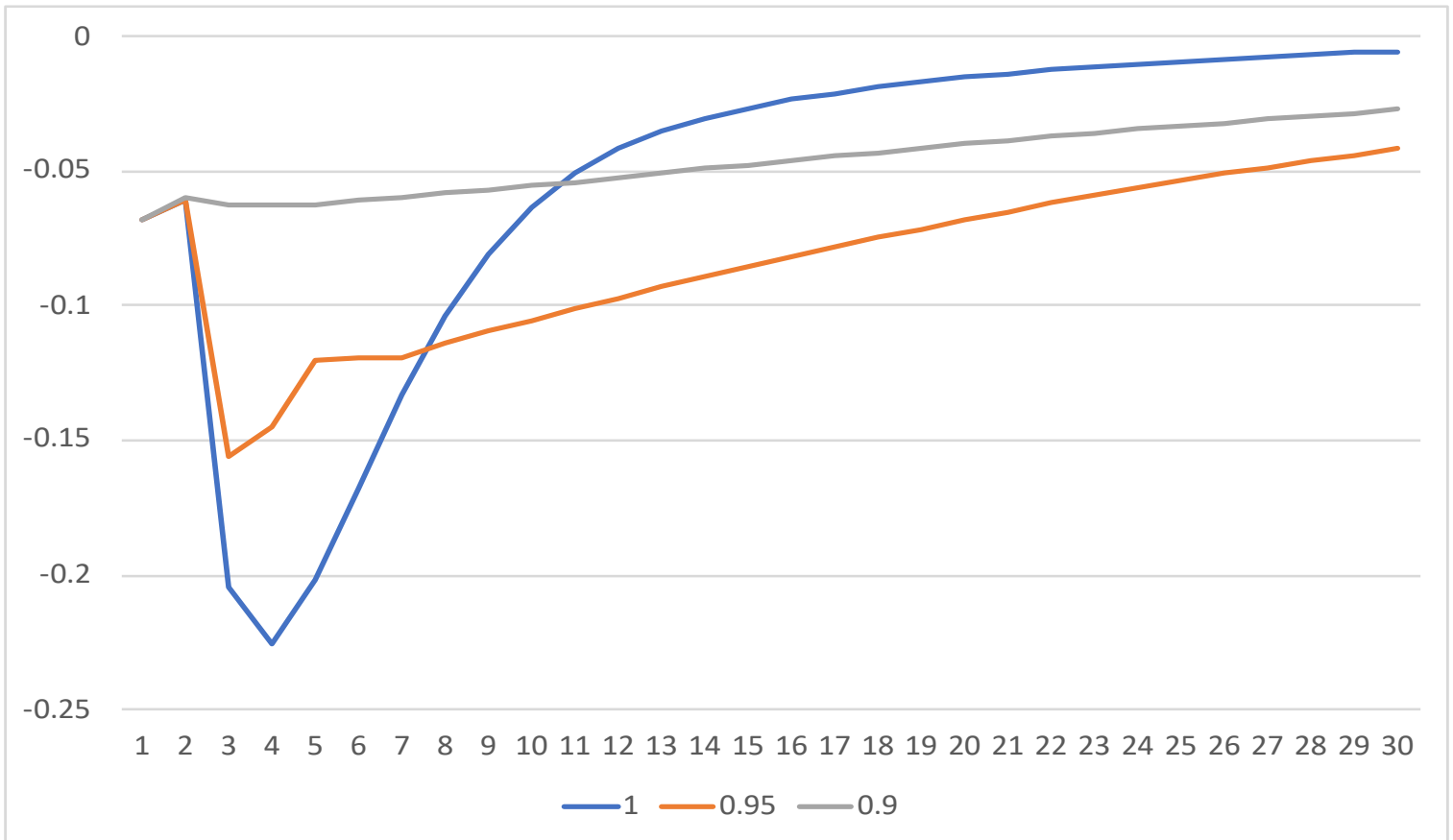

Figure: Output reaction to a TFP shock for different values for ϕ

Consumption reaction

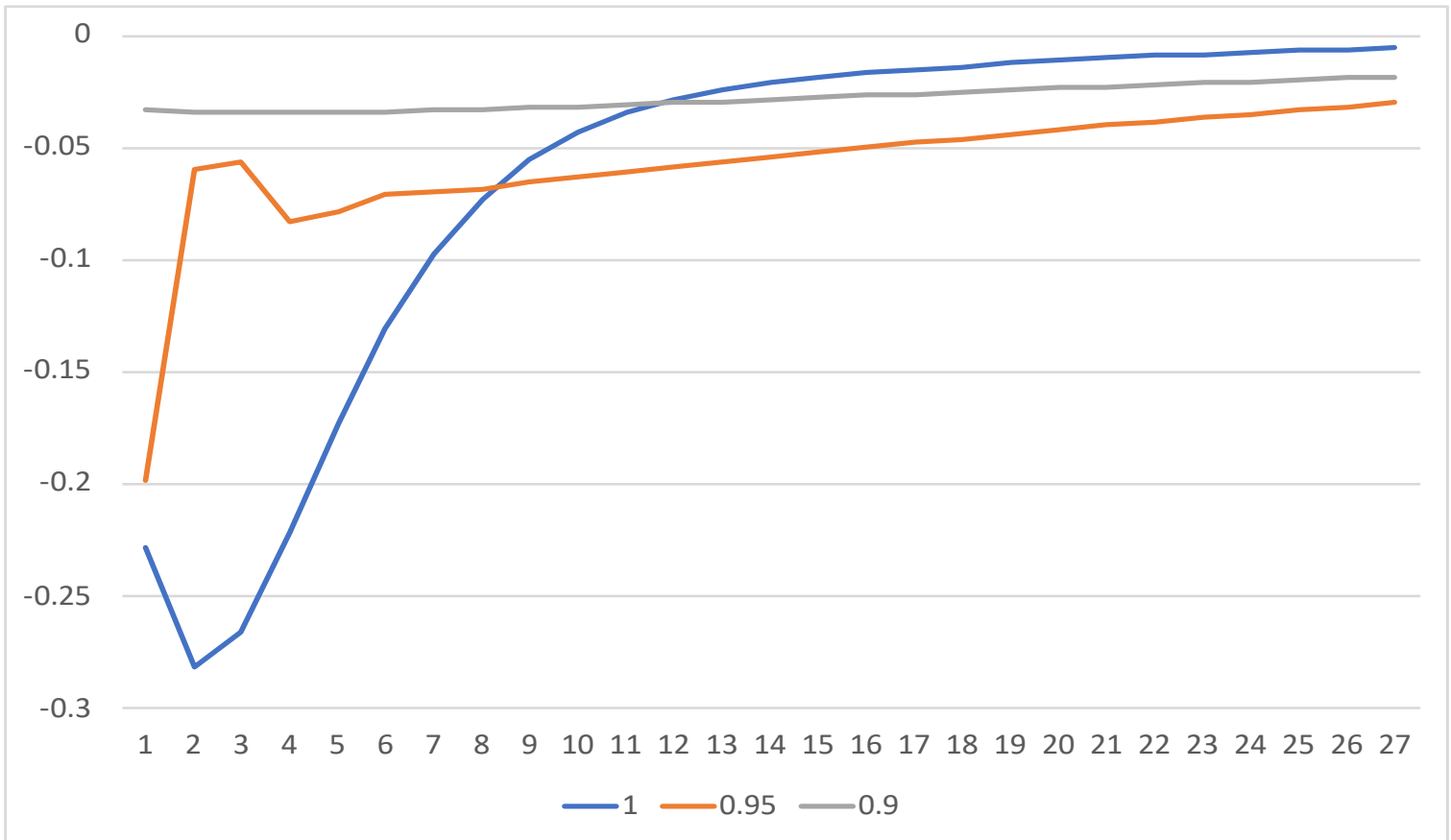

Figure: Consumption reaction to a TFP shock for different values for ϕ

Labor reaction

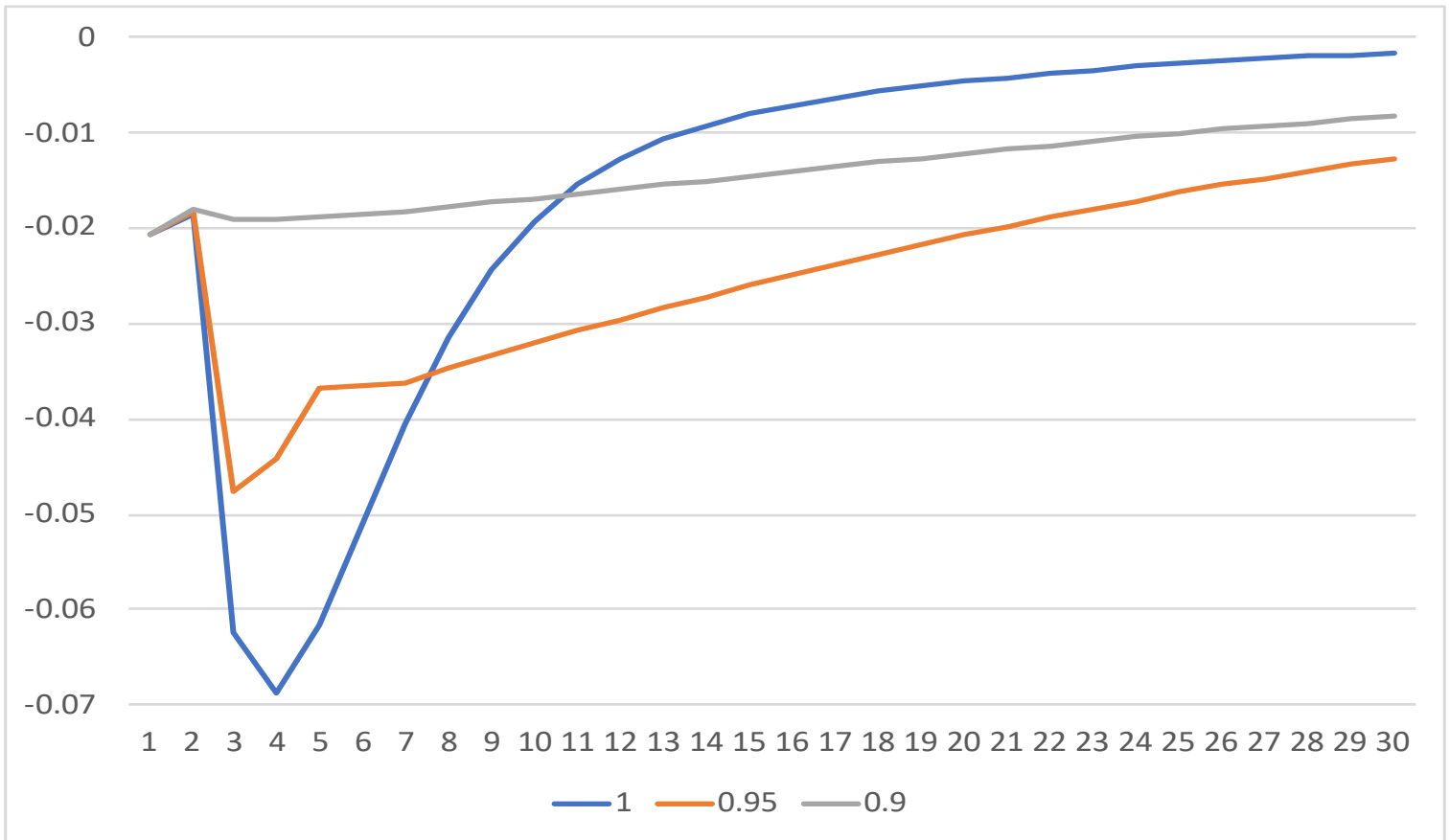

Figure: Labor reaction to a TFP shock for different values for ϕ

