

# Monetary and Fiscal Policies in Times of Large Debt: Unity is Strength

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# Introduction

A legacy of the pandemic is a **large public debt** raising concerns about

- 1 **Price stability** and **macroeconomic volatility**
- 2 The strength and speed of the recovery if **a fiscal stabilization** were implemented at a time in which monetary policy is constrained

We show that this **trade-off** admits a third more pleasant outcome:

- **Monetary and fiscal coordination** to let inflation moderately overshoot the central bank's inflation target so as
  1. to stabilize a fraction of the government debt that is (fiscally) unfunded
  2. to eliminate the deflationary bias that has characterized the last 20 years
- Solution in line with **historical experience**, **but** requires clear policy communication

## This paper

- We build and estimate a TANK model with partially **unfunded** government debt:
  - 1 Business cycle and monetary policy shocks propagate as usual
  - 2 **Unfunded** fiscal shocks generate movements in trend inflation that the central bank accommodates  $\Rightarrow$  **a fiscal theory of trend inflation**
- **Fiscal trend inflation** accounts for the bulk of the inflation dynamics:
  - 1 A persistent and **partially unfunded** rise in transfers in the mid-1960s (*Great Society*) accounts for the increase in trend inflation during the Great Inflation
  - 2 Partially unfunded debt has offset the deflationary bias from the 1990s and on
  - 3 Historically the share of unfunded debt and fiscal trend inflation have evolved sluggishly: The recent large increases in spending require **policy coordination**
  - 4 **Temporary increase** in inflation as a result of the COVID fiscal stimulus

## A TANK Model with Partially Unfunded Debt

# The Model

## State-of-the-art TANK model

- Distortionary taxation on labor and capital income
- Hand-to-mouth households
- Long-term government bonds
- **Typical set of business cycle shocks** plus **fiscal shocks** and a **shifter of the Phillips curve** capturing market and non policy forces such as globalization and demographic changes

# Underfunded Debt and Monetary and Fiscal Coordination

- Two types of transfers:
  1. **Funded** transfers: Transfers backed by future fiscal adjustments
  2. **Unfunded** transfers: Transfers **not** backed by future fiscal adjustments
- The monetary authority **tolerates** the increase in inflation needed to stabilize the resulting amount of **unfunded** debt

# Fiscal and Monetary Rules

## Fiscal Rules

$$\hat{g}_t = \rho_G \hat{g}_{t-1} - (1 - \rho_G) \gamma_G \tilde{b}_{t-1}^F + \zeta_{g,t}$$

$$\hat{z}_t = \phi_{zy} \hat{y}_t + \rho_Z \hat{z}_{t-1} - (1 - \rho_Z) \gamma_Z \tilde{b}_{t-1}^F + \zeta_{z,t}^F + \zeta_{z,t}^U$$

$$\hat{\tau}_t^L = \rho_L \hat{\tau}_{t-1}^L + (1 - \rho_L) \gamma_L \tilde{b}_{t-1}^F + \zeta_{\tau_L,t}$$

$$\hat{\tau}_t^K = \rho_K \hat{\tau}_{t-1}^K + (1 - \rho_K) \gamma_K \tilde{b}_{t-1}^F + \zeta_{\tau_K,t}$$

## Monetary Rule

$$\hat{R}_t = \max \left( -\ln R_*, \rho_r \hat{R}_{t-1} + (1 - \rho_r) \left[ \phi_\pi \left( \hat{\pi}_t - \hat{\pi}_t^{\text{Target}} \right) + \phi_y \hat{y}_t \right] \right) + \epsilon_{R,t}$$

## Definition of Funded Debt and the Inflation Target

- The funded share of debt  $\tilde{b}_t^F$  is stabilized by fiscal instruments
  1. The parameters  $\gamma_G$ ,  $\gamma_Z$ ,  $\gamma_L$ , and  $\gamma_K$  are sufficiently large to back the funded debt  $\tilde{b}_t^F$
  2. Changes in transfers  $\zeta_{z,t}^U$  determine the share of unfunded debt



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- The inflation target,  $\hat{\pi}_t^{\text{Target}}$ , is the increase in inflation needed to stabilize the unfunded share of the debt ( $\tilde{b}_t - \tilde{b}_t^F$ )
  - Monetary authority only responds to deviations of inflation from the endogenous target

