Fiscal Strength within a Framework of Institutional Independence*

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Abstract

This paper develops a theoretical framework in which fiscal and monetary authorities interact strategically to determine tax, inflation, and debt policy. A tax-minimizing debt-manager and an inflation-minimizing central bank operate non-cooperatively while constrained by government solvency, household optimization, and each other's choices. Fiscal strength, measured as debt-manager bargaining power, provides a foundation for examining policy dynamics along a continuum as opposed to switching between discrete regimes. Greater fiscal strength leads to higher inflation and lower taxes, and model-imputed American fiscal strength generally co-moves with data on presidential pressure on the Fed. When compared with first-best, U.S. fiscal policy was too strong in the 1970s and has been too weak since 2008, largely because surprise inflation is more effective at financing highly indebted governments.

Keywords: Fiscal policy, Monetary policy, Central bank independence, Nash bargaining, U.S. macroeconomic policy.

JEL Classification: E52, E63, H62, H63, C72.

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1 Introduction

American presidents and high-ranking Federal Reserve (Fed) officials often hold separate ideologies concerning how fiscal and monetary policies should jointly shape the country's economic backdrop.

As part of his 2024 presidential campaign, Donald Trump released his vision for the future of this relationship, endorsing that "Congress should limit [the Fed's] mandate to the sole objective of stable money" and stating, "I feel that the president should have at least [a] say in [making interest rate decisions]."[1] Trump's recent criticisms of Fed Chair Powell, and Powell's commitment to an elevated federal funds rate amid falling rates abroad, take a more hostile tone. With messaging such as, "We have a stupid person at the Fed...maybe I should go to the Fed," to "You have a guy in there that, with the stroke of a pen, could save us hundreds of billions of dollars a year...but he won't because he's a stupid person," and "if I think [a future Fed Chair appointee candidate is] going to keep the rates where they are...I'm not going to put them in. I'm going to put somebody that wants to cut rates," it is clear that Trump sees Fed independence as a constraint on presidential economic authority.[2] Appendix A lists Trump's recent quotes towards Powell and the Fed.

This is not a new phenomenon. Presidents have long pressured high ranking Fed officials to keep rates, and resulting borrowing costs, low, with varying degrees of success. In the mid-1960s, President Lyndon B. Johnson pushed Fed Chair William McChesney Martin against a wall in an effort to keep interest low on war bonds. In the early-1970s, President Richard Nixon kept rates low by constantly and aggressively berating Fed Chair Arthur Burns before Nixon's 1972 reelection. In the early-1980s, President Ronald Reagan played a precarious 'game of chicken' with Fed Chair Paul Volcker, cutting taxes and raising expenditures in the face of promised prolonged elevated rates.[3] Romer and Romer (2009) and Bianchi and Melosi (2022) credit the eventual reduction in 1980s inflation to the combination of Volcker's commitment to high rates and Reagan's tax hikes.

Many theoretical models exist separating fiscal and monetary policy within a competitive, general equilibrium setting, beginning with work by Sargent and Wallace (1981). The Fiscal Theory of the Price Level (FTPL) initially developed by Leeper (1991), Sims (1994) and Woodford (1995) characterizes distinct regimes where fiscal and monetary policy commit to follow rules in an economy with nominal government debt. Models by Dixit and Lambertini (2003), Gnocchi (2013) and Gnocchi and Lambertini (2016) iterate on FTPL by assuming

[1] See Chapter 24 of *Project 2025* by Winfree (2024) and the *Wall Street Journal*'s 4/26/2024 article by Restuccia, Timmons, and Leary (2024).

[2] See direct quotes from presidential speeches on 6/18/2025, 6/27/2025 and 6/27/2025, respectively.

[3] Sargent (1986) credits Neil Wallace with this phrasing.

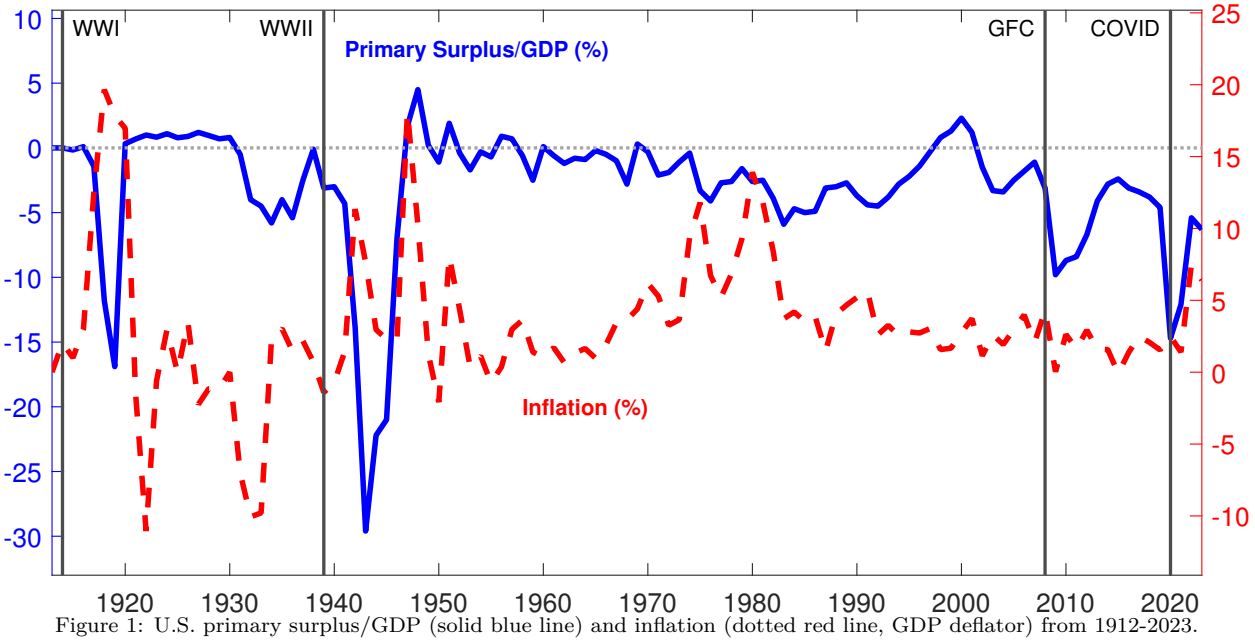


Figure 1: U.S. primary surplus/GDP (solid blue line) and inflation (dotted red line, GDP deflator) from 1912-2023.

monetary and fiscal policies engage in non-cooperatively optimal policy unrestricted by a rules framework, pinning down unique subgame perfect equilibria through discrepancies in institutions' abilities to commit. Work by Chen, Leeper, and Leith (2021) combines non-cooperation with FTPL by including Markov switching and policy non-cooperation within a policy rules framework. Despite this, a common and persistent challenge exists throughout the literature: reconciling high U.S. inflation during periods of low and stable government indebtedness, as in the 1970s, and low U.S. inflation during periods of high and rising government indebtedness, as in the 2010s, as shown in Figure 1.

I introduce a novel approach to studying fiscal-monetary joint policy, characterizing regimes along a continuum rather than as a discrete set. This conceptual step, which uses conventional ideas from game theory, provides the foundation for more nuanced fiscal-monetary analysis than that currently in the literature. Additionally, it offers a way to include theoretical political pressure shocks, like those empirically studied in Drechsel (2024), and quantitative predictions implied by such shocks, in standard DSGE analysis. Such an approach may eventually reconcile joint fiscal-monetary policy between 1970s and the 2010s using political pressure shocks rather than regime switching, hopefully providing a better fit to data.