The results depend on the inefficiency in Government Banks

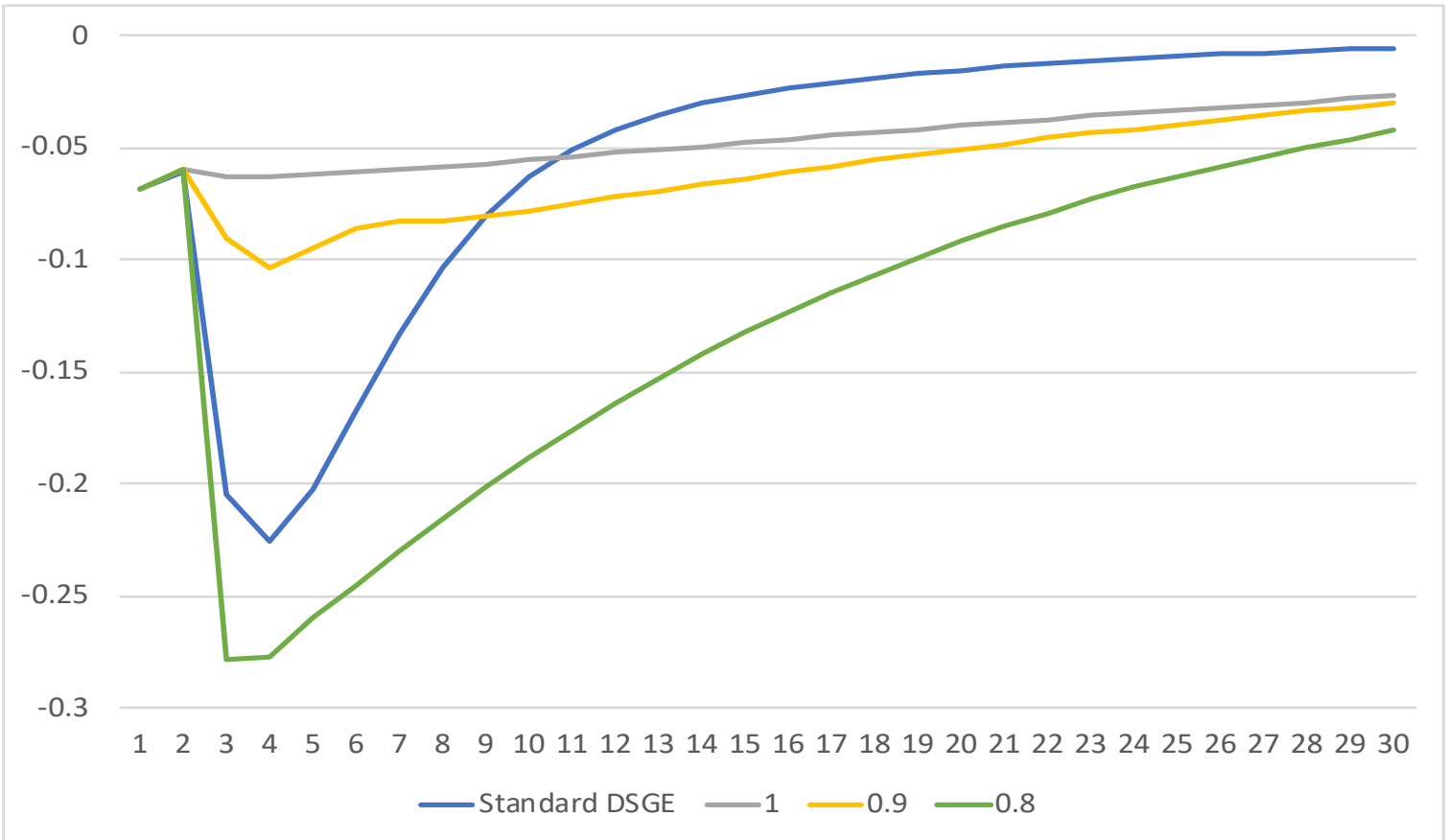

Figure: Output reaction to a TFP shock for different values for κ. $\phi = 0.9$

The results depend on the percentage of Non-Ricardian households

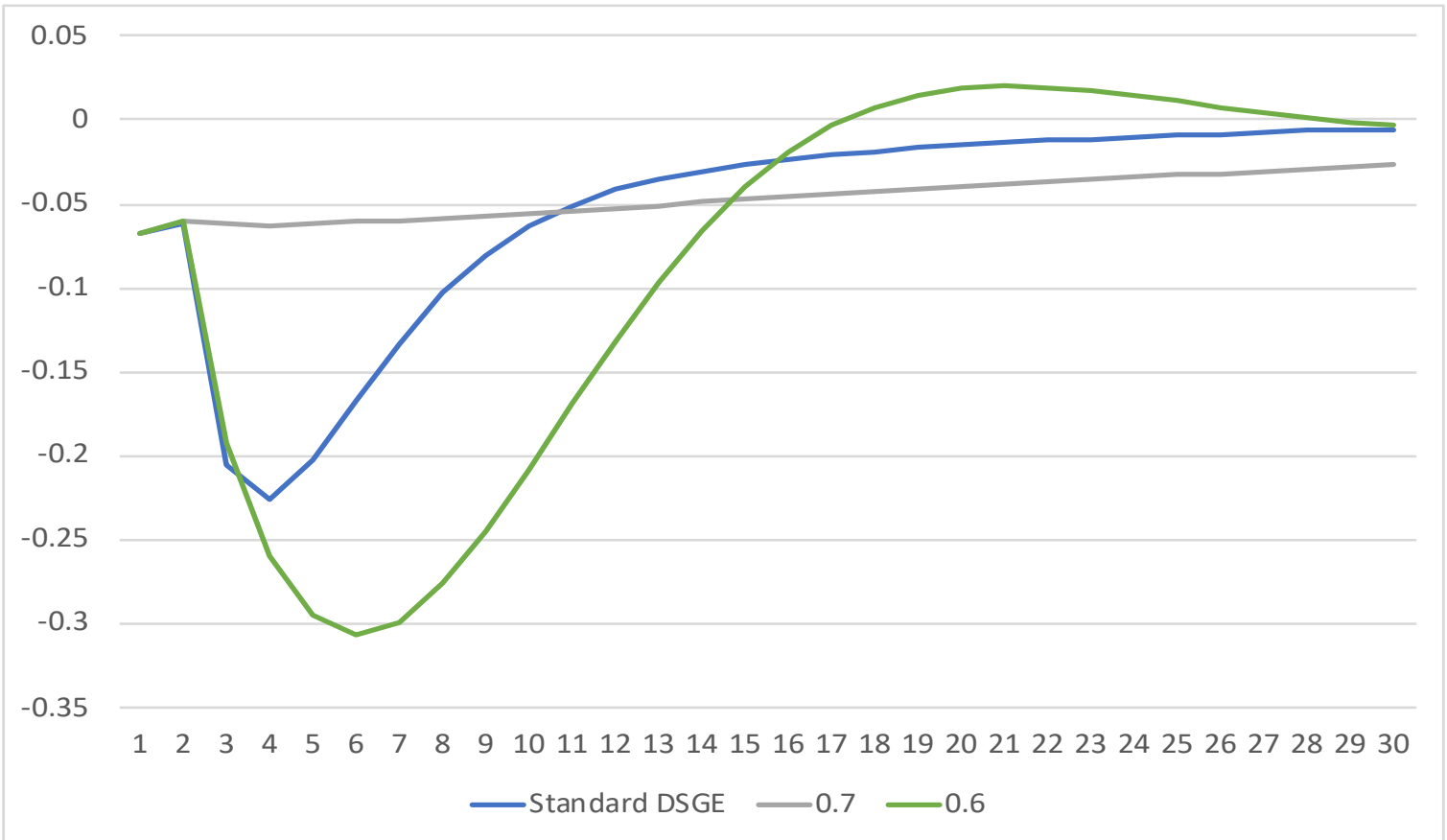

Figure: Output reaction to a TFP shock for different values for λ. $\phi = 0.9$

Further Research

- The next step is to extend the model to endogenously determine g and tr by using an objective function for the government.
- It is also worth noting that here the government does not care about its debt capacity - this is an immediate extension.

Conclusions

- We have seen the importance of including public and private banks as two different agents in an equilibrium model. As a matter of fact, with a small percentage of public banks, the responses regarding macroeconomic variables are very different in magnitude.
- The reaction of the economy differs from the canonical DSGE with banks when we account for this heterogeneity.
- Modeling the observed behavior of government banks during recessions allows us to see that the recovery of the economy might be less severe depending on the characteristics of the economy.
- The two main characteristics that drive those results are the percertage of Non-Ricardian People and the trade-off between the good stabilization goal and the potential negative behavior of those institutions.

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