The Effects of a Money-financed Fiscal Stimulus Without Irredeemability of Money

Eiji Okano
Nagoya City University

Masataka Eguchi
Nagoya City University

Roberto Billi
Sveriges Riksbank

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Th University of Sydney

1 Introduction (1)

IM Making the *MF* Fiscal Stimulus Effective

- Buiter (2014, *Economics*) identifies some conditions that must be satisfied for helicopter money to always boost aggregate demand.
- One of those is that fiat base money is irredeemable and is viewed as an asset by the holder but not as a liability by the issuer, namely, irredeemability of money (IM).

1 Introduction (2)

Gali (2020) Showing the Effectiveness of the *MF* Fiscal Stimulus with the IM

- Taking over Buiter (2014), Gali (2020, *JME*) was successful in showing effectiveness of a money-financed (*MF*) fiscal stimulus, even in a liquidity trap.
- Gali (2020) assumes fiat base money is an asset (wealth) to the holder (households), but does not constitute in any meaningful sense a liability to the issuer (central bank or consolidated government).
- Fiscal policy rule in Gali (2020) does not suffice the TVC on the fiat base money.
- That is, the IM is premised in Gali (2020).

1 Introduction (3)

IM is Not Necessary to Make the *MF* Fiscal Stimulus Effective

- What we show is that the IM is not necessary to make the *MF* fiscal stimulus effective, even in a liquidity trap.
- To show the effectiveness of the *MF* fiscal stimulus without the IM, we derive a fiscal policy rule sufficing the TVC such that fiat base money is a liability to issuer (central bank).
- We are suceesful to show the effectiveness of the the *MF* fiscal stimulus even in a liquidity trap (although its effectiveness is weaker than than that with the IM).
- Our fiscal policy rule results from the FTPL advocated by Cochrane (2005, *JME*) and intends to redeem both fiscal authority's debt and central bank's debt, namely fiat base money.

1 Introduction (4)

MF Fiscal Stimulus without the IM Corresponding and Temporary or Non-permanent QE

- What is the *MF* fiscal stimulus without the IM?
- According to Buiter (2014), the *MF* fiscal stimulus with the IM corresponds to permanent or irreversible quantitative easing (QE).
- Following this context, it can be said that the *MF* fiscal stimulus without the IM corresponds to temporary or non-permanent QE.
- It can be said that what we show in this paper is the effectiveness of temporary or non-permanent QE in a liquidity trap.

1 Introduction (5)

Analysis in a Two-country Model

- We extend the analysis to a two-country model.
- Regarding the fact that QE3 in the US and the Quantitative and Qualitative Monetary Easing (QQE) in Japan are conducted simulateously, it can be said that analyzing in a two-country model is very important.
- Even in a two-country model, the *MF* fiscal stimulus without the IM is effective (although its effectiveness is weaker than that with the IM).
- Even when the *MF* fiscal stimulus is conducted simultaneously in a liquidity trap in two countries, the *MF* fiscal stimulus is effective, regardless of whether there is the IM or not (although its effectiveness is weaker than that with the IM).

1 Introduction (6)

- The reminder of the paper is organized as follows:

2. Section 2 discusses the related literature.
3. Section 3 shows the fiscal and monetary policy framework.
4. Section 4 shows effects of a fiscal stimulus in normal times when the ZLB constraint is unavailable. multipliers.
5. Section 5 considers the effects of a fiscal stimulus in a liquidity trap where a ZLB constraint is applicable.
6. Section 6 concludes the paper.

2 Related Literature (1)

- Bernake (2003, Speech) is pioneer in discussing the *MF* fiscal stimulus.
- Buiter (2014) shows an appropriate TVC for consolidated government that ensures the IM and successfully demonstrates the effectiveness of the *MF* fiscal stimulus.
- Gali (2020) expanding Buiter (2014) and proposes a theoretical framework of *MF* fiscal stimulus with the IM.
- While Gali (2020) shows that the IM is necessary to make the *MF* fiscal stimulus effective implicitly, we are ssuccesuful to show that the IM is not necessary.

2 Related Literature (2)

- Okano and Eguchi (2024, *IMFER*) analyze *MF* fiscal stimulus with the IM in a small open economy and find that the effectiveness of the *MF* is more substantial as the openness increases.
- To evaluate global *MF* fiscal stimulus after the GFC, their small open economy setting is not sufficient.
- Instead of a small open economy model, we adopt a two-country model.
- We show that the effectiveness of global *MF* fiscal stimulus is remarkable, even if the IM is denied.

3 The Fiscal and Monetary Policy Framework

- The model consists of policy and non-policy blocks.
- The non-policy block is the same as that in Gali (2020).
- The policy block is different from Gali (2020), due to fiscal policy rule which is derived following Cochrane (2005) and is resulting from a class of FTPL equation.

3.1 Government: Budget Constraints and Financing Regimes

Consolidated Governmen Budget Constraint

$$G_t + \mathcal{B}_{t-1}\mathcal{R}_{t-1} = TR_t + \mathcal{B}_t + \frac{\Delta M_t}{P_t}, \tag{2}$$

where $\mathcal{R}_t \equiv (1 + i_t)\,\Pi_{t+1}^{-1}$ denotes the (ex-post) gross real interest rate.

Iterating Eq.(2) forward j times, plugging Euler equation, taking the limit for $j \to \infty$ and imposing an appropriate TVC

$$\lim_{k\to\infty}\beta^{t+j+1}\mathcal{R}_{t+k}\left(\mathcal{B}_{t+k}+L_{t+k}\right)=0, \tag{3}$$

yields:

$$\frac{U_{c,t}Z_t\left(1+i_{t-1}\right)\left(B_{t-1}+M_{t-1}\right)}{P_t}=$$

$$\sum_{k=0}^{\infty}\beta^h U_{c,t+k}Z_{t+h}SP_{t+h}$$

$$+\sum_{k=0}^{\infty}\beta^{k-1}U_{c,t+h-1}Z_{t+h-1}\left(\frac{i_{t+h-1}}{1+i_{t+h-1}}\right)L_{t+h-1}. \tag{4}$$

Note that the TVC is imposed even on the real money balance L_t.

Eq.(4) means:

$$\frac{\text{Nominal Government Debt}}{\text{Price Level}} = \text{Expected Present Value of Primary Surpluses.}$$

- Eq.(4) can be log-linearized as:

$$\widehat{i}_{t-1} + \frac{b(1-\beta)}{\chi\beta}\widehat{sp}_t = \frac{b+\chi}{\chi}\widehat{i}_{t-1} + \frac{1}{\chi}\widehat{b}_{t-1} + \frac{b(1-\beta)^2+\chi\beta^2}{\chi\beta}\widehat{l}_{t-1} - \frac{\beta}{\chi}\widehat{b}_t - \beta\widehat{l}_t - \frac{b+\chi\beta}{\chi}\pi_t,$$

- LHS: Fiscal Surplus and Seignorage
- 1st to 3rd Terms in RHS: Burden to Redeem Government Debt with Interest Payment and the Real Money Balance
- 4th to 5th Terms in RHS: Renewal of Government Debt and Renewal of Real Money Balance
- 6th Term in RHS: Inflation Tax

- Plugging logarithmic definition of the fiscal surplus into the LHS in the previous expression, we have:

$$\widehat{tr}_t = b\hat{i}_{t-1} + \hat{b}_{t-1} + \frac{b\,(1-\beta)^2 + \chi\beta^2}{\beta}\hat{l}_{t-1} - \beta\hat{b}_t - \beta\chi\hat{l}_t - (b + \chi\beta)\,\pi_t + \hat{g}_t, \quad (7)$$

- Eq.(7) is a fiscal policy rule that complies with the FTPL regime.
- Eq.(7) shows that if the burden to redeem consolidated government's debt is not covered by lump-sum tax and newly issued debt including newly issued real money, the government "inflate away" as referred by Cochrane (2023).

- To compare, we analyze the effectiveness of *MF* fiscal stimulus with the IM.
- As in Gali (2020), in an economy with the IM, we assume the following simple tax rule throughout the analysis:

$$\widehat{tr}_t = \psi_b \hat{b}_{t-1}, \tag{8}$$

- $\psi_b > \rho$ guarantees that the debt ratio converges to its long-run target.
- Under Eq.(8), following TVC is satisfied:

$$\lim_{k\to\infty} \Lambda_{t,t+k} \mathcal{B}_{t+k} = 0, \tag{9}$$

instead of Eq.(3), with $\Lambda_{t,t+k} \equiv \prod_{j=0}^{t+k-1} \mathcal{R}_{t+}^{-1}$.

3.2 Experiments

An Increase in the Government Expenditure

$$\widehat{g}_t = \delta^t > 0,$$

The *MF* Scheme

$$\Delta m_t = \frac{1}{\chi}\left[\widehat{g}_t - \widehat{\varsigma}_t + (1+\rho)\, b\left(\widehat{i}_{t-1} - \pi_t\right)\right], \tag{11}$$

which suffices $\widehat{b}_t = 0$ for all t.

The *DF* Scheme

$$\pi_t \;=\; 0,$$

which is CPI inflation targeting.

3.3 Non-policy Block

Similar to Gali (2020), we assume:

- A Large Number of Identical Infinitely-lived Households who Maximizes their Utiity
- Single Final Good Produced with A Constant Returns Technology
- Calvo Pricing
- Flexible Wages

Appendix A Non-policy Block (1)

Households' Utility:

$$\sum_{t=0}^{\infty} \beta^t \mathcal{U}\left(C_t, L_t, N_t; Z_t\right),$$

with $U\left(C_t, L_t, N_t; Z_t\right) \equiv \left(U\left(C_t, L_t\right) - V\left(N_t\right)\right) Z_t$.

A Sequence of Budget Constraints:

$$P_t C_t + B_t + M_t = B_{t-1}\left(1 + i_{t-1}\right) + M_{t-1} + W_t N_t + D_t - P_t T R_t.$$

Appendix A Non-policy Block (2)

Optimality Conditions for Households:

$$\begin{aligned} U_{c,t} &= \beta\,(1+i_t)\,\Pi_{t+1} U_{c,t+1}, \\ \frac{W_t}{P_t} &= \frac{V_{n,t}}{U_{c,t}}, \\ \frac{U_{l,t}}{U_{c,t}} &= \frac{i_t}{1+i_t}. \end{aligned}$$

Appendix A Non-policy Block (3)

Demand Schedule for A Generic Good:

$$Y_t(j) = \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon}.$$

Technology

$$Y_t(j) = N_t(j)^{1-\alpha}.$$

Appendix A Non-policy Block (4)

The FONC for Firms under Calvo Pricing:

$$\sum_{k=0}^{\infty} \theta^k \left[\Lambda_{t,t+k} \left(\frac{1}{P_{t+k}} \right) Y_{t+k|t} \left(\tilde{P}_t - \mathcal{M} MC^n_{t+\ |t} \right) \right] = 0,$$

with $\mathcal{M} \equiv \frac{\varepsilon}{\varepsilon - 1}$ and $Y_{t+k|t} \equiv \left(\frac{\tilde{P}_t}{P_{t+k}} \right)^{-\varepsilon} Y_{t+k}$.