This paper develops a theory of fiscal and monetary non-cooperation, where a unique equilibrium is determined by fiscal policy's strength relative to monetary policy. An inflation-targeting central bank and tax-minimizing debt-manager operate within an economy similar to that in Lucas and Stokey's (1983) model but with nominal debt. Policy authorities simultaneously commit to state contingent plans that maximize their own institution-specific

payoffs, resulting in a one-shot game. Equilibrium satisfies requirements for a competitive equilibrium outlined by Barro (1979) and Lucas and Stokey (1983) and a Nash equilibrium introduced by Nash (1951). I select a unique equilibrium from the resulting continuum using Harsanyi and Selten's (1972) asymmetric Nash bargaining concept and interpret the bargaining parameter as a measure of fiscal strength.[4]

Given inherited debt and a stochastic stream of current and future government spending, the debt-manager chooses a plan for labor-distorting taxes and fiscally-issued debt, while the central bank chooses a plan for costly inflation and monetarily-demanded debt. Households hold the difference of fiscal and monetary debt portfolios once markets clear. Given one institution's plan and optimal household consumption, labor supply, and savings behavior, the other institution must satisfy government solvency along an individually-optimal policy path.

The government must be financed somehow, introducing a fundamental trade-off between distorting labor taxes and an inflation tax similar to that introduced in Phelps (1973). Surprise inflation devalues debt to keep distortionary taxes low, while distortionary taxes raise real revenues to keep inflation low. The central bank selects the zero-inflation equilibrium when it has unilateral control of government policy. This is monetary dominance. The debt-manager selects the tax-minimizing equilibrium (which implies arbitrarily high inflation) when it has unilateral control of government policy. This is fiscal dominance. If only one of these government branches exists in the economy, households improve welfare by institutionalizing the other. Additionally, model institutions mirror American institutions in obvious ways: the Fed, like the model's central bank, targets inflation while Congress and the president, like the model's debt-manager, pass tax cuts to achieve political objectives.[5]

A Ramsey planner selects the tax/inflation financing mix that maximizes household welfare. The planner calls for an interior solution: one with non-zero inflation and non-minimized tax rates. The Ramsey plan is achievable under a non-cooperative government when fiscal strength is low, echoing a chorus of work supporting strong, independent monetary policy like that by Alesina (1988), Grilli, Masciandaro, and Tabellini (1992), and Alesina and Summers (1993).

Recent work by Drechsel (2024) uncovers historical data on meetings between U.S. presidents and Fed officials and compares them to U.S. inflation outcomes, positing that presidents meet with Fed officials to pressure them into reducing rates. Drechsel supports

[4]Of course, the Fed and Treasury/President do not sit across from one another in a conference room and negotiate future paths of taxes and interest rates. Yet, by labeling a less-reliant fiscal authority as 'stronger' according to such a criterion, it is possible to encapsulate political ideas in an economic framework using conventional, micro-founded theory.

[5]With America's latest tax cut included in the recent 'Big Beautiful Bill.'

this claim by finding a causal link between the meetings President Richard Nixon (1969–1974) held with Fed officials in 1971 during Fed Chair Arthur Burns's (1970–1978) tenure and a decrease in the Fed Funds rate, calling such an event a 'political pressure shock.'

It is not entirely clear what a political pressure shock looks like in a DSGE model as compared with a monetary or fiscal policy shock, for instance. If political pressure exists in the meeting rooms of high-ranking policymakers and affects macroeconomic variables like the Fed's policy rate, a theory that specifies this pressure may be useful. Additionally, such a theory may be the *only* way to identify political pressure going forward, as presidential meeting agendas are no longer available to the public. I consider this paper's notion of fiscal strength to be the theoretical counterpart to Drechsel's empirical political pressure concept.[6].

To show the relationship between the two, I solve this paper's model in every year from 1943–2023 given American data on privately held debt and spending, and I impute the implicit amount of fiscal strength required for the model to match realized U.S. inflation rates each year. I compare the imputed fiscal strength time series with that of hours presidents spent with Fed officials in meetings each year from 1943–2008 (hours data end in 2008). The time series line up well after 1952, the year after the Treasury-Fed Accord, until the end of the sample. Both datasets exhibit two major upward spikes between 1971–1981, and imputed fiscal strength remains low until post-COVID inflation arrives in 2021.

For further comparison, I calculate average imputed fiscal strength and average annual meeting hours by presidential and Fed chair term over the same time frame, finding a positive relationship between the number of hours presidents and Fed chairs spent in meetings and the amount of imputed fiscal strength they experienced during their time in office.

Another question the paper answers is normative: when was American fiscal policy 'too strong' and when was it 'too weak?'[7] Given U.S. debt and spending data each year from 1943–2023, I calculate the amount of fiscal strength that implements the model's Ramsey plan each year and compare it with imputed fiscal strength. Imputed and first-best fiscal strengths line up well from the beginning of the sample until the late-1960s, and again from the mid-1980s until the Great Financial Crisis (GFC) in 2008. I find that fiscal policy was too strong throughout the 1970s and has been too weak since the GFC. The key piece of intuition is that surprise inflation is a more powerful financing tool in high-debt economies than low-debt ones, while imposing similar welfare costs on households in both. Debt-to-GDP remained between 20%-30% in the 1970s, while inflation soared: high inflation financed a large portion of a small debt stock. Government debt spiked in 2008 and rose to more

[6]And I expect responses to fiscal strength shocks to resemble that to political pressure shocks in future work

[7]Too strong and too weak compared to what the planner would choose if directing American policy that year.

than 80% by 2015 while inflation remained below the Fed's 2% target: low surprise inflation financed a small amount of a large debt stock. The COVID spike in fiscal strength and corresponding inflation better approximated the model planner's solution because such a rise in inflation greatly reduced tax distortions the government would otherwise need to levy to finance itself.

This paper offers three main contributions. First, it develops a theory by which fiscal strength, a continuous variable regulating monetary-fiscal regime selection, determines a unique equilibrium under individually optimizing fiscal and monetary policy. Second, it provides theoretical underpinnings of new and exciting empirical data and offers a way to extend that data to present day. Third, it offers a glimpse into the history of fiscal and monetary interaction in post-war America and compares those interactions to a normative standard.

2 Model

2.1 Environment

I consider an infinitely-lived flexible-price economy with periods indexed by $t \in \{0, 1, 2, \cdots\}$. Three types of agents inhabit the model: households, a debt-manager and a central bank.

A measure-1 continuum of identical price-taking households consume c_t and produce an aggregated, non-storable good in every period equal to their labor supply n_t. Households own the economy's production technology, and their labor income is taxed at rate $\tau_t \in [0, 1)$.

Exogenous government purchases of the consumption good g_t evolve according to an S-state Markov process with transition matrix $\mathcal{P}$. The $S \times 1$ vector of spending states is $g \equiv \{g(s)\}_s$ where $s \in \{1, \cdots, S\}$, and the time t history of government spending realizations is $g^t \equiv \{g_0, g_1, \cdots, g_t\}$. The set of potential time t histories is given by G^t. Finally, let F^t denote the marginal distribution of histories implied by $\mathcal{P}$ and g_0, and let f^t denote the density for F^t. There is no other source of uncertainty in the model.

Total production is consumed by households and the government, so the economy's aggregate resource constraint (ARC) is

$$n_t = c_t + g_t \quad \forall t \tag{1}$$

Define $P_t > 0$ as the aggregate price level, which represents the exchange rate between nominal objects (hereafter referred to as 'dollars') and the numeraire. Households lend (borrow) in dollars using a portfolio of nominal, one-period, state-contingent government debt

$B_t = \left\{B_t^{(s)}\right\}_{s=1}^{S}$, where they receive $B_t^{(s')}$ dollars upon realizing state $s' \in \{1, \cdots, S\}$ when entering period $t+1$. This is a nominal version of the portfolio originally studied in Arrow (1964). Finally, call $\pi_t = \frac{P_t}{P_{t-1}}$ the economy's time t gross inflation rate.