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  - Monetary authority only responds to deviations of inflation from the endogenous target
  
- The funded debt and the inflation target are defined using a shadow economy

# Constructing the Shadow Economy

## Monetary-led policy mix in the shadow economy

- Shocks to unfunded transfers  $\zeta_{z,t}^U$  are shut down and the whole public debt  $\tilde{b}_t^F$  in the shadow economy is funded
- Taylor principle is satisfied: Response to  $\hat{\pi}_t^F$  more than one-to-one

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### Fiscally-led policy mix in response to the unfunded debt

- Debt in the actual economy is  $\tilde{b}_t > \tilde{b}_t^F$
- The inflation target in the actual economy is

$$\hat{\pi}_t^{\text{Target}} \equiv \hat{\pi}_t - \hat{\pi}_t^F = \hat{\pi}_t^U$$

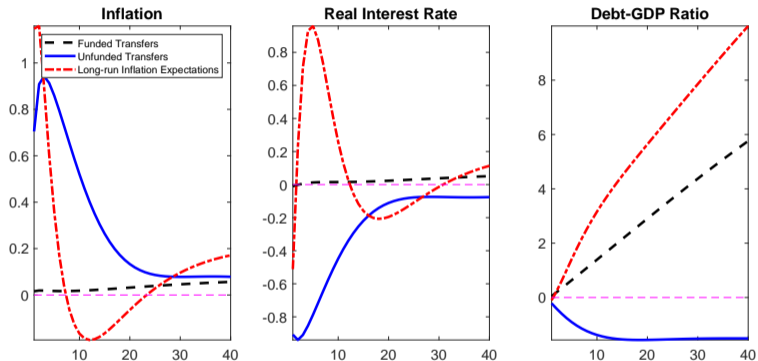
which is the **change in inflation** needed to stabilize the amount of **unfunded debt**

# Empirical Analysis

# Estimation

- The model is estimated using a data set of 20 macro and fiscal variables
  1. Real GDP growth
  2. Real consumption growth
  3. Real investment growth
  4. Hours worked
  5. Inflation (GDP deflator)
  6. Growth rate of real average weekly earnings
  7. Real transfers payments growth rate
  8. Real government consumption and investment growth rate
  9. Debt to GDP ratio
  10. Federal funds rate (FFR)
  - 11-20. 1Q-10Q ahead expected market path of the FFR (OIS data)
- Sample periods: 1960q1-2007q4 and 2008q1-2020q4
- Second sample includes all the 20 observables; re-estimation of standard deviations and the factor model governing the forward guidance shocks (Campbell et al. 2012)

# Identification of Unfunded Transfers Shocks



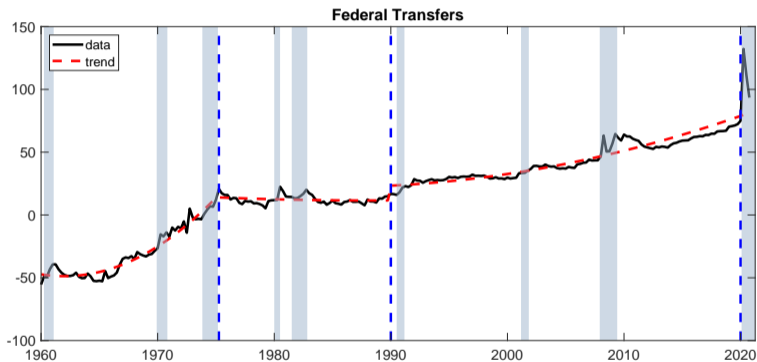
- **Funded transfers:** **Modest** impact on the macroeconomy, debt **increase**
- **Unfunded transfers:** **Persistent** inflation increase, real rate decline, debt **decline**
- **Phillips curve shifter:** **Temporary** inflation spike, real rate increase, debt **increase**

# A Fiscal Theory of Trend Inflation

- Shocks to the **unfunded portion of government debt** are accommodated by the Federal Reserve
- These shocks lead to a **persistent** increase in inflation and inflation expectations
- **Identification** of these shocks rests on the joint dynamics of inflation, inflation expectations, real interest rates, and the debt-to-GDP ratio