Aggregated Market Clearing Condition:

$$Y_t = C_t + G_t,$$

Appendix B Steady State and Equilibrium Dynamics (1)

Steady State Output and Real Balances:

$$\begin{aligned}(1-\alpha)\,U_c &= \mathcal{M}V_n N^{\alpha},\\ \frac{U_l}{U_c} &= \frac{\rho}{1+\rho}.\end{aligned}$$

Under the linear technology, i.e., $\alpha = 0$, the first equality boilds down to $\frac{V_n}{U_c} = \mathcal{M}^{-1}$.

Appendix B Steady State and Equilibrium Dynamics (2)

The Equilibrium Dynamics:

$$\begin{aligned}
\widehat{y}_t &= \widehat{c}_t + \widehat{g}_t, \\
\widehat{\xi}_t &= \widehat{\xi}_{t+1} + \widehat{i}_t - \pi_{t+1} - \widehat{\rho}_t, \\
\widehat{\xi}_t &= -\sigma \widehat{c}_t + \upsilon \widehat{l}_t, \\
\pi_t &= \beta \pi_{t+1} - \kappa_t \widehat{\mu}_t, \\
\widehat{\mu}_t &= \widehat{\xi}_t - \frac{\alpha + \varphi}{1 - \alpha} \widehat{y}_t, \\
\widehat{l}_t &= \widehat{c}_t - \eta \widehat{i}_t, \\
\widehat{l}_{t-1} &= \widehat{l}_t + \pi_t \Delta m_t,
\end{aligned}$$

as well as log-linearized Eq.(2) with $\sigma \equiv -\frac{U_{cc}C}{U_c}$, $\varphi \equiv \frac{V_{nn}N}{V_n}$, $\upsilon \equiv \frac{U_{cl}L}{U_c}$, $\eta \equiv \frac{\epsilon_{lc}}{\rho}$, $\epsilon_{lc} \equiv -\frac{1}{h'}\frac{\rho}{1+\rho}V$ and $h\left(\frac{C}{L}\right) \equiv \frac{U_l}{U_c}$.

3.4 Steady State and Equilibrium Dynamics

- The model is log-linearized to derive equilibrium dynamics around the steady state.
- The analysis below considers equilibrium in the neighborhood of a steady state with zero inflation and zero government expenditure.
- Our parameterization is consistent with Gali (2020).

Tab. 2: Parameterization

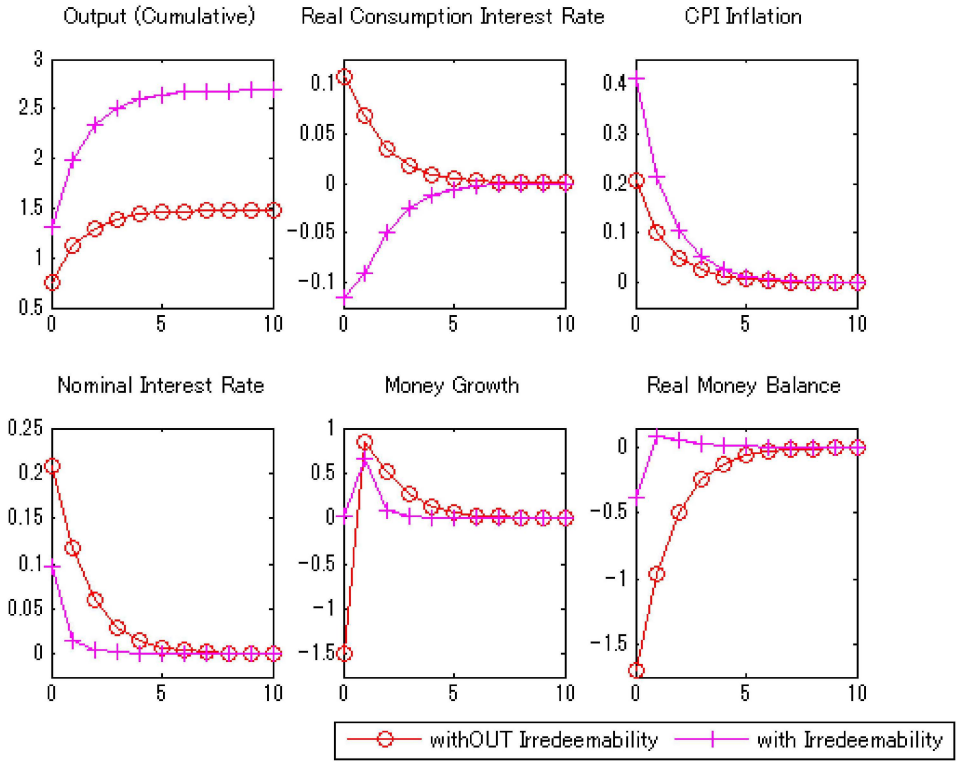
Parameter	Description	Value
σ	Relative Risk Aversion	1
β	Discount Factor	0.995
φ	Curvature of Labor Disutility	5
α	Index of Decreasing Returns to Labor	0.25
ϵ	Elasticity of Substitution among Goods	9
θ	Calvo Index of Price Rigidities	0.75
χ	Steady state Inverse Velocity	$\frac{1}{3}$
η	Semi-elasticity of Money Demand	7
υ	Separability of Real Balances	0
ψ_b	Tax Adjustment	0.02
b	Target Debt Ratio	2.4
δ	Persistence	0.5

4 Effects of the Fiscal Stimulus in Normal Times

4.1 MF Fiscal Stimulus (1)

- Fig. 1 shows the dynamic effects of an increase in government expenditure under the *MF* fiscal stimulus in normal times.
- The output and the CPI inflation increase, irrespective of whether there is the IM or not (Panels 1 and 3, Fig. 1).
- However, an increase in both is smaller in the case without IM.

Fig. 1: Dynamic Effects of an Increase in the Government Expenditure under the *MF* Fiscal Stimulus in Normal Times



4.1 MF Fiscal Stimulus (2)

- One of reasons is using lump-sum tax financing to increase government expenditure.
- Plugging $\widehat{b}_t = 0$ into fiscal policy rule which denies the IM yields:

$$\widehat{tr}_t = b\widehat{i}_{t-1} + \frac{b\,(1-\beta)^2 + \chi\beta^2}{\beta}\widehat{l}_{t-1} - \beta\chi\widehat{l}_t - (b+\chi\beta)\,\pi_t + \widehat{g}_t. \quad (13)$$

- Eq.(13) implies that the lump-sum tax varies, and an increase in government expenditure can be financed by an increase in the tax, in the case without the IM.
- In the case with the IM, $\widehat{tr}_t = 0$ replaces Eq.(13).

4.1 MF Fiscal Stimulus (3)

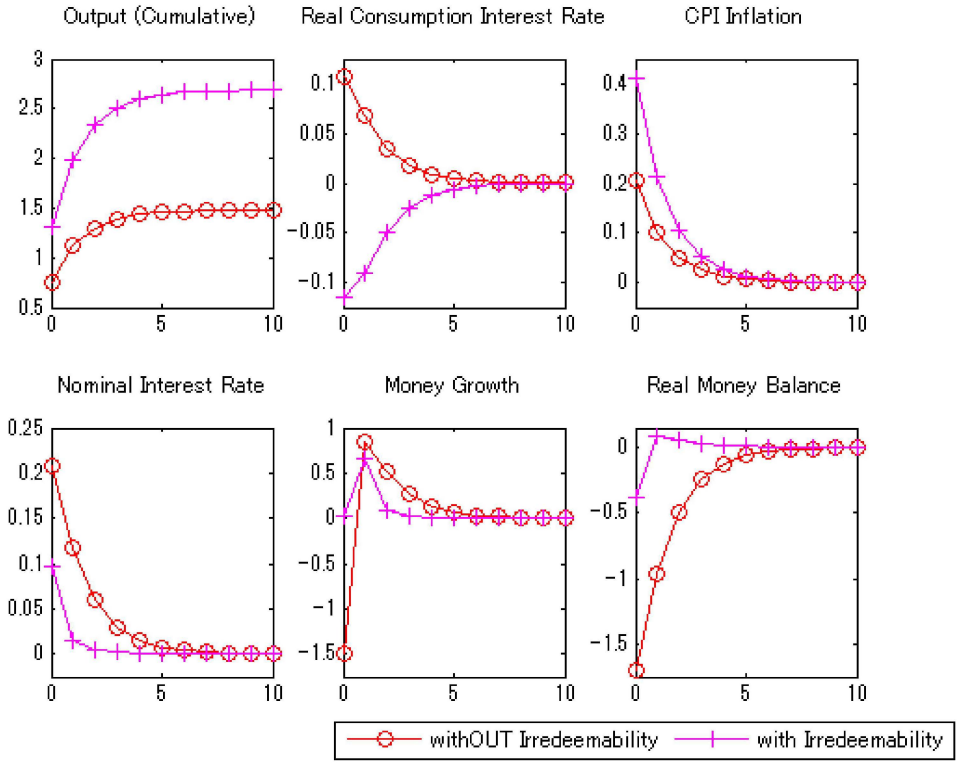
$$\widehat{tr}_t = b\widehat{i}_{t-1} + \frac{b\,(1-\beta)^2 + \chi\beta^2}{\beta}\widehat{l}_{t-1} - \beta\chi\widehat{l}_t - (b+\chi\beta)\,\pi_t + \widehat{g}_t. \quad (13)$$

- Another one stems from the salient feature of the FTPL.
- Eq.(13) implies that the inflation negatively relates to the current real money balance in the case without the IM.
- An increase in government expenditure applies pressure to increase the CPI inflation, which mitigates the burden of redeeming consolidated government's debt.
- Renewal of its debt is not necessary.
- The current real money balance corresponds to the reneweal of its debt.

4.1 MF Fiscal Stimulus (4)

- Then, the current real money balance is reduced through a decrease in the money growth (Panels 5 and 6).
- This decrease applies pressure to suppress the CPI inflation (Panel 3).
- The real consumption interets rate increases and an increase in the output is less than that in the case with the IM (Panels 1 and 2).