Household welfare is defined as the sum of discounted expected utility over its lifetime according to the function

$$W_0 = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{u\left(c_t\right) - v\left(n_t\right) - w\left(\pi_t\right)\right\} = \sum_{t=0}^{\infty} \beta^t \sum_{g_t \in G^t} \left\{u\left(c_t\right) - v\left(n_t\right) - w\left(\pi_t\right)\right\} f^t\left(g^t\right) \quad (2)$$

where $\beta \in (0,1)$, where u, v and w are twice-differentiable, where $u' > 0$, $u'' < 0$, $v' > 0$, $v'' > 0$, and where w is minimized at 1. Utility is increasing in consumption, decreasing in labor supply, decreasing in gross inflation greater than one, and increasing in gross inflation less than one.

The government is split into two branches: the debt-manager and central bank. Institutions have commitment power, and each institution aims to maximize the sum of discounted expected household utility under a reweighing of utility components.

The debt-manager chooses the issued supply of government debt across types $\boldsymbol{B}_t^{dm} = \left\{\boldsymbol{B}_t^{(s),dm}\right\}_{s=1}^{S}$ and the labor income tax rate τ_t each period to maximize its lifetime payout given by

$$\begin{aligned} W_0^{dm} &= \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{\left(1-\rho^{dm}\right)\left[u\left(c_t\right) - v\left(n_t\right)\right] - \rho^{dm} w\left(\pi_t\right)\right\} \\ &= \sum_{t=0}^{\infty} \beta^t \sum_{g_t \in G^t} \left\{\left(1-\rho^{dm}\right)\left[u\left(c_t\right) - v\left(n_t\right)\right] - \rho^{dm} w\left(\pi_t\right)\right\} f^t\left(g^t\right) \end{aligned} \quad (3)$$

where $\rho^{dm} \in [0,1]$, and where $\boldsymbol{B}_t^{dm} \in \mathbb{R}^S$ is otherwise unrestricted.

The central bank simultaneously chooses its debt demand $\boldsymbol{B}_t^{cb} = \left\{\boldsymbol{B}_t^{(s),cb}\right\}_{s=1}^{S}$ and the inflation rate π_t each period to maximize its lifetime payout given by

$$\begin{aligned} W_0^{cb} &= \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{\left(1-\rho^{cb}\right)\left[u\left(c_t\right) - v\left(n_t\right)\right] - \rho^{cb} w\left(\pi_t\right)\right\} \\ &= \sum_{t=0}^{\infty} \beta^t \sum_{g_t \in G^t} \left\{\left(1-\rho^{cb}\right)\left[u\left(c_t\right) - v\left(n_t\right)\right] - \rho^{cb} w\left(\pi_t\right)\right\} f^t\left(g^t\right) \end{aligned} \quad (4)$$

where $\rho^{cb} \in [0,1]$, and where $\boldsymbol{B}_t^{cb} \in \mathbb{R}^S$ is otherwise unrestricted.

The structure of outstanding government debt at time t is $\boldsymbol{B}_t = \boldsymbol{B}_t^{dm} - \boldsymbol{B}_t^{cb}$. Debt markets clear when household lending equals consolidated government borrowing so that

$$\boldsymbol{B}_t = B_t \quad \forall t \tag{5}$$

where $B_t = \left\{B_t^{(s)}\right\}_{s=1}^{S}$.

2.2 Market Structure

S asset markets exist in every period: one for each circulating debt instrument. Debt is exchanged at nominal prices $Q_t \equiv \left\{Q_t^{(s)}\right\}_{s=1}^{S}$ where $Q_t^{(s)}$ is the time t price of a bond that matures in state s at time $t+1$.

Upon entering state $s' \in \{1, \cdots, S\}$, each household chooses $\{c_t, n_t, B_t\}_{t=0}^{\infty}$ to maximize (2) subject to its household budget constraint (HHBC), given as

$$P_t c_t + \sum_{s=1}^{S} Q_t^{(s)} B_t^{(s)} \leq P_t \left(1 - \tau_t\right) n_t + B_{t-1}^{(s')} \tag{6}$$

Household debt holdings are subject to limits that eliminate Ponzi schemes:

$$B_t^{(s)} \in \left[\underline{B}, \overline{B}\right] \quad \forall t, s \tag{7}$$

where debt limits $\underline{B}$ and $\overline{B}$ are set to be sufficiently large so that (7) does not bind in equilibrium.

The debt-manager chooses fiscal policy $\left\{\tau_t, \boldsymbol{B}_t^{dm}\right\}_{t=0}^{\infty}$ to maximize (3). The central bank chooses monetary policy $\left\{\pi_t, \boldsymbol{B}_t^{cb}\right\}_{t=0}^{\infty}$ to maximize (4). Institutions are constrained by the ARC (1), HHBC (6), household optimization, and the other institution's simultaneous policy choice, which is taken as given at time t. The ARC (1) and HHBC (6), combine to produce the consolidated government's budget constraint (GBC), written as

$$B_{t-1}^{(s')} + P_t g_t \geq \sum_{s=1}^{S} Q_t^{(s)} B_t^{(s)} + P_t \tau_t n_t \tag{8}$$

upon entering state $s' \in \{1, \cdots, S\}$ at time t.

3 Competitive Nash Equilibrium

3.1 Equilibrium Definition

Equilibrium is similar to that in the anonymous commitment game found in Chari and Kehoe (1990) except for the addition of a second committing policymaker. Time 0 institutions select infinite sequences of policies, contingent on future realizations of uncertainty. Due to

initial institutions' commitment technologies, future institutions are constrained to follow such time 0 plans. Households move after institutions at time 0.

I define the economy's time t state as $x_t \equiv \{g^t, B_{t-1}\}$. The debt-manager's time t action is a selection of fiscal policy $\eta_t^{dm} = \eta^{dm}(x_t) = \left\{\tau_t, \boldsymbol{B}_t^{dm}\right\}$, the central bank's time t action is a selection of monetary policy $\eta_t^{cb} = \eta^{cb}(x_t) = \left\{\pi_t, \boldsymbol{B}_t^{cb}\right\}$ and households' time t action is a selection of consumption, labor supply and debt holdings $\eta_t^{hh} = \eta^{hh}(x_t) = \{c_t, n_t, B_t\}$.

I index government institutions by $i \in \{dm, cb\}$ and denote i's opponent by $-i$. A time 0 strategy for institution i is a set of current and future committed action profiles $\gamma_0^i(x_0, \gamma^i(\cdot), \gamma^{-i}(\cdot)) \equiv \left\{\{\eta(x_t, \gamma^i(\cdot), \gamma^{-i}(\cdot))\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ and its time $t > 0$ strategy is simply its previously-committed, state-contingent action $\gamma_t^i(x_t, \gamma^i(\cdot), \gamma^{-i}(\cdot)) \equiv \eta^i(x_t, \gamma^i(\cdot), \gamma^{-i}(\cdot))$.[8] Combine these strategies into i's unified strategy profile $\gamma^i(\cdot) \equiv \{\gamma_0^i(\cdot), \gamma_t^i(\cdot)\}$.