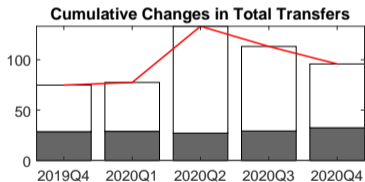
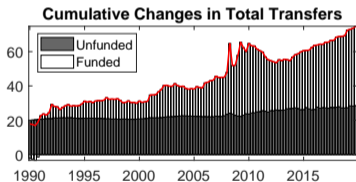
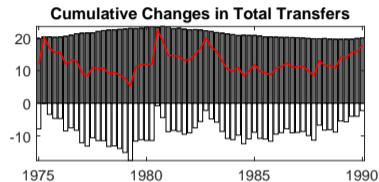
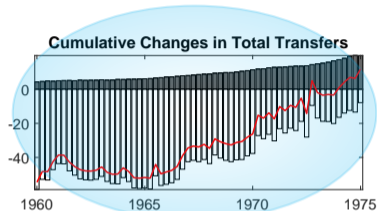


# U.S. Real Federal Transfer Payments: Four phases



Transfers in deviations from steady state: Four phases

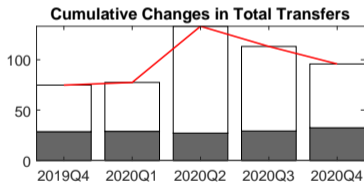
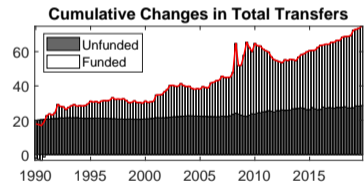
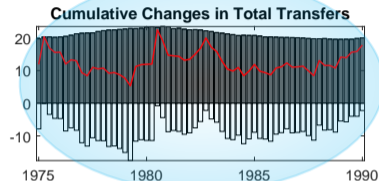
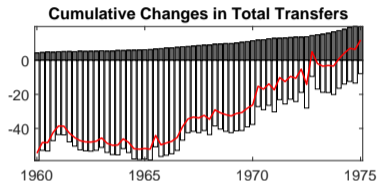
# Funded and Unfunded Transfers



Four phases:

- 1 From the 1960s to the mid-1970s: Large rise of unfunded transfers

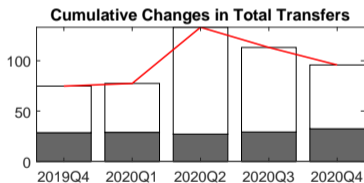
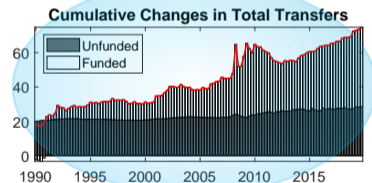
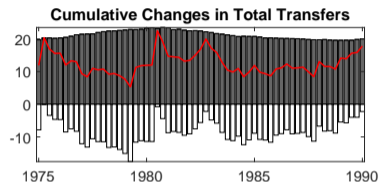
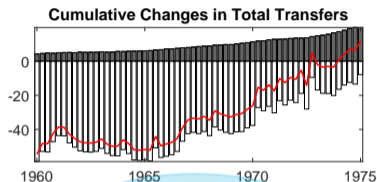
# Funded and Unfunded Transfers



Four phases:

- From the mid-1970s to the 1990s: Stability, with hump shape in unfunded transfers

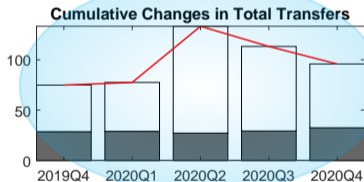
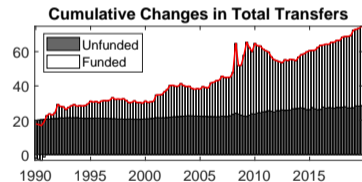
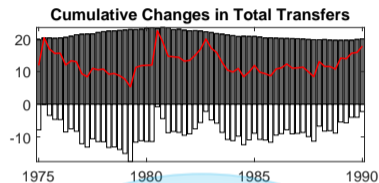
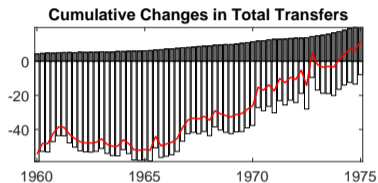
# Funded and Unfunded Transfers



Four phases:

- From the 1990s to the Pandemic: Further rise, prevalently funded

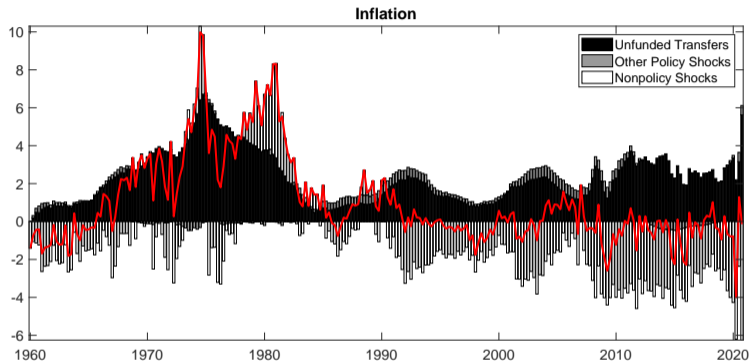
# Funded and Unfunded Transfers



Four phases:

- 1 The COVID stimulus packages

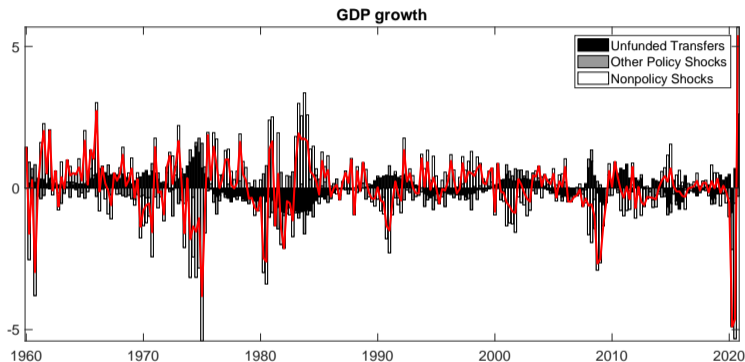
# Drivers of Inflation



Unfunded spending:

- 1 Accounts for rise of trend inflation in the 1960s-1970s and decline in the 1980s
- 2 **Offsets the deflationary bias** that nonpolicy shocks have set off since early 1990s

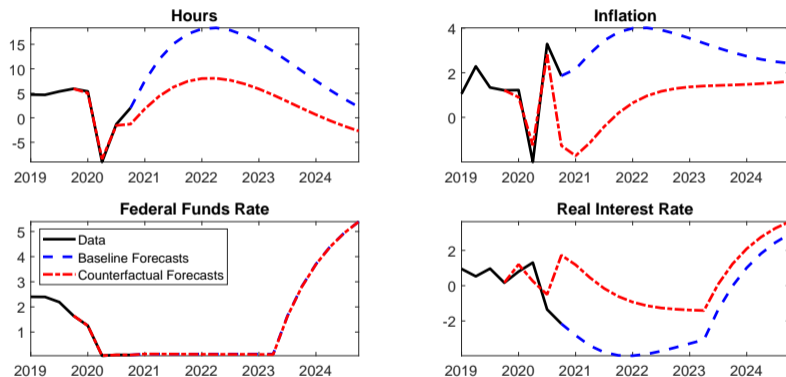
# Drivers of GDP growth



Unfunded spending:

- 1 Declines in the early 1980s, contributing to growth slowdown
- 2 Provides a **large boost** at the end of the sample

# Unfunded Debt and Reflation of the Economy

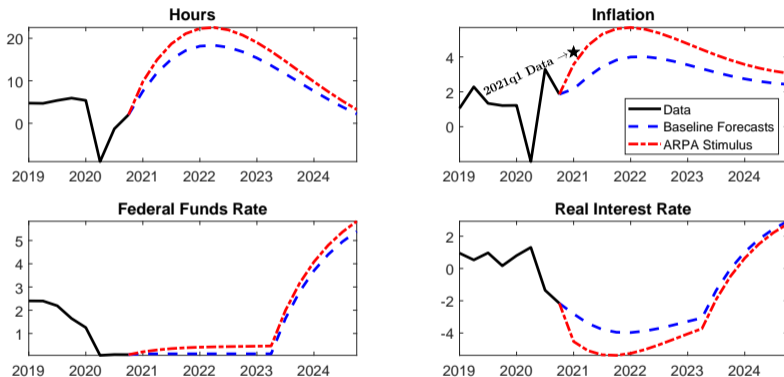


**Baseline:** Forecast based on filtered data up to 2020Q4

**Counterfactual:** All shocks to transfers estimated in 2020Q1-2020Q4 are funded



# Does Recent Fiscal Profligacy Pose a Threat to Price Stability?



**Baseline:** Forecast based on filtered data up to 2020Q4

**Counterfactual:** Forecast including ARPA shock based on transfer payments in 2021Q1 attributed to funded and unfunded transfers according to historical pattern