Fig. 1: Dynamic Effects of an Increase in the Government Expenditure under the *MF* Fiscal Stimulus in Normal Times



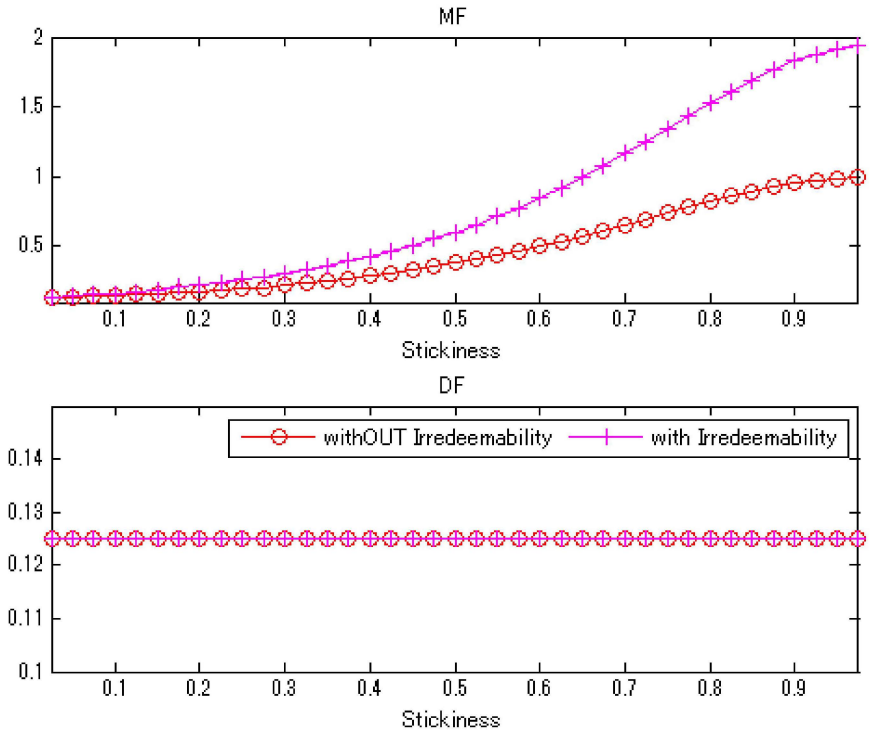
4.3 Sensitivity Analysis

- We fucus on the relationship between the fiscal multipliers and the parameter measuring the price stickiness θ or shock persistence δ, similar to Gali (2020).
- Following Gali (2020), we define the cumulative output multiplier $(1-\delta)\sum_{t=0}^{\infty}\widehat{y}_t$.

4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (1)

- Fig. 2 depicts the cumulative output multipliers for an increase in government expenditure as a function of price stickiness θ.
- The size of the multiplier for a *MF* fiscal stimulus remains above that for a *DF* fiscal stimulus and converges to it only as prices become fully flexible, irrespective of whether there is the IM or not.

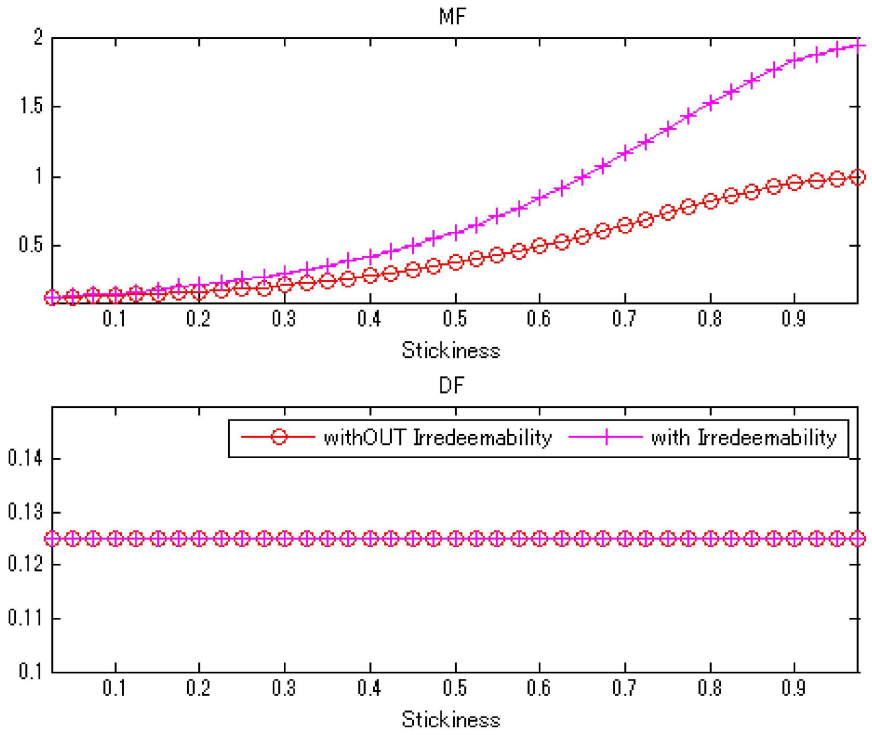
Fig. 2: Fiscal Multipliers: The Role of Price Stickiness



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (2)

- However, the multipliers do not necessarily increase enormously as the stickiness increases under a *MF* fiscal stimulus without the IM.
- Under the fiscal policy rule denying the IM Eq.(7), an increase in the money growth accelerates the renewal of consolidated government's debt so that the necessity to "inflate away" declines.

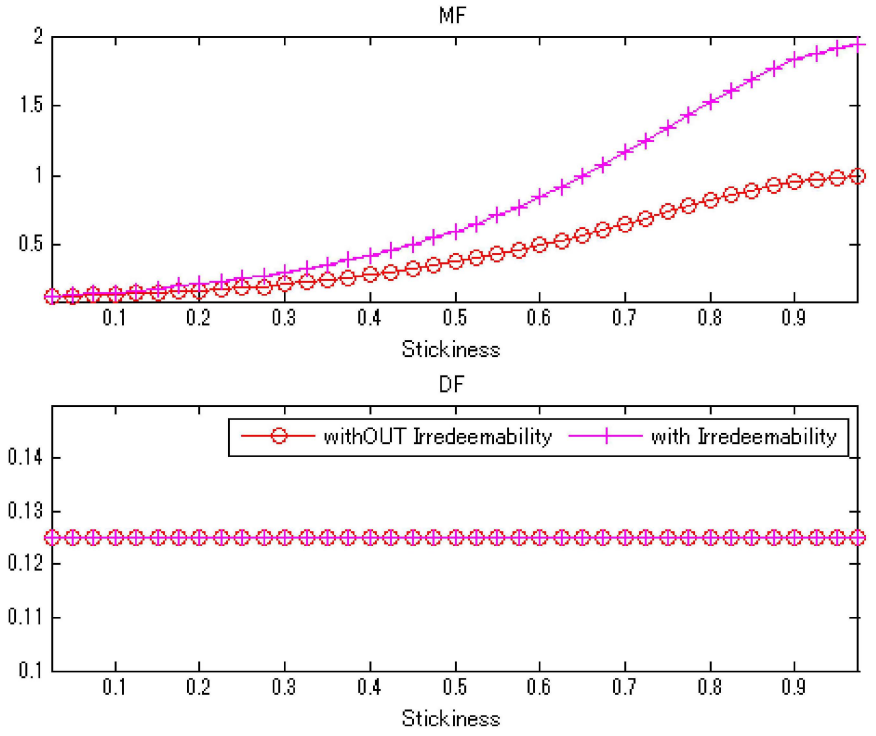
Fig. 2: Fiscal Multipliers: The Role of Price Stickiness



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (3)

- Because of this, the real consumption interest rate increases in the case of a *MF* fiscal stimulus without the IM.
- Most importantly, the *MF* fiscal stimulus remains more effective than the *DF* fiscal stimulus, even in the absence of the IM.

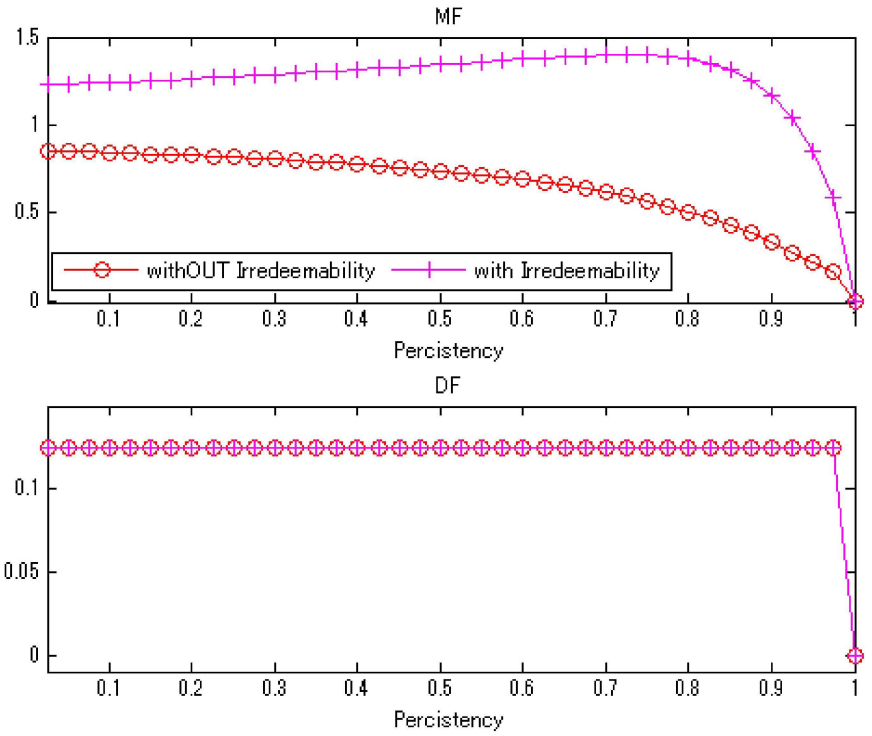
Fig. 2: Fiscal Multipliers: The Role of Price Stickiness



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (4)

- Fig. 3 depicts the cumulative output multipliers for an increase in government expenditure as a function of shock persistence δ.
- The multiplier attains zero under both the *MF* and the *DF* fiscal stimulus when the persistency attains 1.
- In the case of a *DF* fiscal stimulus, the multiplier is independent of the persistency.