A pure strategy competitive Nash equilibrium (CNE) consists of a debt-manager strategy $\gamma^{dm}(\cdot)$, a central bank strategy $\gamma^{cb}(\cdot)$, a household strategy $\gamma^{hh}\left(x_t, \gamma^{dm}(\cdot), \gamma^{cb}(\cdot)\right) = \eta^{hh}\left(x_t, \gamma^{dm}(\cdot), \gamma^{cb}(\cdot)\right)$, a pricing function for the aggregate price level $P_t = \gamma^P\left(x_t, \gamma^{dm}(\cdot), \gamma^{cb}(\cdot)\right)$ and a pricing function for the vector of bond prices $Q_t = \gamma^Q\left(x_t, \gamma^{dm}(\cdot), \gamma^{cb}(\cdot)\right)$ such that in every period:

1. The household strategy $\gamma^{hh}(\cdot)$ maximizes (2) given $\gamma^{dm}(\cdot)$, $\gamma^{cb}(\cdot)$, $\gamma^P(\cdot)$ and $\gamma^Q(\cdot)$ while satisfying (6) and (7),

2. The debt-manager's strategy $\gamma^{dm}(\cdot)$ maximizes (3) given $\gamma^{hh}(\cdot)$, $\gamma^{cb}(\cdot)$, $\gamma^P(\cdot)$ and $\gamma^Q(\cdot)$ while satisfying (8),

3. The central bank's strategy $\gamma^{cb}(\cdot)$ maximizes (4) given $\gamma^{hh}(\cdot)$, $\gamma^{dm}(\cdot)$, $\gamma^P(\cdot)$ and $\gamma^Q(\cdot)$ while satisfying (8),

4. The set of pricing equations $\gamma^P(\cdot)$ and $\gamma^Q(\cdot)$ clear all markets, satisfying (1) and (5).

Households, the debt-manger and the central bank are fully rational, have complete information about each others' problems and understand the underlying government spending process $\{g, \mathcal{P}\}$.

3.2 Household Optimization

Household optimization ensures the HHBC (6) and GBC (8) hold as strict equalities and that

[8] Where action profiles are now more appropriately written as functions of the economy's state and government strategy.

$$1-\tau_t=\frac{v'\left(n_t\right)}{u'\left(c_t\right)}\ \text{ and }\ Q_t^{(s')}=\beta\mathbb{E}_t\left[\frac{u'\left(c_{t+1}\right)P_t}{u'\left(c_t\right)P_{t+1}}\right]\mathcal{P}_{s,s'}\ \ \forall s,s'\in\{1,\cdots,S\} \tag{9}$$

when all debt is traded, where $\mathcal{P}_{s,s'}$ is the $s\times s'$ element of $\mathcal{P}$: the probability of entering state s' at time $t+1$, conditional on being in state s at time t.

Well-known properties of such a Markov process allow for a reduction in the economy's state space, as, at time t, the time $t-1$ history of spending states g^{t-1} is not informative to households or government branches, given B_{t-1}. The economy's relevant state space can therefore be rewritten as $\tilde{x}_t=\{g_t,B_{t-1}\}$.

Equation (9) and properties of $u\left(\cdot\right)$, $v\left(\cdot\right)$ and β imply a transversality condition (TVC) on the real value of maturing government debt so that

$$\lim_{i\to\infty}\left(\frac{\beta^i B_{t-1+i}^{(s)}}{P_{t+i}}\right)=0\ \ ,\ \ \forall s\in\{1,\cdots,S\} \tag{10}$$

3.3 Price Level Determination

I combine the ARC (1), HHBC (6) and household optimization (9), forward-iterate on the probability-weighted sum of maturing government debt and apply the TVC (10) to write

$$\underbrace{\frac{B_{t-1}^{(s)}}{P_t}}_{\text{(Maturing debt)}/P_t}=\underbrace{\frac{1}{u'\left(c_t\right)}\mathbb{E}_t\sum_{i=0}^{\infty}\beta^i\left[u'\left(c_{t+i}\right)c_{t+i}-v'\left(n_{t+i}\right)n_{t+i}\right]}_{\mathbb{E}_t[\text{PV(primary surpluses)}]} \tag{11}$$

which I call the economy's pricing equation. The price level P_t adjusts in every period to ensure that the real value of outstanding nominal debt equals the expected present value of government primary surpluses.[9]

3.4 A Quasi-Primal Approach

Households and government branches derive utility in part from inflation. Expressions thus far have outlined relationships between nominal debt, fiscal financing and the price level. To better align the model with agents' preferences, it is useful to convert the pricing equation (11) from being in terms of nominal debt and the price level to instead being in terms of real debt and inflation.

Define a household's real (indexed) debt holdings as $b_t^{(s)}\equiv\frac{B_t^{(s)}}{P_t}$ and the government's real

[9]Notice that $u'\left(c_{t+i}\right)c_{t+i}-v'\left(n_{t+i}\right)n_{t+i}=u'\left(c_{t+i}\right)\left(\tau_{t+i}n_{t+i}-g_{t+i}\right)$ from the ARC (1) and the HH FOC on τ_t (9).

debt supplied as $\boldsymbol{b}_t^{(s)} \equiv \frac{\boldsymbol{B}_t^{(s)}}{P_t}$, and define the vector of real debt allocations held by households as $b_t \equiv \left\{b_t^{(s)}\right\}_{s=1}^{S}$ and jointly-supplied by the government as $\boldsymbol{b}_t \equiv \left\{\boldsymbol{b}_t^{(s)}\right\}_{s=1}^{S}$. The economy's pricing equation (11) can now be expressed as

$$\underbrace{\frac{b_{t-1}^{(s)}}{\pi_t}}_{\text{(Maturing debt)}/P_t} = \underbrace{\frac{1}{u'(c_t)}\mathbb{E}_t \sum_{i=0}^{\infty} \beta^i \left[u'(c_{t+i})\, c_{t+i} - v'(n_{t+i})\, n_{t+i}\right]}_{\mathbb{E}_t[\text{PV(primary surpluses)}]} \tag{12}$$

where I call (12) the economy's implementability constraint (IC).

Any CNE must be a competitive equilibrium. Lucas and Stokey (1983) employ the primal approach to characterize a competitive equilibrium, which consists of substituting out all prices from the economy and writing the system in terms only of allocations. I employ a quasi-primal approach that follows Lucas and Stokey (1983), except I allow π_t to remain in the system. Equations (1) and (12) are necessary and sufficient conditions for a competitive equilibrium.

Proposition 1 ***(competitive equilibrium)*** *A stochastic sequence* $\left\{\left\{c_t(x_t), n_t(x_t), g_t, \pi_t(x_t)\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ *is a competitive equilibrium if and only if it satisfies* (1) $\forall g^t \in G^t, \forall t$ *and* $\exists \left\{\left\{\left\{\boldsymbol{b}_t^{(s)}(x_t)\right\}_{s=1}^{S}\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ *which satisfies* (12) $\forall g^t \in G^t, \forall t$.

Proof: The proof can be found in appendix B.

The requirements for a competitive equilibrium are met so long as there exists allocations that satisfy the ARC and the IC every period for every possible draw of exogenous government spending. Nominal Arrow securities complete financial markets, so they can be issued to implement any feasible, pre-committed joint tax/inflation path.[10] Solving government institutions' problems subject only to (1) and (12) dramatically simplifies the analysis.

The IC (12) is the key to the game played between institutions. Because inflation doesn't enter the ARC (1), $\{c_t, n_t\}$ depends entirely on fiscal policy while $\{\pi_t\}$ depends entirely on monetary policy.[11] The IC (12) connects the two: institutions' state-contingent plans must be jointly consistent with (12). A debt-manager that chooses current and future tax policy constrains the central bank through (12). Symmetrically, a central bank that chooses current and future inflation policy constrains the debt-manager through (12). The IC becomes the

[10] Implementing these plans requires that $b_{t-1}^{(s)} = \frac{B_{t-1}^{(s)}}{P_{t-1}}$ satisfies the IC (12) for every potential time t realized state.