# Unity is Strength

Policymakers face unprecedented challenges:

- ① High debt that would require **large fiscal corrections**
- ② Low interest rate environment that limits the ability to stabilize the economy  
⇒ **deflationary bias**

**Unity is strength**: Coordination between the two authorities allows policymakers to gain **fiscal space** and **correct the deflationary bias**

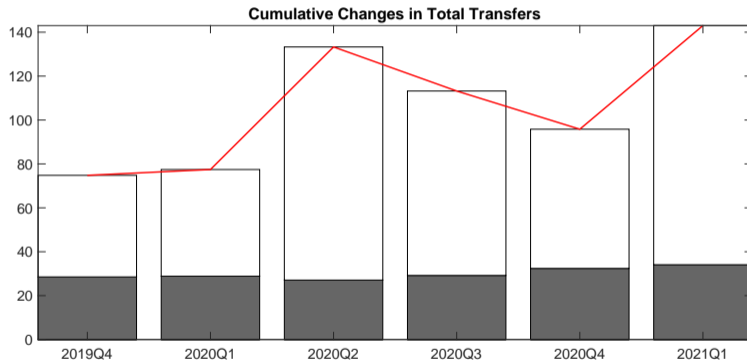
The policy strategy:

- ① Generates a **modest increase in inflation**
- ② Credible because of **the fiscal situation** ⇒ different from a change in the target
- ③ Consistent with **historical experience**

## Concluding Remarks

- **Fiscal vulnerability and monetary policy**: When spending is large, **beliefs** about what share of spending is unfunded may lead to large swings in inflation
- **Historically**, this share has been moving **sluggishly** in the US, but **the future can be different from the past**
- **Monetary policy as a coordination device**:
  - ① The monetary authority can prevent swift changes in beliefs by setting a limit to the **deviations of inflation from its long-run target**
  - ② If such an announcement is credible, it will **coordinate and anchor beliefs** on the share of unfunded spending.

# Funded and Unfunded Transfers (2020q1-2021q1)



# Calibrated Parameters

<b>Parameters Fixed in Estimation</b>		
	Parameters	Values
Discount factor	$\beta$	0.9900
Debt maturity decay rate	$\rho$	0.9680
Capital depreciation rate	$\delta$	0.0250
Elasticity of output to capital	$\alpha$	0.3300
Wage markup	$\eta_w$	0.1400
Price markup	$\eta_p$	0.1400
Government expenditures to GDP ratio	$s_{gc}$	0.1100
Steady state tax rate on labor income	$\tau_L$	0.1860
Steady state tax rate on capital income	$\tau_K$	0.2180
Steady state tax rate on consumption	$\tau_C$	0.0230

# First Sample Estimates

Prior and Posterior Distribution for Structural Parameters							
Param	Posterior Distribution				Prior Distribution		
	Mode	Median	5%	95%	Type	Mean	Std
$s_b$	2.1703	2.1834	2.0147	2.3497	N	1.8200	0.1000
$100\ln \mu$	0.4000	0.4001	0.3255	0.4925	N	0.5000	0.0500
$100\ln \Pi$	0.5402	0.5195	0.4267	0.6104	N	0.5000	0.0500
$\zeta$	1.9704	1.9167	1.7493	2.1217	N	2.0000	0.2500
$\mu$	0.0771	0.0778	0.0652	0.0925	N	0.1100	0.0100
$\omega_w$	0.8041	0.8063	0.7861	0.8243	B	0.5000	0.1000
$\omega_p$	0.8663	0.8666	0.8375	0.8897	B	0.5000	0.1000
$\psi$	0.6596	0.6572	0.5755	0.7502	B	0.5000	0.1000
$s$	5.7144	5.5214	5.0185	5.9213	N	6.0000	0.5000
$\chi_w$	0.0372	0.0437	0.0164	0.0923	B	0.5000	0.2000
$\chi_p$	0.3117	0.2782	0.1279	0.4101	B	0.5000	0.2000
$\theta$	0.9106	0.9091	0.8985	0.9187	B	0.5000	0.2000
$\alpha^G$	-0.0455	-0.0396	-0.1832	0.0838	N	0.0000	0.1000