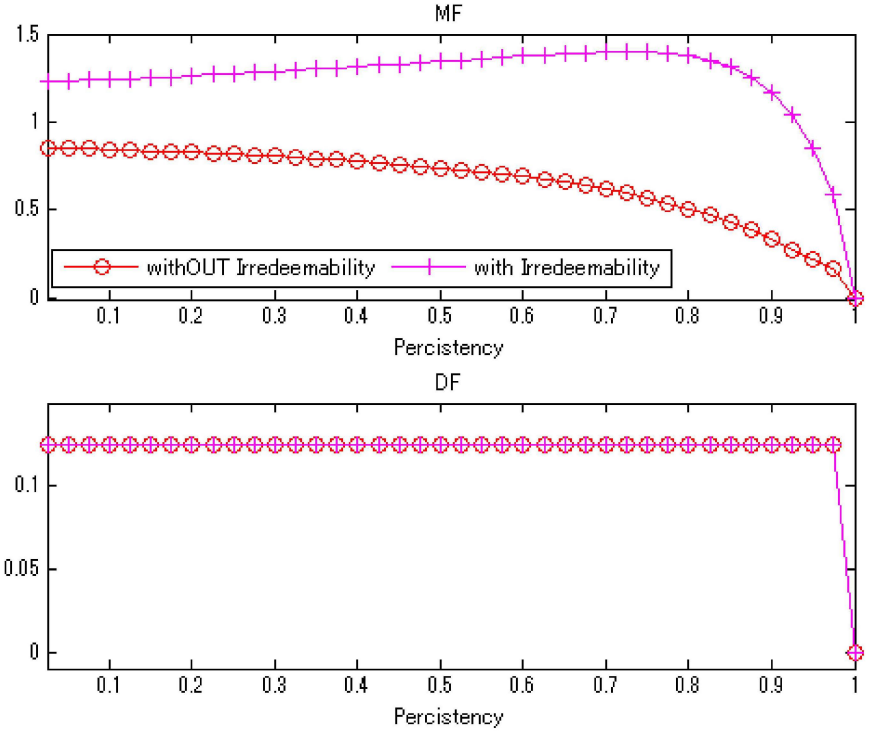
Fig. 3: Fiscal Multipliers: The Role of Shock Persistence



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (5)

- Those findings are also reported by Gali (2020).
- In a closed economy without the IM, the relationship appears to be monotonic (As the shock persistence increases, the multipliers decrease).
- In a closed economy with the IM, the relationship appears non-monotonic.

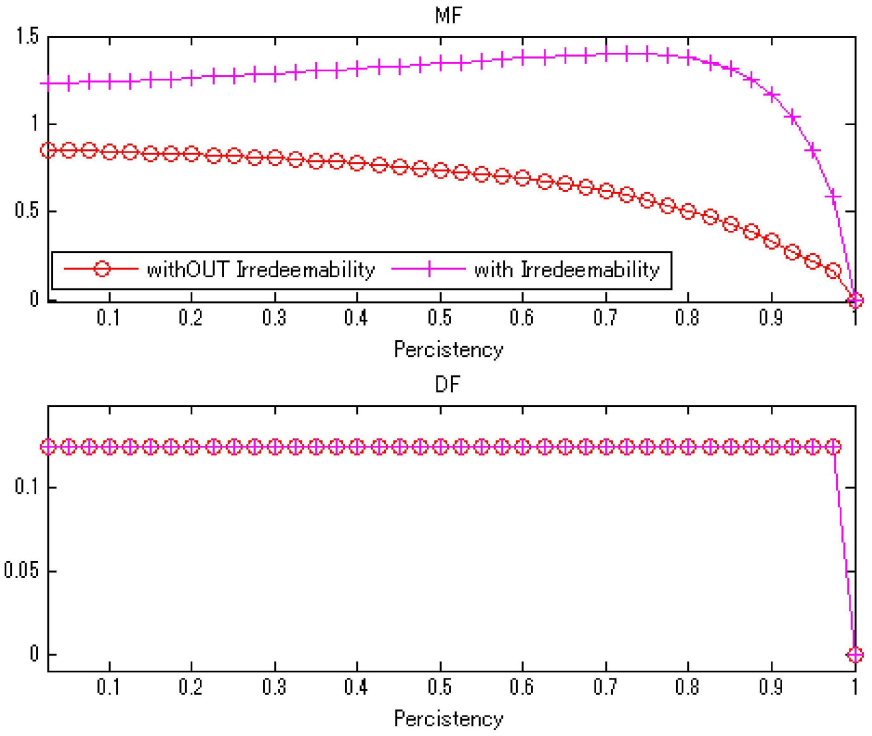
Fig. 3: Fiscal Multipliers: The Role of Shock Persistence



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (6)

- Gali (2020) who premises the IM shows monotonic relationship, so our result in a closed economy with the IM is not consistent with that in Gali (2020).
- However, the multipliers range from 1 to 1.4, similar to Gali (2020) and we are able to replicate it to some extent.

Fig. 3: Fiscal Multipliers: The Role of Shock Persistence



4.3.1 Fiscal Multipliers: without Irredeemability vs. with Irredeemability of Money (7)

- Most importantly, Figs. 2 and 3 confirm the robustness to changes in the degree of shock persistence δ and the stickiness θ of two of the findings above.
- Although the overall effectiveness of the *MF* fiscal stimulus in a closed economy without the IM is limited, it remains more effective than the *DF* fiscal stimulus, even in the absence of the IM.
- The IM is not a necessary condition for the *MF* fiscal stimulus to outperform the *DF* fiscal stimulus.

4.4 An Extension: A Two-country Economy in Normal Times

- The GFC spread across borders in the world.
- Therefore, examining the effectiveness of the *MF* in a two-country economy model is worth.
- We extend a closed economy model in Gali (2020) to a two-country economy model following Benigno and Benigno (2008, *MD*).

4.4.2 Non-policy Blocks

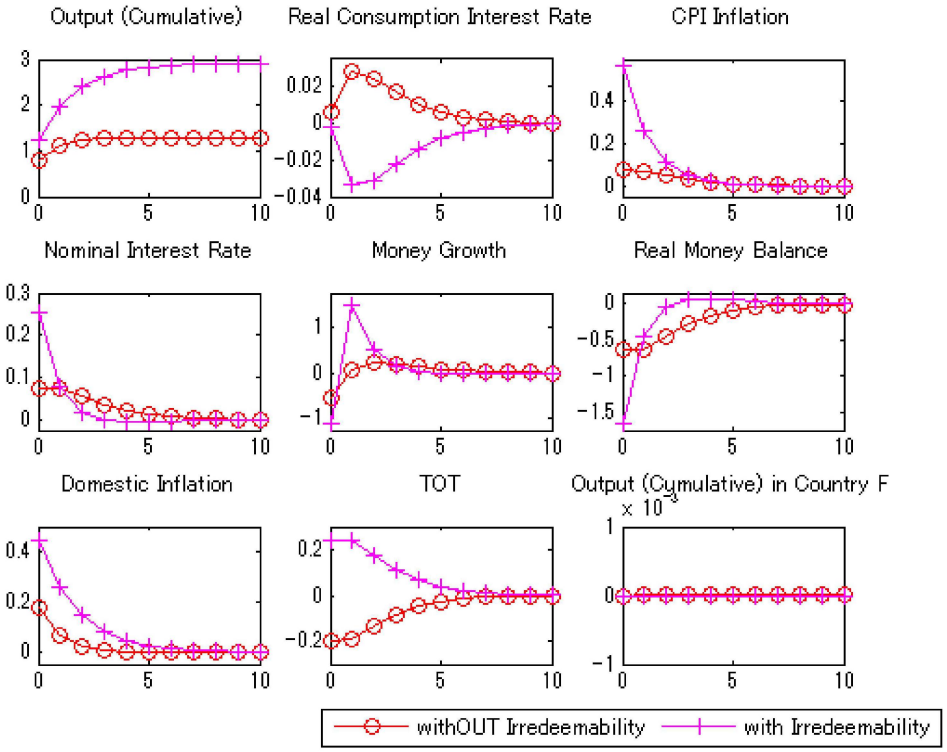
Similar to Benigno and Benigno (2008), we additionally assume:

- Perfect Substitution between Goods Produced in Two Countries
- Perfect Financial Market at the International Level (The UIP).
- All Goods being Tradable
- LOOP (so that the PPP)
- Equally Sized Countries

4.4.4 MF Fiscal Stimulus (1)

- Fig. 4 shows the dynamic effects of an increase in government expenditure under the *MF* fiscal stimulus in normal times.
- Irrespective of whether there is the IM or not, the CPI inflation and the output increases.
- An increase in domestic inflation applies pressure to depreciate the nominal exchange rate because domestic inflation is part of the CPI inflation.

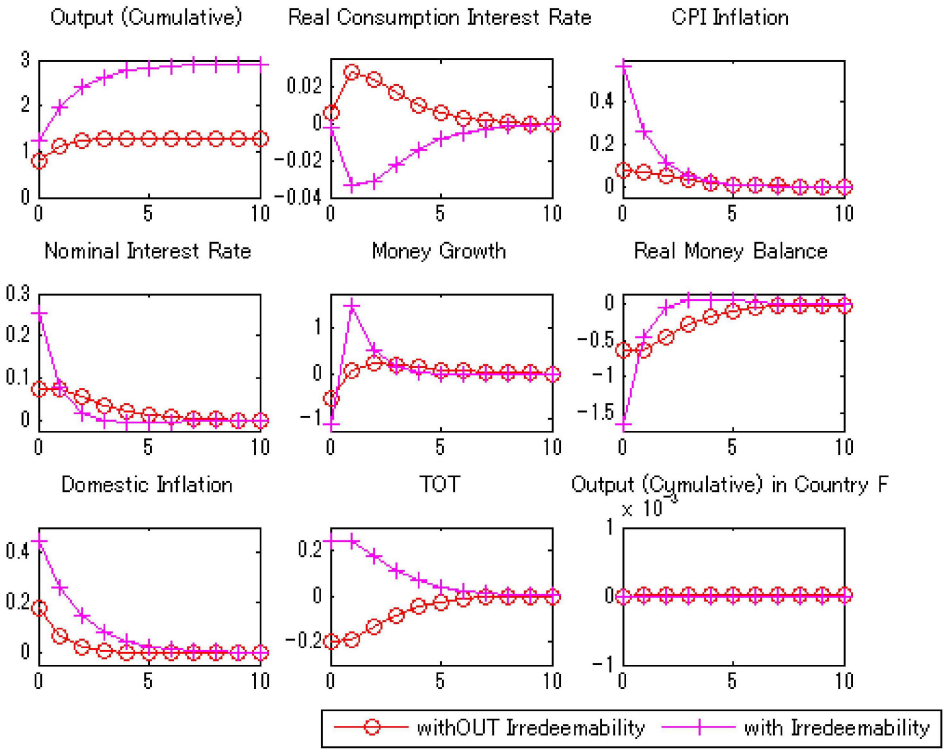
Fig. 4: Dyn. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the NT in a Two-country Economy



4.4.4 MF Fiscal Stimulus (2)

- This depreciation in the nominal exchange rate increases import inflation which has no price stickiness.
- Thus, in the case with the IM, an increase in the CPI inflation is higher than that in a closed economy with the IM (Panel 3).