[11] Notice that the ARC (1) and the HH FOC on τ_t (9) form a system of two equations with two unknowns in c_t and n_t, given τ_t and g_t.

frontier along which the institutional game is played.

4 Analysis

4.1 Ramsey Plan: An Efficient Benchmark

I begin by considering welfare-maximizing joint fiscal-monetary policy conducted by a Ramsey planner with commitment power. Such a Ramsey plan serves as an efficient benchmark by which to compare outcomes from equilibrium government policy.

The Ramsey planner commits to state-contingent plans for $\{\tau_t\}$, $\{\pi_t\}$, and $\{\boldsymbol{b}_t\}$ to maximize true household welfare (2), given its constraint set (1), (5)–(7), (9)–(10). Applying the quasi-primal approach described in Section 3.4 transforms the problem so the Ramsey planner equivalently commits to state-contingent plans for $\{c_t\}$, $\{n_t\}$, $\{\pi_t\}$, and $\{\boldsymbol{b}_t\}$ subject to the ARC (1) and IC (12).

The Ramsey planner's FOCs on $\{c_t\}$ and $\{n_t\}$ combine to yield

$$u'(c_0)[1+\lambda_0] + \lambda_0\left[u''(c_0)\left(c_0 - \frac{b_{-1}^{(s)}}{\pi_0}\right)\right] = v'(n_0)[1+\lambda_0] + \lambda_0 v''(n_0)\, n_0 \quad \text{and} \tag{13}$$

$$u'(c_t)[1+\lambda_0] + \lambda_0 u''(c_t)\, c_t = v'(n_t)[1+\lambda_0] + \lambda_0 v''(n_t)\, n_t \quad \forall t > 0 \tag{14}$$

where λ_0 is the planner's Lagrange multiplier on the time 0 IC (12).[12]

The Ramsey planner's FOCs on $\{\pi_t\}$ are

$$w'(\pi_0)\,\pi_0^2 = \lambda_0 u'(c_0)\, b_{-1}^{(s)} \quad \text{and} \tag{15}$$

$$\pi_t = 1 \quad \forall t > 0 \tag{16}$$

The Ramsey planner sets $\{\tau_t\}$ and $\{\pi_t\}$ to simultaneously achieve three directives. The first is an intratemporal goal to align marginal welfare losses between using τ_t and π_t each period. The second is a goal to smooth welfare losses from its costly tools intertemporally. Both goals take the amount of financing needed to satisfy the IC (12) as given. The third goal is embedded in the planner's FOC on τ_0's (13) and π_0's (15) terms which include inherited, maturing debt $b_{-1}^{(s)}$: the planner sets τ_t and π_t to lessen its own financing burden by devaluing (appreciating) inherited debt (assets).

[12] Specifying linearly-separable CRRA utility in c_t and n_t would imply a perfectly-smooth stationary tax rate. When $u''(c_t)\, c_t = \bar{u}u'(c_t)$ and $v''(n_t)\, n_t = \bar{v}v'(n_t)$, where $\bar{u}$ and $\bar{v}$ are constants, the Ramsey FOC on τ_t (14) becomes $\frac{v'(n_t)}{u'(c_t)} = \frac{1+\lambda_0(1+\bar{u})}{1+\lambda_0(1+\bar{v})}$. The tax rate is then $\tau_t = \tau = 1 - \frac{1+\lambda_0(1+\bar{u})}{1+\lambda_0(1+\bar{v})}$ by the household's FOC on τ_t (9).

The planner chooses $\boldsymbol{b}_t$ so that, given its own Ramsey plan defined by FOCs on τ_t (14) and π_t (16), the state of the economy $\{g_t, b_{t-1}\}$, and the government's exogenous spending process embedded in $\{g, \mathcal{P}\}$, $b_t^{(s')}$ satisfies the time $t+1$ IC (12) in every potential time $t+1$ state $s' \in \{1, \cdots, S\}$.

4.2 Non-Cooperative Equilibrium

Sargent (1986) credits Neil Wallace for characterizing monetary-fiscal coordination during the Reagan (1981–1989) and Volcker (1979–1987) years as a precarious 'game of chicken,' where fiscal policymakers promised tax reductions and expenditure plans while Fed officials pledged unwavering commitment to tight money. They pursued conflicting plans with the expectation that the other would 'chicken out' as the U.S.'s GBC tightened. These incompatible strategies created an unsustainable impasse: either the Fed would capitulate by monetizing government debt, or Congress would yield by reducing expenditures to balance budgets. Institutional commitments transform policy coordination into strategic gamesmanship, with macroeconomic consequences hanging in the balance.

The debt-manager commits to state-contingent plans for $\{\tau_t\}$ and $\left\{\boldsymbol{b}_t^{dm}\right\}$ to maximize its payout (3), and the central bank commits to state-contingent plans for $\{\pi_t\}$ and $\left\{\boldsymbol{b}_t^{cb}\right\}$ to maximize its payout (4), given each branch's opponent's plan and given the consolidated government's constraint set (1), (5)–(7), (9)–(10). Applying the quasi-primal approach described in Section 3.4 transforms the problem so that the debt-manager equivalently commits to state-contingent plans for $\{c_t\}$, $\{n_t\}$ and $\left\{\boldsymbol{b}_t^{dm}\right\}$ to maximize its payout (3), and the central bank commits to state-contingent plans for $\{\pi_t\}$ and $\left\{\boldsymbol{b}_t^{cb}\right\}$ to maximize its payout (4), given each branch's opponent's plan and given the ARC (1) and IC (12). For the rest of the analysis, assume inherited, maturing debt $b_{-1}^{(s)}$ is such that the debt-manager could feasibly, individually satisfy the ARC (1) and IC (12) under $\pi_t = 1$ every period.

I specify the model by setting $\rho^{dm} = 0$ and $\rho^{cb} = 1$ so that the debt-manager minimizes welfare loss from tax distortions while the central bank minimizes welfare loss from inflation.

The debt-manger's FOCs on $\{c_t\}$ and $\{n_t\}$ imply

$$u'(c_0)\left[1+\lambda_0^{dm}\right] + \lambda_0^{dm}\left[u''(c_0)\left(c_0 - \frac{b_{-1}^{(s)}}{\pi_0}\right)\right] = v'(n_0)\left[1+\lambda_0^{dm}\right] + \lambda_0^{dm} v''(n_0)\, n_0 \quad \text{and} \quad (17)$$

$$u'(c_t)\left[1+\lambda_0^{dm}\right] + \lambda_0^{dm} u''(c_t)\, c_t = v'(n_t)\left[1+\lambda_0^{dm}\right] + \lambda_0^{dm} v''(n_t)\, n_t \quad \forall t > 0 \quad (18)$$

where λ_0^{dm} is the debt-manager's Lagrange multiplier on the time 0 IC (12).

The central bank's FOCs on $\{\pi_t\}$ are

$$w'(\pi_0)\,\pi_0^2 = \lambda_0^{cb} u'(c_0)\, b_{-1}^{(s)} \qquad \text{and} \tag{19}$$

$$\pi_t = 1 \qquad \forall t > 0 \tag{20}$$

where λ_0^{dm} is the central bank's Lagrange multiplier on the time 0 IC (12).

Institutional FOCs (17)–(20) are identical to the planner's FOCs (13)–(16), except for the replacement of λ_0 with λ_0^{dm} in (17)–(18) and with λ_0^{cb} in (19)–(20).

The non-cooperative government shares only two of the Ramsey planner's three policy directives. While institutions individually smooth welfare losses intertemporally and devalue inherited debt, no longer does government policy ensure that *intratemporal* marginal welfare losses from τ_t and π_t equate.