# First Sample Estimates

Prior and Posterior Distribution							
Param	Posterior Distribution				Prior Distribution		
	Mode	Median	5%	95%	Type	Mean	Std
$\phi_y$	0.0012	0.0019	0.0001	0.0074	N	0.2500	0.1000
$\phi_\pi$	2.0577	2.0963	1.9462	2.2525	N	2.0000	0.1000
$\phi_{zy}$	0.0715	0.0439	0.0198	0.0719	G	0.1000	0.0500
$\gamma_G$	0.3800	0.3463	0.2218	0.4279	N	0.2500	0.1000
$\gamma_K$	0.0043	0.0064	0.0003	0.0335	N	0.2500	0.1000
$\gamma_L$	0.0163	0.0133	0.0009	0.0461	N	0.2500	0.1000
$\gamma_Z$	0.0017	0.0063	0.0003	0.0249	N	0.2500	0.1000
$\rho_r$	0.7250	0.7223	0.6650	0.7746	B	0.5000	0.1000
$\rho_G$	0.9637	0.9627	0.9340	0.9803	B	0.5000	0.1000
$\rho_Z$	0.5007	0.4313	0.3430	0.5448	B	0.5000	0.1000
$\rho_K$	0.5000	0.4690	0.3798	0.5586	B	0.5000	0.1000
$\rho_L$	0.4977	0.5015	0.3873	0.6409	B	0.5000	0.1000
$\rho_C$	0.4996	0.4280	0.3698	0.4818	B	0.5000	0.1000

# First Sample Estimates

Prior and Posterior Distribution							
Param	Posterior Distribution				Prior Distribution		
	Mode	Median	5%	95%	Type	Mean	Std
$\rho_{eG}$	0.2868	0.3045	0.1506	0.3782	B	0.5000	0.1000
$\rho_{eZ}^F$	0.9954	0.9953	0.9933	0.9968	B	0.9950	0.0010
$\rho_{eZ}^U$	0.9958	0.9956	0.9937	0.9971	B	0.9950	0.0010
$\rho_a$	0.2987	0.2803	0.1711	0.3610	B	0.5000	0.1000
$\rho_b$	0.8237	0.8237	0.7774	0.8609	B	0.5000	0.1000
$\rho_{em}$	0.2407	0.2573	0.1692	0.3105	B	0.5000	0.1000
$\rho_i$	0.9205	0.9206	0.8990	0.9395	B	0.5000	0.1000
$\rho_{rp}$	0.9085	0.9062	0.8880	0.9220	B	0.5000	0.1000
$\rho_{\pi NKPC}$	0.9965	0.9966	0.9951	0.9977	B	0.9950	0.0010



# First Sample Estimates

Prior and Posterior Distribution							
Param	Posterior Distribution				Prior Distribution		
	Mode	Median	5%	95%	Type	Mean	Std
$\sigma_G$	1.9046	1.9306	1.7416	2.1419	IG	0.5000	0.2000
$\sigma_F$	2.9635	2.8922	2.6631	3.0924	IG	0.5000	0.2000
$\sigma_Z^U$	0.5166	0.5500	0.4194	0.7319	IG	0.1000	0.0500
$\sigma_Z^a$	1.2113	1.1989	1.0895	1.3349	IG	0.5000	0.2000
$\sigma_b$	4.9850	4.9782	4.9214	4.9986	IG	0.2500	0.2000
$\sigma_m$	0.2375	0.2406	0.2154	0.2691	IG	0.5000	0.2000
$\sigma_i$	0.5192	0.5318	0.4734	0.5955	IG	0.5000	0.2000
$\sigma_w$	0.3487	0.3512	0.3156	0.3912	IG	0.5000	0.2000
$\sigma_p$	0.1625	0.1640	0.1427	0.1877	IG	0.5000	0.2000
$\sigma_{rp}$	0.3914	0.3990	0.3441	0.4586	IG	0.5000	0.2000
$\sigma_{\pi}^{NKPC}$	1.3255	1.3763	1.2106	1.6382	IG	0.1000	0.0500
$\sigma_{GDP}^m$	0.4330	0.4352	0.3947	0.4831	IG	0.5000	0.2000
$\sigma_{by}^m$	0.3160	0.3032	0.2221	0.4217	IG	0.5000	0.2000