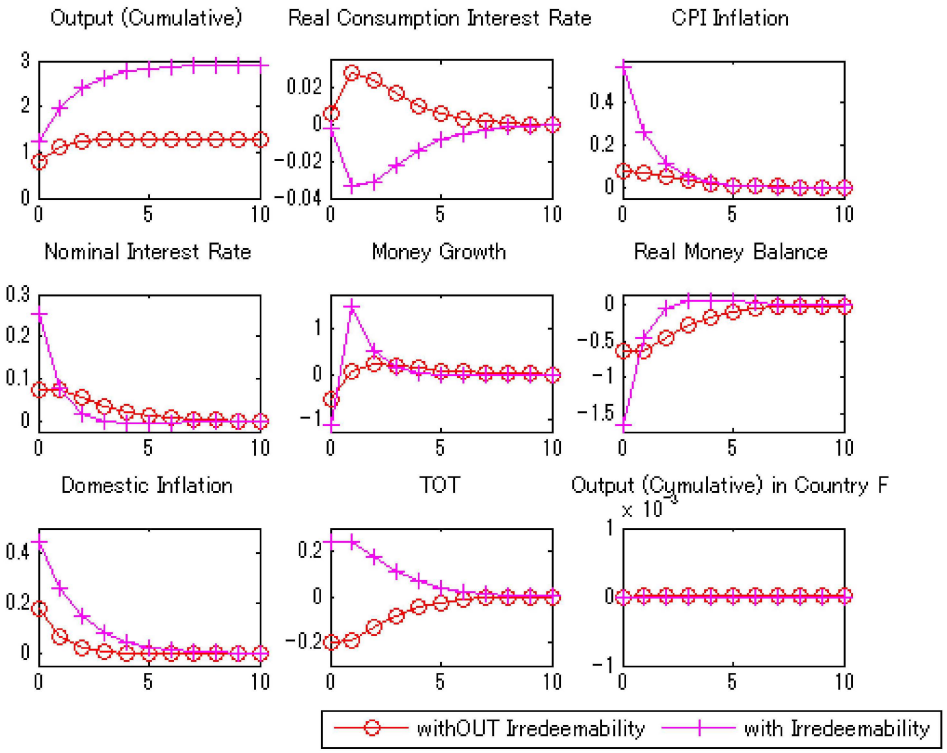
Fig. 4: Dyn. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the NT in a Two-country Economy



4.4.4 MF Fiscal Stimulus (3)

- In the case without the IM, an increase in the CPI inflation is less than that in the case with the IM (Panel 3).
- This increase is less than that in the case with with the IM.
- In the case without the IM, money is viewed as debt even by consolidated government.

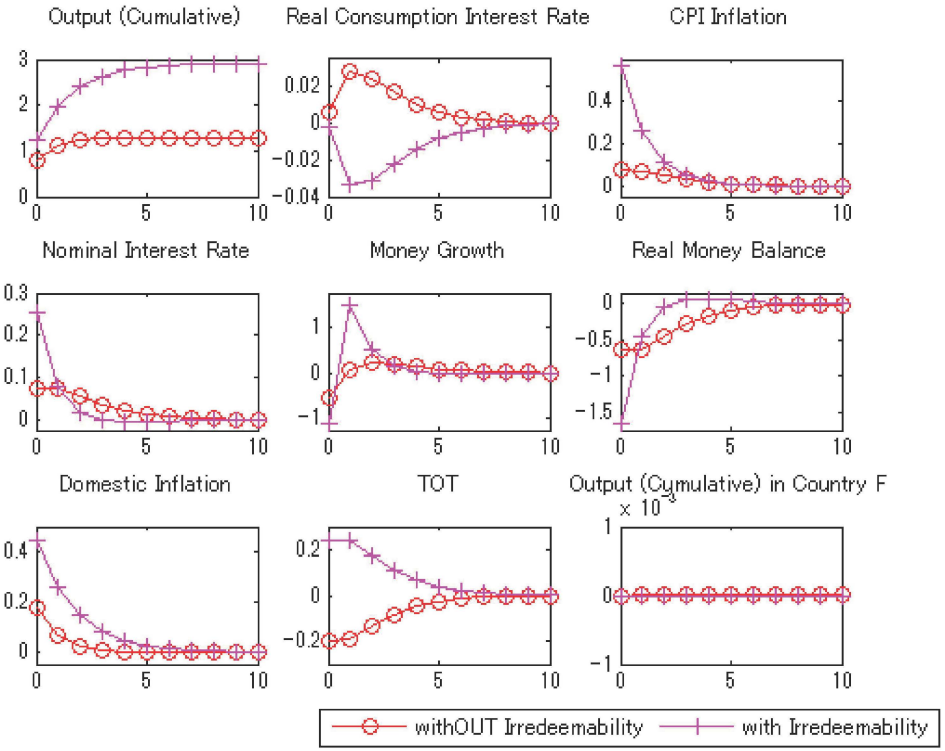
Fig. 4: Dyn. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the NT in a Two-country Economy



4.4.4 MF Fiscal Stimulus (4)

- In a two-country economy, pressure to increase the CPI inflation resulting from an increase in the governm-net expenditure is less than that in a closed economy (Remember $\pi_t = \nu\pi_{H,t} + (1-\nu)\,\pi_{F,t}$).
- Thus, a decrease in the real money balance is less in the case without the IM (Panel 6).

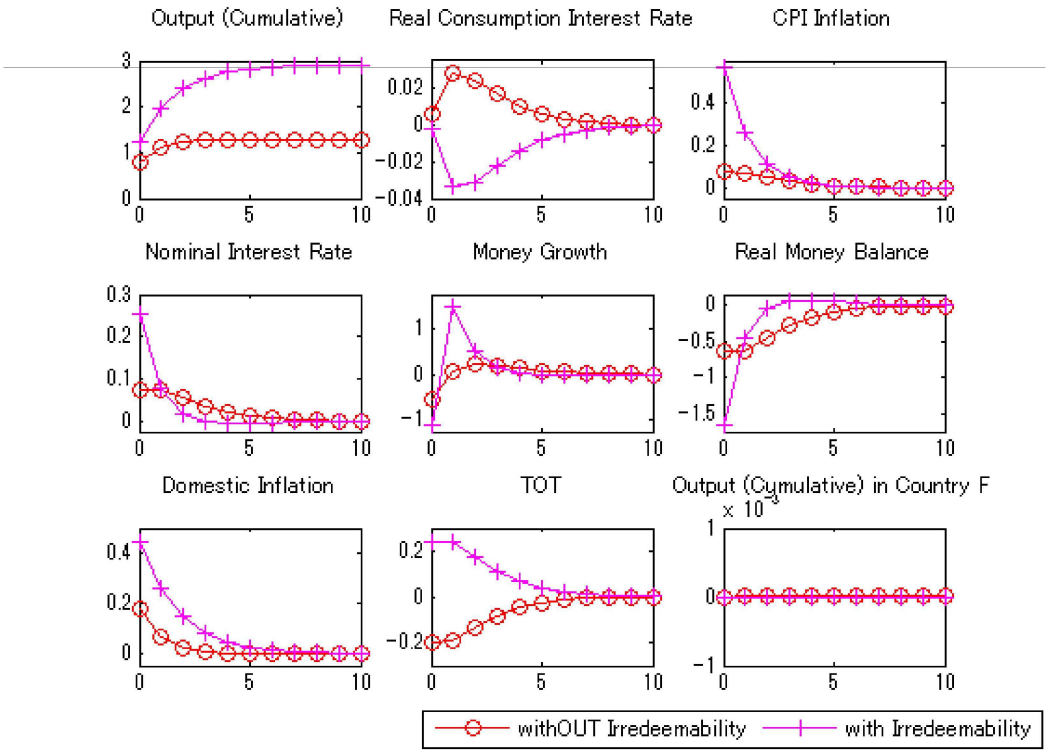
Fig. 4: Dyn. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the NT in a Two-country Economy



4.4.4 MF Fiscal Stimulus (5)

- To "Inflate away" is not necessary so that an increase in the CPI inflation is less in the case without the IM.
- This less incraese in the CPI infaltion makes the *MF* fiscal stimulus less effective.

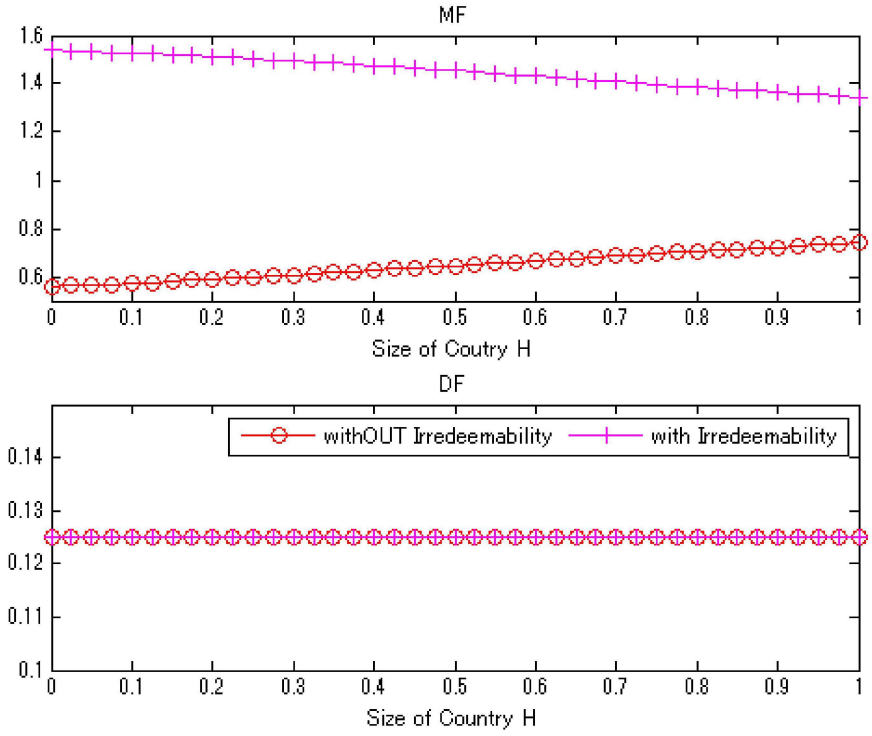
Fig. 4: Dyn. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the NT in a Two-country Economy



4.4.5 Sensitivity Analysis (1)

- Fig. 5 shows the relationship between the fiscal multipliers and the size of country H ν to increase government expenditure in the country H.
- In the case with the IM, as the size increases, the CPI inflation is more sticky and the effectiveness of the *MF* fiscal stimulus is less.