Splitting the government into two non-cooperative institutions results in a second Lagrange multiplier and, with no additional restrictions on the model, multiple state-contingent policy paths consistent with the definition of CNE. The remainder of this section is dedicated to characterizing and resolving this multiplicity.

4.2.1 A Continuum of Equilibria

For the remainder of the analysis, assume the time 0 government inherits a strictly positive amount of maturing debt $b_{-1}^{(s)} > 0$.[13] So long as the debt-manager's and central bank's plans follow (17)–(20) while satisfying the ARC (1) and IC (12), no institution finds it desirable to deviate from its own plan. Any deviation from such a plan along the ARC (1) violates either the IC (12) or optimal smoothing of individual payouts.

For instance, in the case where the debt-manager sets taxes lower than what is required to finance inherited debt and current and expected future spending with no inflation ($\pi_t = \pi = 1\ \forall t$), the central bank optimally inflates away a portion of the inherited debt stock's real value to ensure the ARC (1) and IC (12) hold while it follows its payout-maximizing plan according to (19)–(20).

Conversely, in the case where the central bank sets inflation lower than what is required to entirely erode away inherited debt's value ($\pi_0 < \infty$), the debt-manager optimally taxes households to pay off un-eroded inherited debt and current and expected future spending to ensure the ARC (1) and IC (12) hold while it follows its payout-maximizing plan given by (17)–(18).

Either institution can act in an unconstrained manner, but only so long as the other institution picks up the slack to satisfy the consolidated government's constraints. An

[13] This assumption is not required for future results, but it aids in clarifying exposition.

unconstrained debt-manager sets taxes only to finance new government spending without financing any inherited debt, relying on the central bank to hyperinflate all debt away at time 0 $\left(\lambda_0^{cb} \to \infty\right)$.[14] An unconstrained central bank sets inflation to $\pi_t = \pi = 1$ every period, leaving the debt-manager to finance the entire stock of inherited debt as well as current and future spending with explicit taxes $\left(\lambda_0^{cb} = 0\right)$. The continuum between these extremes all satisfy CNE and can be indexed by the central bank's Lagrange multiplier $\lambda_0^{cb} \in [0, \infty)$.

There exists another continuum of CNE – one associated with time 0 deflation $\left(\lambda_0^{cb} < 0\right)$. I define a boundary set of inherited debt structures $\hat{b}_{-1}$ as

$$\hat{b}_{-1} \equiv \left\{ b_{-1} \in \mathbb{R}^S_{++} : \forall b'_{-1} > b_{-1}, \pi_0 > 1 \text{ is required for CNE} \right\}$$

to characterize this continuum in Lemma 1.

Lemma 1 ***(payoff dominated CNE)*** $\forall b_{-1} \in \left(\mathbf{0}, \hat{b}_{-1}\right)$, $\exists \lambda_0^{dm} > 0$, $\lambda_0^{cb} < 0$ *which satisfies a CNE.*

Proof: The proof can be found in appendix B.

As long as solvency is feasible under time 0 deflation ($\pi_0 < 1$), there exists CNE beyond the continuum observed between unconstrained institutions $\lambda_0^{cb} \in [0, \infty)$. Given maturing inherited debt, this continuum of 'payoff dominated' CNE can be indexed by $\lambda_0^{cb} \in [-N, 0)$ where $N \geq 0$ is a constant. Deflated inherited debt needs to be financed by higher taxes than those required for a zero inflation economy. Conversely, any path of sufficiently elevated tax rates needs to be accommodated by deflation so that the ARC (1) and IC (12) hold.

I call this set of equilibria 'payoff dominated' because institutions could individually be made better off moving the economy toward a zero inflation ($\lambda_0^{cb} = 0$) equilibrium. Tax distortions fall and costly deflation wanes as a negative λ_0^{cb} approaches 0.

4.2.2 Payoff Dominance: A Refinement

Payoff dominance, as proposed by Harsanyi and Selten (1988), is a refinement criterion for selecting among multiple Nash equilibria. It asserts that, when faced with multiple equilibria, rational, non-cooperative players will coordinate to eliminate equilibria where players can be individually made better off.

I apply Harsanyi and Selten (1988)'s payoff dominance refinement to Section 3.1's CNE definition, eliminating all CNE indexed from $\lambda_0^{cb} \in [-N, 0)$ and leaving the set of payoff

[14] This is not to say the debt-manager wants hyperinflation, per se, but that hyperinflation is the means by which the government remains solvent under fully minimized taxes.

dominant CNE as those indexed from $\lambda_0^{cb} \in [0, \infty)$.

4.2.3 Fiscal Strength and a Unique Equilibrium

Beginning with the Fed's inception in 1913, and continuing through the Treasury-Fed Accord in 1951 until today, U.S. fiscal policymakers have placed varying degrees of implicit and explicit pressure on Fed officials. Arguments in support of reduced Fed operational independence resurfaced during the U.S.'s 2024 presidential election and continue today. These discussions commonly include calls for a fiscal seat on the FOMC, for the president to be personally involved with rate decisions, and/or for stronger Fed oversight by the Treasury.

The model's multiplicity serves as an opportunity to introduce a measure of fiscal strength – the degree to which fiscal policy pressures monetary policy – to determine a unique equilibrium.

To close the model, I introduce the asymmetric Nash bargaining solution proposed by Harsanyi and Selten (1972). Institutions agree to maximize a product of individual surpluses, weighted by the amount of bargaining power the debt-manager possesses relative to the central bank. The weighted product is

$$\left(W_0^{dm} - d_0^{dm}\right)^{\alpha} \left(W_0^{cb} - d_0^{cb}\right)^{1-\alpha} \tag{21}$$

where d_0^i is institution i's payout under its worst-case feasible CNE and where $\alpha \in [0, 1)$ is a measure of fiscal strength. I maximize (21) taking α as given to arrive at the model's unique solution.

Conventional bargaining models include non-cooperative games where a set of feasible equilibria lie inside the Pareto frontier. With some justification, one such equilibrium from that set is designated the game's 'disagreement equilibrium,' which players realize should negotiations break down. Players' 'disagreement payouts' are typically used for $\{d_0^i\}$.

This paper's model differs from a standard bargaining set-up due to the full set of feasible CNE lying on the Pareto frontier – the IC (12). Imagine a single, feasible equilibrium is labeled the model's disagreement point. In such a scenario, equilibrium collapses to that disagreement point for all $\alpha \in [0, 1)$ as the bargaining solution (21) maximizes a weighted product of utility gains relative to the disagreement point, and, by definition, any movement along the IC (12) results in a negative weighted product (21).

I use the endpoints of the Pareto frontier as player-specific reference points for $\{d_0^i\}$, rather than those from a single disagreement outcome. The approach shares conceptual similarities with economic analyses of claims problems in O'Neill's (1982) work and spatial voting models by Downs (1957) and Black (1958), while maintaining a structure consistent with asymmetric bargaining.

The debt-manager enjoys its best-case scenario when fiscal strength approaches $\alpha \to 1$ so that inherited nominal debt is fully financed by time 0 inflation and taxes only need to finance current and expected future spending. Symmetrically, the central bank achieves its best-case scenario when fiscal strength is set to $\alpha = 0$ so that debt and spending are entirely tax-financed. The continuum indexed by $\lambda_0^{cb} \in [0, \infty)$ is also indexed by $\alpha \in [0, 1)$.

Finally, denote the welfare-maximizing level of fiscal strength α^* as the amount of fiscal bargaining power for which equilibrium allocations are consistent with those defined by the Ramsey plan in Section 4.1. Institutions are equally constrained when $\alpha = \alpha^*$ so that $\lambda_0^{dm} = \lambda_0^{cb} = \lambda_0$.