# Second Sample Estimates

Prior and Posterior Distribution: Second sample							
Param	Posterior Distribution				Prior Distribution		
	Mode	Median	5%	95%	Type	Mean	Std
$\sigma_G$	3.2021				IG	0.5000	0.2000
$\sigma_F$	4.9982				IG	0.5000	0.2000
$\sigma_Z$	1.0214				IG	0.1000	0.0500
$\sigma_a$	3.7944				IG	0.5000	0.2000
$\sigma_b$	4.9975				IG	0.2500	0.2000
$\sigma_m$	0.1242				IG	0.5000	0.2000
$\sigma_i$	2.5281				IG	0.5000	0.2000
$\sigma_w$	0.6567				IG	0.5000	0.2000
$\sigma_p$	0.1630				IG	0.5000	0.2000
$\sigma_{rp}$	2.8727				IG	0.5000	0.2000
$\sigma_{\pi NKPC}$	4.9939				IG	0.1000	0.0500
$\sigma_{GDP}^m$	1.7952				IG	0.5000	0.2000
$\sigma_{by}^m$	4.9963				IG	0.5000	0.2000

Notation of Model Parameters	
	Parameters
Debt to annualized GDP ratio	$s_b$
Steady-state growth rate	$100 \ln \mu$
Steady state inflation rate	$100 \ln \Pi$
Inverse Frisch elasticity	$\xi$
Share of hand-to-mouth households	$\mu$
Wage Calvo parameter	$\omega_w$
Price Calvo parameter	$\omega_p$
Capital utilization cost	$\psi$
Investment adjustment cost	$s$
Wage inflation indexing parameter	$\chi_w$
Price inflation indexing parameter	$\chi_p$
Habits in consumption	$\theta$
Substitutability of private vs. gov. consumption	$\alpha_G$

Notation of Model Parameters	
	Parameters
Taylor rule response to output	$\phi_y$
Taylor rule response to inflation	$\phi_\pi$
Transfers response to output	$\phi_{zy}$
Inverse Frisch elasticity	$\xi$
Government consumption response to debt	$\gamma_G$
Tax on capital response to debt	$\gamma_K$
Tax on labor response to debt	$\gamma_L$
Transfers response to debt	$\gamma_Z$
Serial correlation on interest rate in Taylor rule	$\rho_r$
Serial correlation on government consumption rule	$\rho_G$
Serial correlation on transfers rule	$\rho_Z$
Serial correlation on capital tax rule	$\rho_K$
Serial correlation on labor tax rule	$\rho_L$
Serial correlation on consumption tax rule	$\rho_C$

Notation of Model Parameters	
	Parameters
AR coefficient on government consumption policy shocks	$\rho_{eG}$
AR coefficient on funded transfers' shocks	$\rho_{eZ}^F$
AR coefficient on unfunded transfers' shocks	$\rho_{eZ}^U$
AR coefficient on technology shocks	$\rho_a$
AR coefficient on preference shocks	$\rho_b$
AR coefficient on monetary policy shocks	$\rho_m$
AR coefficient on investment shocks	$\rho_i$
AR coefficient on risk premium shocks	$\rho_{rp}$
AR coefficient on inflation drift shocks	$\rho_{\pi NKPC}$

Notation of Model Parameters	
	Parameters
Standard deviation government consumption shocks	$\sigma_G$
Standard deviation funded transfers' shocks	$\sigma_Z^F$
Standard deviation unfunded transfers' shocks	$\sigma_Z^U$
Standard deviation technology shocks	$\sigma_a$
Standard deviation preference shocks	$\sigma_b$
Standard deviation monetary policy shocks	$\sigma_m$
Standard deviation investment shocks	$\sigma_j$
Standard deviation wage markup shocks	$\sigma_w$
Standard deviation price markup shocks	$\sigma_p$
Standard deviation risk premium shocks	$\sigma_{rp}$
Standard deviation inflation drift shocks	$\sigma_{\pi^*}$
Measurement error on GDP	$\sigma_{GDP}^m$
Measurement error on debt to GDP ratio	$\sigma_{by}^m$