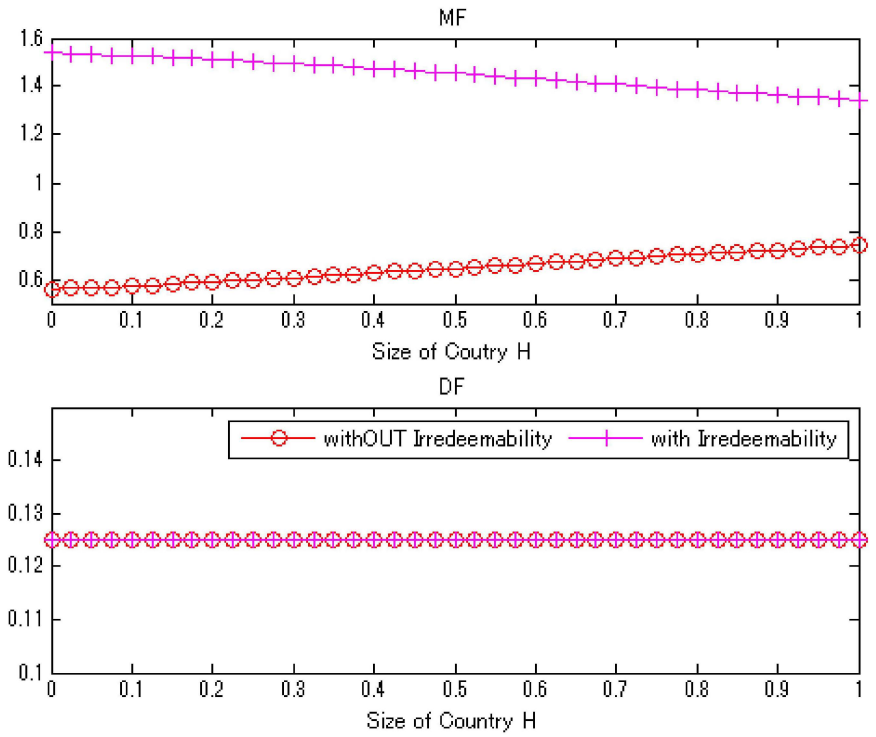
Fig. 5: Fiscal Multipliers: The Role of Size of Country H



4.4.5 Sensitivity Analysis (2)

- In the case without the IM, as the size increases, pressure to increase the CPI inflation is less and a decrease in the real money balance is less.
- The higher the real money balance, the lower the necessity to "inflate away" (Remember the real money balance is viewed as debt by consolidated government).
- Thus, as the size increases, the effectiveness of the *MF* fiscal stimulus is more.

Fig. 5: Fiscal Multipliers: The Role of Size of Country H



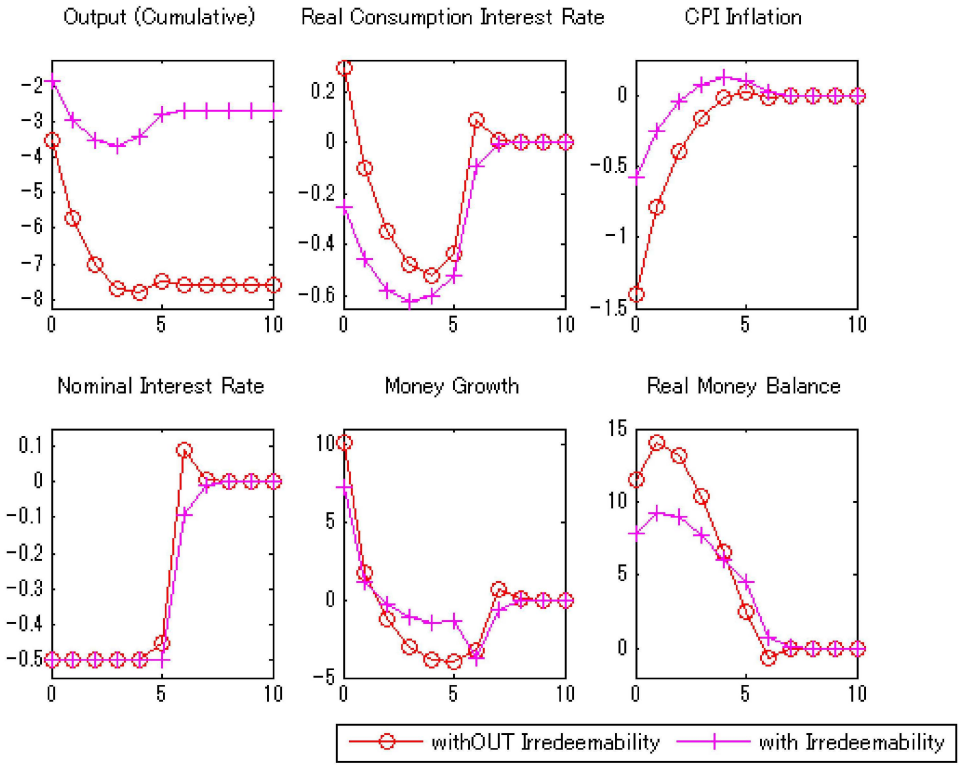
5 The Effects of the Fiscal Stimulus in a Liquidity Trap

- This section explores the effectiveness of the *MF* fiscal stimulus in the face of a temporary adverse demand shock.
- Similar to Gali(2020), the ZLB constraint takes the form $\widehat{i}_t \geq \log\beta$ and we assume temporary adverse demand shock that takes the natural interest rate to negative territory up to period five.

5.2 MF Fiscal Stimulus (1)

- Fig. 6 shows the dynamic effects of an increase in government expenditure under the *MF* fiscal stimulus in a liquidity trap.
- An adverse demand shock decreases the CPI inflation, which causes revenue shortfall through a decrease in the inflation tax.
- This shortfall is financed by money injection, and the real money balance increases (Panel 6).

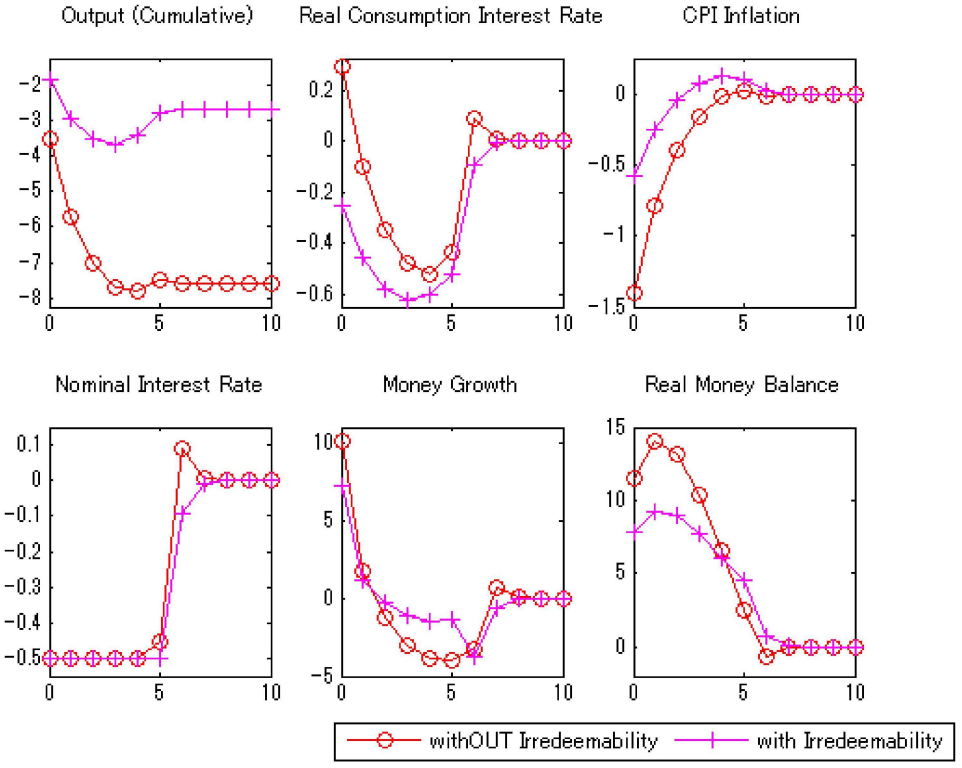
Fig. 6: Dynamic Effects of an Increase in the Government Expenditure under the MF Fiscal Stimulus in a Liquidity Trap



5.2 MF Fiscal Stimulus (2)

- In the case without the IM, an increase in the real money balance removes incentive to "inflate away" so that a decrease in the CPI inflation is more severe (Panel 3).
- The effectiveness of the *MF* is less effective in the case without the IM.

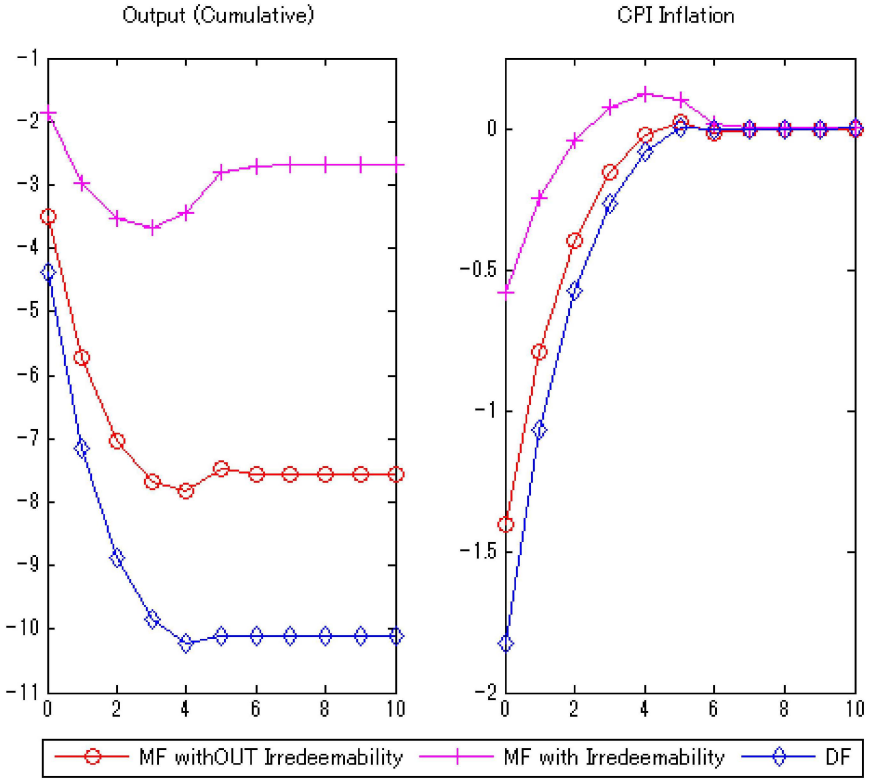
Fig. 6: Dynamic Effects of an Increase in the Government Expenditure under the MF Fiscal Stimulus in a Liquidity Trap



5.4 Comparing the Effects of the MF Fiscal Stimulus with the DF Fiscal Stimulus in a Liquidity Trap

- Fig. 7 compares the effectiveness of the *MF* fiscal stimulus with the *DF* fiscal stimulus in a liquidity trap.
- *MF* fiscal stimulus without the IM is less effective than that with the IM.
- However, the *MF* fiscal stimulus without the IM is still more effective than the *DF* fiscal without the IM.