5 Model Calibration

I consider a two-sate (low and high government spending) economy where households derive per-period payoffs in the form

$$u(c_t) - v(n_t) - w(\pi_t) = \frac{c_t^{1-\sigma}}{1-\sigma} - \frac{n_t^{1+\varphi}}{1+\varphi} - \frac{1}{2}\theta\left(\frac{1}{\pi_t} - 1\right) \tag{22}$$

for the remainder of the paper, where $\sigma = \varphi = 2$. Time periods are years, so $\beta = 0.9875^4$ to match the annualized time discount factor from Chari, Christiano, and Kehoe (1995) and Buera and Nicolini (2004). I set government spending $\{g_\ell, g_h\} = \{0.1764, 0.3568\}$ and transition matrix probabilities $\{p_{\ell\ell}, p_{hh}\} = \left\{\frac{75}{76}, \frac{2}{3}\right\}$ to match U.S. (spending+transfer) moments from 1942–2024.[15]

Inherited debt $b_{-1} = 0.5210$ matches the U.S.'s average debt-to-GDP ratio from 1942–2022. The functional form for $w(\pi_t)$ comes from Sims's (2013) work. I set $\theta = 1.22$ so that the planner chooses $\pi_0 = 1.0340$, the U.S.'s average inflation rate from 1943–2023, given the rest of the calibration.[16]

5.1 Fiscal Strength and Tax, Inflation Determination

The optimizing debt-manager perfectly smooths time $t > 0$ tax rates $\tau_t = \bar{\tau}$ according to its FOC (18).[17] An optimizing central bank perfectly smooths time $t > 0$ inflation $\pi_t = 1$ according to its FOC (20). The IC (12) relates surprise inflation π_0 and the path of taxes $\{\tau_0, \bar{\tau}\}$.

[15] Data sources are listed in Appendix E.

[16] One could also calibrate θ so that the planner chooses $\pi_0 = 1.020$, the Fed's explicit inflation target. The difference in calibrated θ does not materially affect the analysis.

[17] The debt-manger's FOC (18) and isoelastic household utility in c_t and n_t imply this result.

CNE	α	$\bar{\tau}$	π_0
All-powerful central bank	0	0.2024	1
Ramsey plan	0.0022	0.2015	1.0340
All-powerful debt-manager	1	0.1665	∞

Table 1: Fiscal strengths, stationary tax rates and time 0 inflation rates across corner and first-best CNE

Figure 2 shows the relationship between the stationary tax rate $\bar{\tau}$ and time 0 inflation π_0, visualizing the economy's Pareto frontier along which institutions determine economic outcomes as discussed in Section 4.2.3. Government policy to the left of the frontier violates the household budget constraint, while policy to the right is inconsistent with household, debt-manager and/or central bank optimization.

The government can jointly set taxes lower than 20.2% should it inflate away inherited debt. Hyperinflation of such debt allows for a 3.5% tax reduction to 16.7%. Setting fiscal strength $\alpha \in [0, 1)$ determines where on Figure 2's frontier the economy falls.

Figure 3 displays the relationship between tax and inflation rates along a portion of the fiscal-monetary regime continuum, marking the amount of fiscal strength required to implement the Ramsey plan.

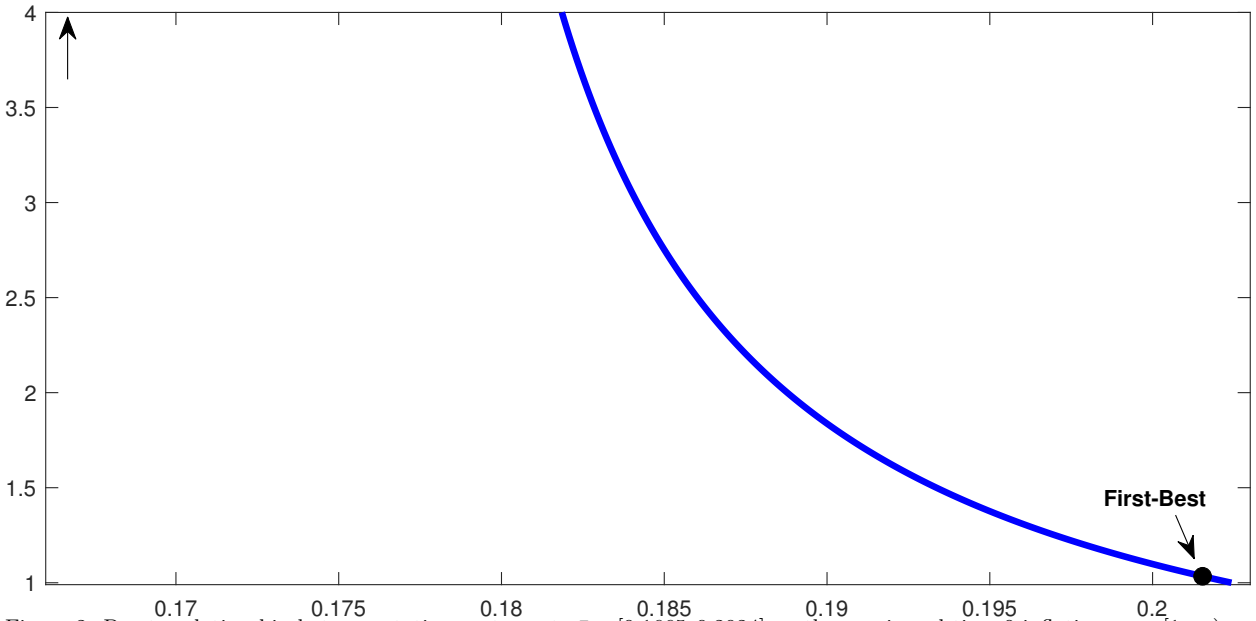


Figure 2: Pareto relationship between stationary tax rate $\bar{\tau} \in [0.1665, 0.2024]$ on the x-axis and time 0 inflation $\pi_0 \in [1, \infty)$ on the y-axis. All feasible equilibria lie along the frontier: points to the left violate the household budget constraint (6) and points to the right violate household, government optimization (9), (17)–(20).

I compare the CNE consistent with first-best to fiscal dominant and monetary dominant CNE in Table 1.

The economy matches the Ramsey Planner's solution only under an extremely powerful central bank, one with more than 99% of the government's relative bargaining power. This