Fig. 7: Dyn. Effects of an Increase in Gov. Exp. in the LT: Comparison of the *MF* scheme and *DF* scheme



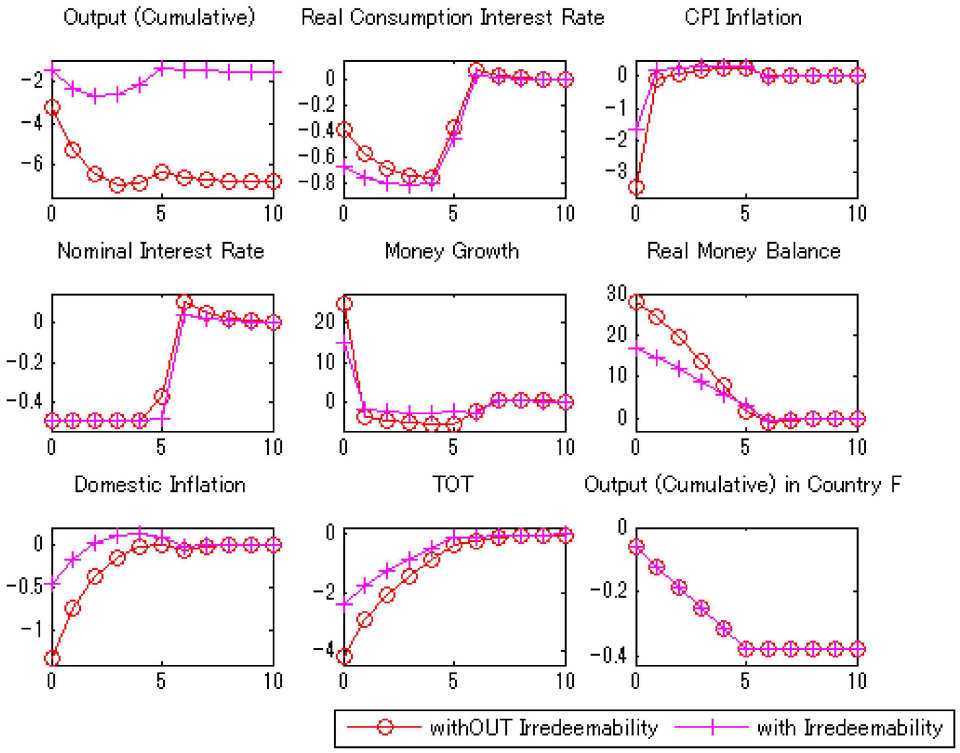
5.5 An Extension: A Two-country Economy in a Liquidity Trap

- Similar to Section 4.4, we show the effectiveness of the MF fiscal stimulus in a liquidity trap in a two-country economy.
- The scenario of a liquidity trap is the same as above.

5.5.1 MF Fiscal Stimulus (1)

- Fig. 8 shows the dynamic effects of an increase in government expenditure under the *MF* fiscal stimulus in a liquidity trap in a two-country economy.
- A decrease in the CPI inflation in the case without the IM is more significant than that with the IM (Panel 3).

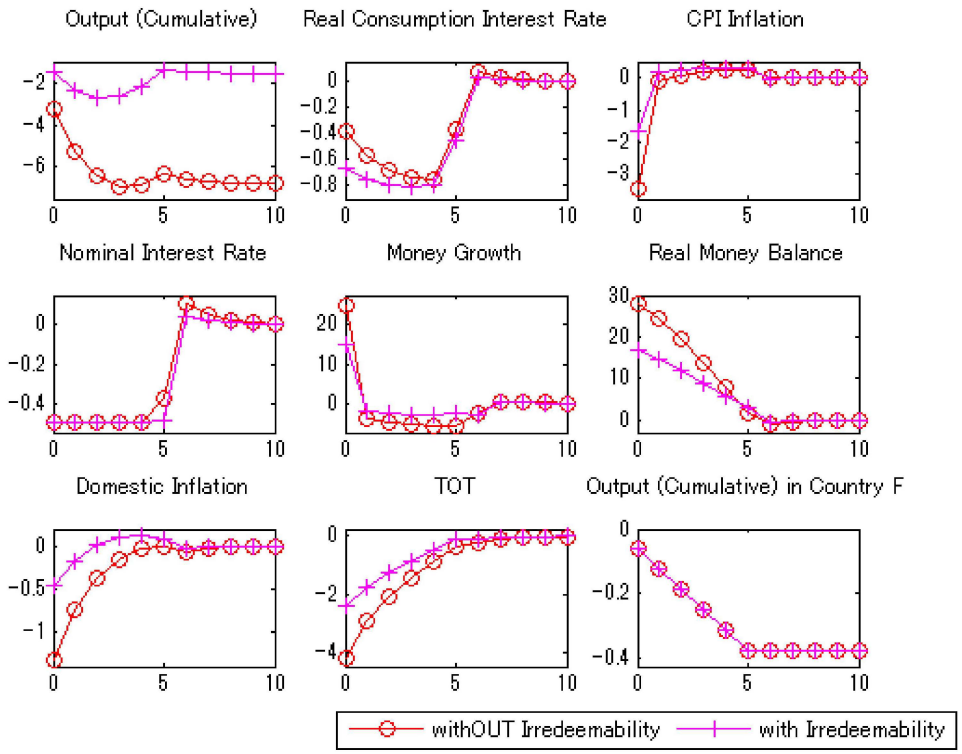
Fig. 8: Dyna. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the LP in a Two-country Economy



5.5.1 MF Fiscal Stimulus (2)

- An increase in the real money balance removes incentive to "inflate away".
- Thus, a decrease in the CPI inflation in the case without the IM is more significant than in that with the IM.
- The *MF* fiscal stimulus without the IM is less effective even in a two-country model.

Fig. 8: Dyna. Effects of an Increase in the Gov. Exp. under the *MF* Fiscal Stimulus in the LP in a Two-country Economy



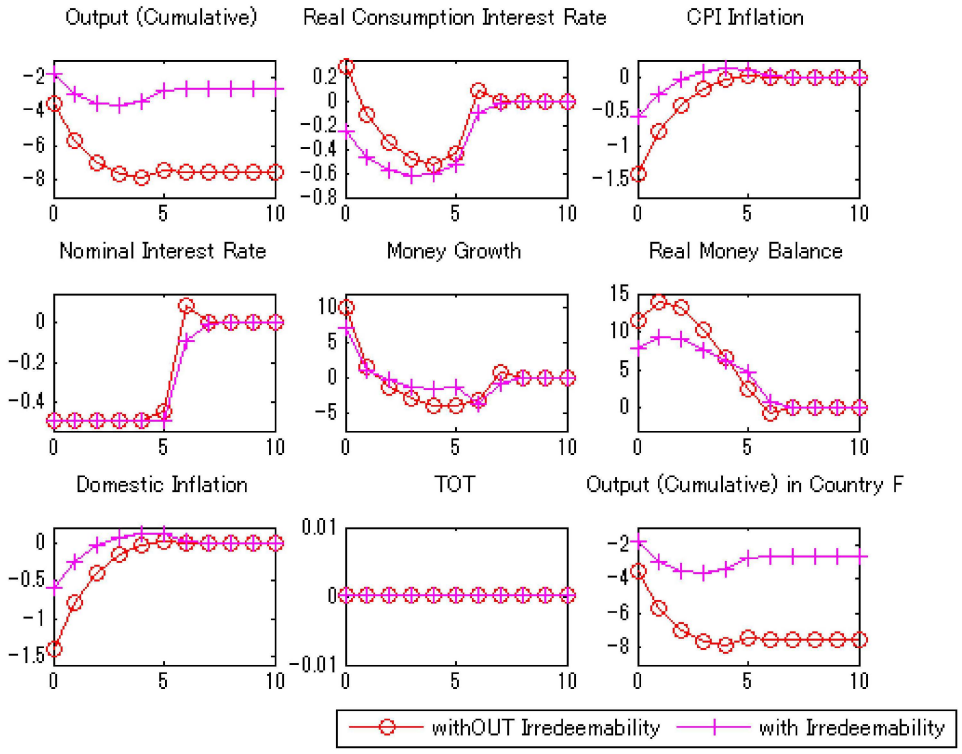
5.5.2 MF Fiscal Stimulus in both Countries (1)

- For one and a half years, large-scale monetary easing measures, which can be regarded as the *MF* fiscal stimulus, were adopted by two economic powers (The QE 3 was adopted from Sep. 2012 to Oct. 2014 in the US while the QQE started in April 2013 in Japan).
- We are curious about the effectiveness of the *MF* fiscal stimulus adopted in two countries simultaneously.
- We assume that countries H and F increase the government expenditure under the *MF* fiscal stimulus in a liquidity trap.
- The scenario of a liquidity trap is the same as above, and that scenario is even applicable in country F.

5.5.2 MF Fiscal Stimulus in both Countries (2)

- Fig. 9 shows the dynamic effects of an increase in the government expenditure under the *MF* fiscal stimulus in a liquidity trap in a two-country economy.
- The TOT is constant due to same responses of CPI inflation and the PPP (Panel 8).
- So, the output in both countries is not affected by the TOT.

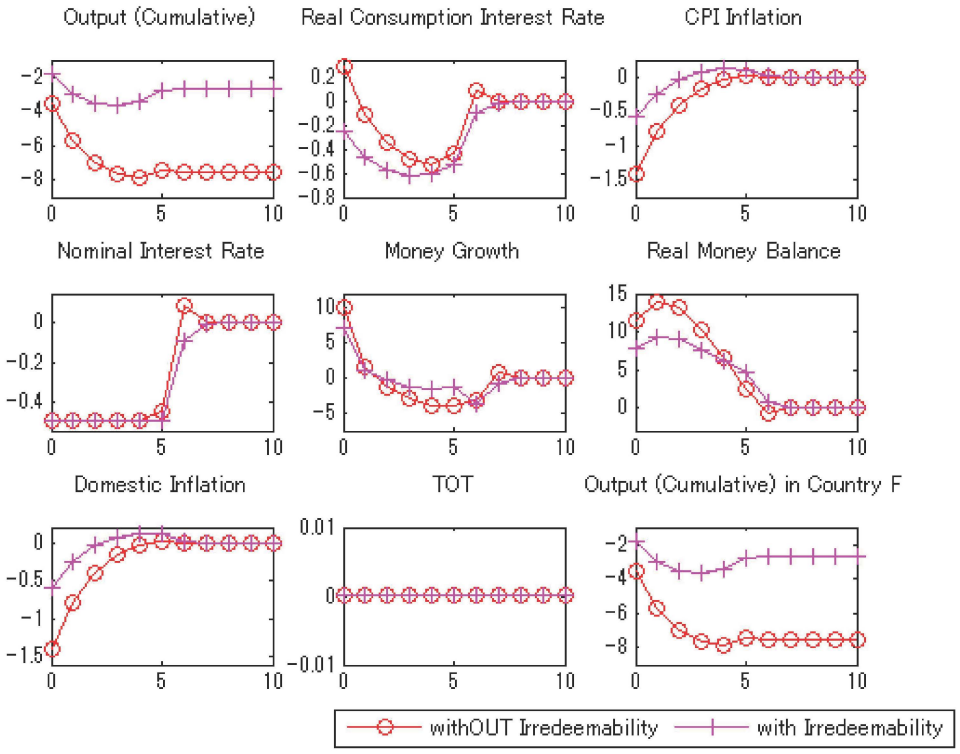
Fig. 9: Dyna. Effects of Increases in the Gov. Exp. under the *MF* Fiscal Stimulus in the LT in Both Countries



5.5.2 MF Fiscal Stimulus in both Countries (3)

- A decrease in the CPI inflation is less than that in the previous case in which just country H suffers a liquidity trap (Panel 3).
- Due to a smaller decrease in the CPI inflation, the consolidated government's revenue shortfall is less than that in the previous case.
- Hence, the money growth is less than that in the previous case (Panel 5).

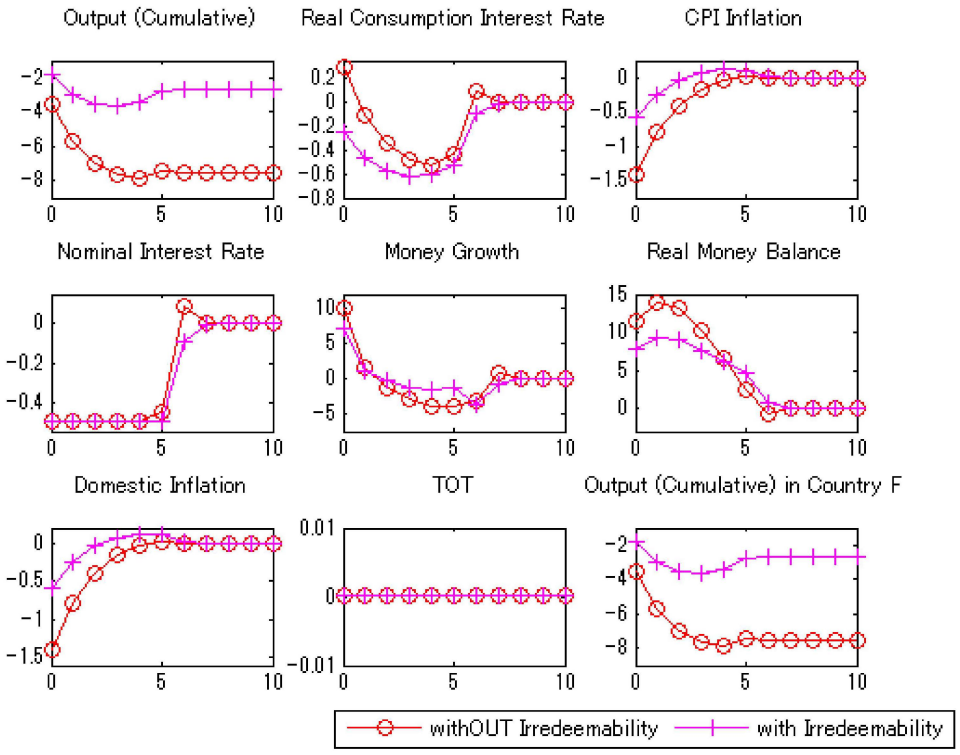
Fig. 9: Dyna. Effects of Increases in the Gov. Exp. under the *MF* Fiscal Stimulus in the LT in Both Countries



5.5.2 MF Fiscal Stimulus in both Countries (4)

- Thus, the effectiveness of bolstering the output is less, irrespective of whether there is an IM or not (Panel 1).
- Based on this result, it can be said that if the QE 3 and the QQE around 2014 seem less effective than we expected.

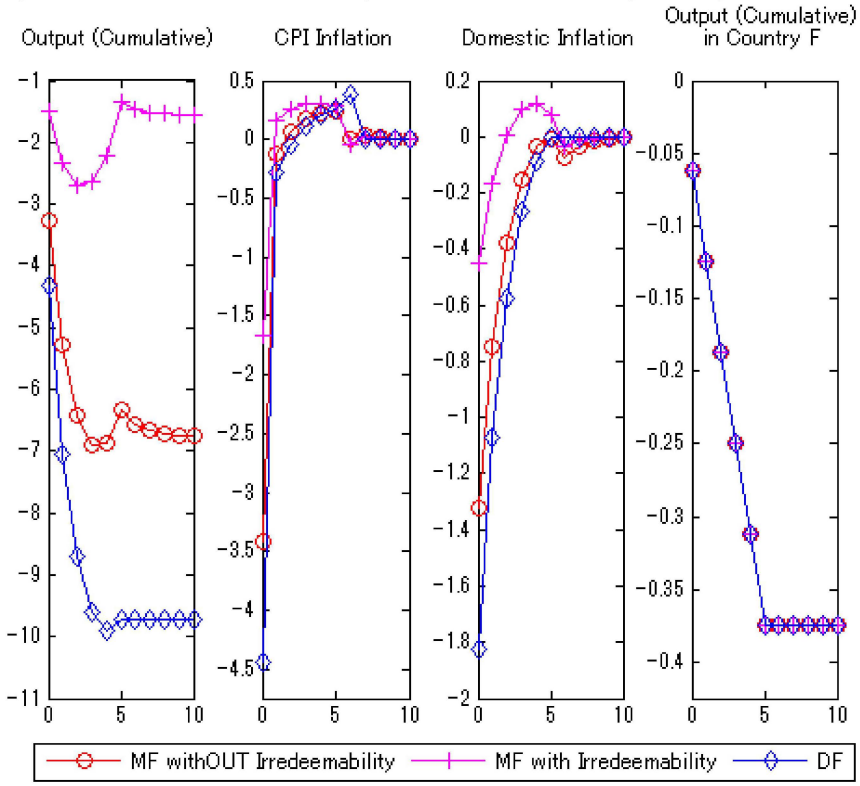
Fig. 9: Dyna. Effects of Increases in the Gov. Exp. under the *MF* Fiscal Stimulus in the LT in Both Countries



5.5.3 Comparing the Effects of the MF Fiscal Stimulus with the DF Fiscal Stimulus in a Liquidity Trap in a Two-country Economy (1)

- Fig. 10 compares the effectiveness of the *MF* fiscal stimulus with that of the *DF* fiscal stimulus in the LT in just country H.
- The *MF* fiscal stimulus is more effective, irrespective of whether there is the IM or not.
- Even when the IM is denied, the *MF* fiscal stimulus is more effective.

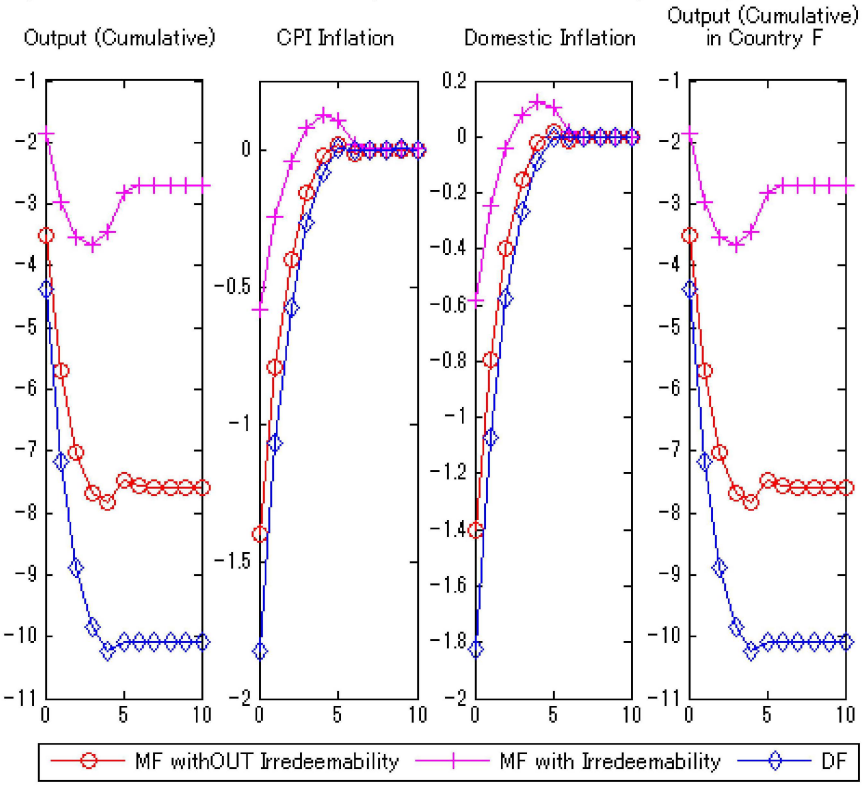
Fig. 10: Dyna. Effects of an Increase in Gov. Exp. in the LT in a Two-country Economy



5.5.3 Comparing the Effects of the MF Fiscal Stimulus with the DF Fiscal Stimulus in a Liquidity Trap in a Two-country Economy (3)

- Fig. 11 compares the effectiveness of the *MF* fiscal stimulus with that of the *DF* fiscal stimulus in the LT.
- The effectiveness of the *MF* fiscal stimulus to bolster the output is still more substantial than that of the *DF* fiscal stimulus, even if there is not the IM.
- Global *MF* fiscal stimulus is worth amid the LT.

Fig. 11: Dyna. Effects of an Increase in Gov. Exp. in the LT in a Two-country Economy



6 Conclusion (1)

- While Gali (2020) implicitly admitted that the IM is necessary, we show that the IM is not required to make the *MF* fiscal stimulus effective.
- Although the effectiveness of the *MF* fiscal stimulus without the IM is weaker than that of the *MF* fiscal stimulus with the IM, that of the *MF* fiscal stimulus without the IM is stronger than the *DF* fiscal stimulus.
- This finding is applicable either in normal times or in a liquidity trap.

6 Conclusion (2)

- We assume not only a closed economy but also a two-country economy.
- We find that the effectiveness of global *MF* fiscal stimulus without the IM amid a liquidity trap is still more substantial than that of *DF* fiscal stimulus.
- Based on our result, it can be said that spending premising the IM, which gives net wealth to the private sector is not necessary to boost up or bolster the output.
- In other words, temporary *MF* fiscal stimulus is sufficient.
- We will be unleashed from a dispute on the illegality of *MF* fiscal stimulus that depends on the IM to escape from a liquidity trap.