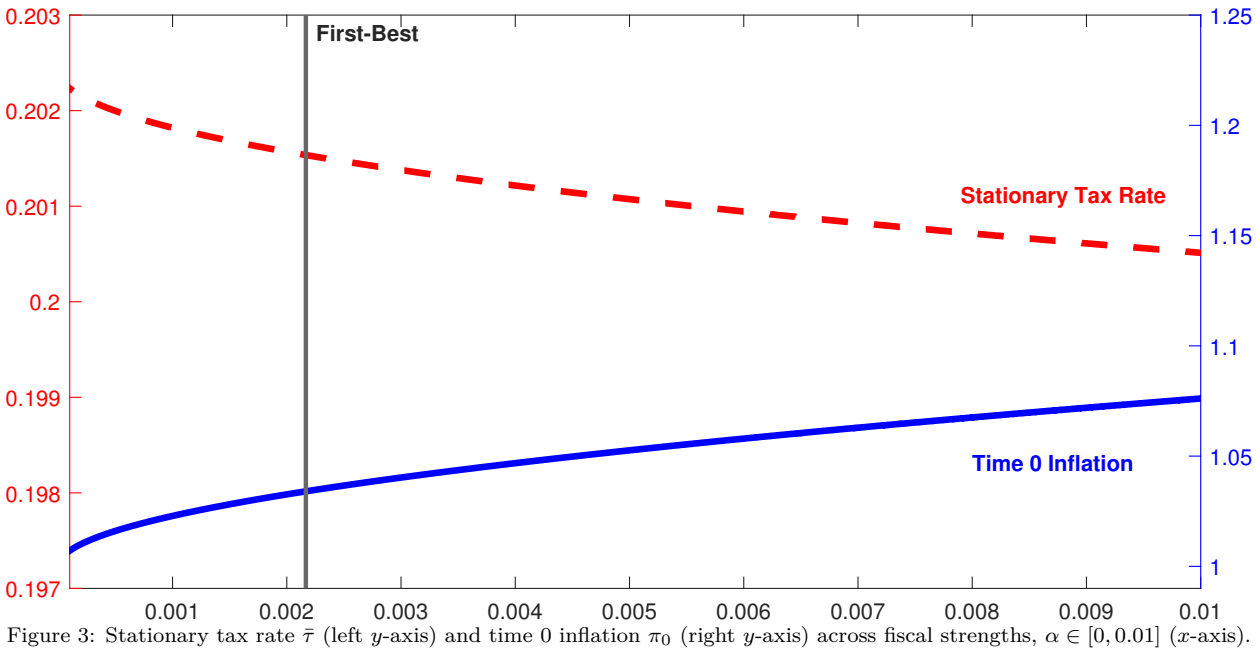


Figure 3: Stationary tax rate $\bar{\tau}$ (left y-axis) and time 0 inflation π_0 (right y-axis) across fiscal strengths, $\alpha \in [0, 0.01]$ (x-axis).

result arises because, while the debt-manager feasibly sets taxes somewhere between 16.65%-20.24%, a relatively narrow range, feasible central bank outcomes span from 1 gross inflation to hyperinflation. This large fiscal-monetary asymmetry in payout possibilities, paired with the fact that welfare is maximized when $\pi_0 = 1.0340$, results in a government that requires a strong central bank to match the planner's solution.

Figure 4 displays welfare outcomes across the same fiscal strength range. Consumption-equivalent welfare loss moving left from the Ramsey plan $\alpha = \alpha^*$ to an all-powerful central bank $\alpha = 0$ is about half of that moving right from the Ramsey plan $\alpha = \alpha^*$ to a government where fiscal policy has just one percent of relative bargaining power $\alpha = 0.01$. Welfare maximization is approximated by an all-powerful central bank – a theoretical result joining a well-established chorus of support for strong, independent monetary policy.

An omnipotent central bank comes closer to maximizing welfare with higher welfare costs from inflation $\theta \to \infty$ and with lower levels of inherited debt $b_{-1}^{(s)} \to 0$, relative to baseline. When households greatly dislike inflation, a more powerful inflation-minimizing central bank is required to match the Ramsey plan. When the government is saddled with high levels of maturing debt, though, a less powerful central bank is required to match the Ramsey plan, as surprise inflation devalues more debt while imposing identical welfare losses. Appendix C explores these relationships in more detail.

5.2 A Time Series of American Fiscal Strength

I use this paper's framework to rationalize post-war American inflation outcomes. Figure 5 displays imputed U.S. government fiscal strength relative to the Fed from 1943–2023.

The series exhibits three periods of elevated fiscal strength: from 1947–1951, throughout the 1970s, and from 2021–2023.

The U.S. Treasury explicitly pressured the Fed from WWII until the 1951 Treasury-Fed Accord. Prior to the Accord, the Fed had an obligation to repress interest rates to support new debt issuance, which constrained its ability to independently manage monetary policy to fight inflation. Pre-1951, monetary policy was thus torn between fighting inflation and propping up bond prices. This, coupled with Congress's repeated reluctance to raise post-war surpluses until the second half of 1948, resulted in increased levels of fiscal strength until the 1949 recession.[18] Fiscal strength again spiked upward in 1951 but immediately fell and remained low until the late-1960s.

In 1964, President Lyndon B. Johnson pushed Fed Chair William McChesney Martin against a wall and exclaimed, "Martin, my boys are dying in Vietnam and you won't print the money I need." In 1971, Fed Chair Arthur Burns wrote, "I am convinced that the President [Nixon] will do anything to be reelected." Indeed, Figure 5 shows fiscal strength beginning to rise during the U.S.'s mid-1960s deployments to Vietnam. American inflation followed suit, continuing to rise and peaking at above 13% in 1979 before falling to less than 4% in 1982, midway through Paul Volcker's (1979-1987) term: a Fed Chair who stood up to Congress in

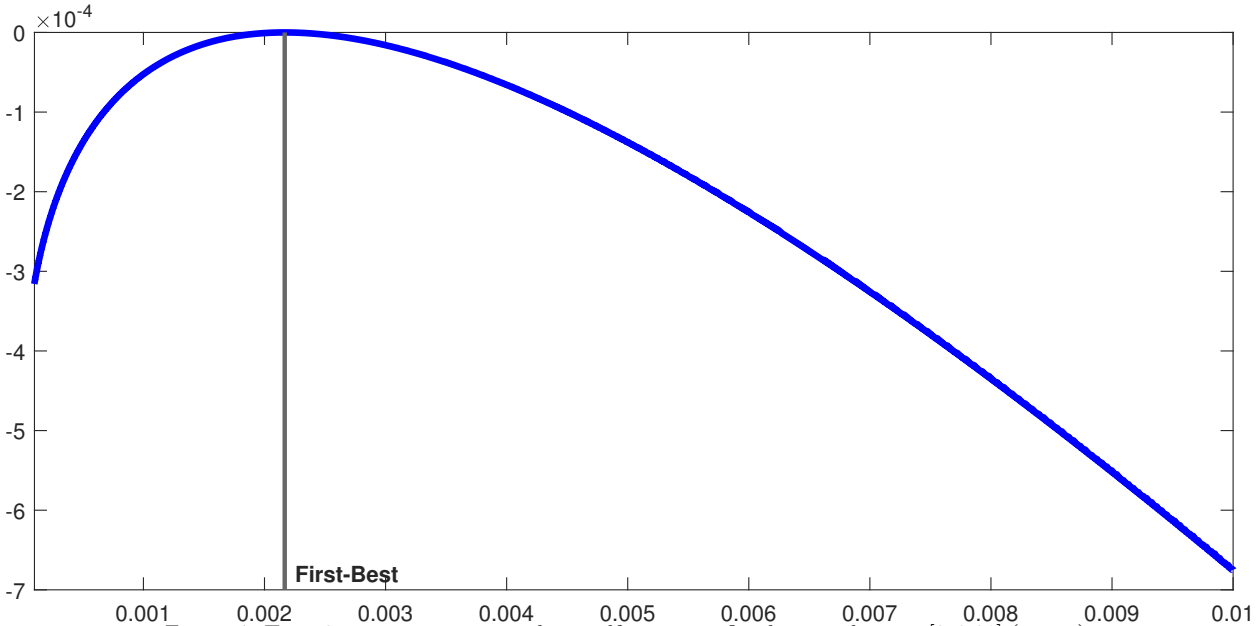


Figure 4: Time 0 consumption-equivalent welfare across fiscal strengths, $\alpha \in [0, 0.01]$ (x-axis).

[18] Caplan (1956) documents federal policy shifts leading up to the 1949 recession.

1980, declaring, "Monetary policy cannot – without peril – be relied on alone to halt inflation. The other major tools of public policy must also be brought to bear on the problem, with fiscal policy playing a central role."

America endured a global health crisis from 2020-2022, committing to six trillion dollars in additional spending and transfer programs over that time.[19] Despite the U.S.'s large fiscal response and resulting ballooning debt position, there was little discussion from policymakers about how COVID policies would ultimately be financed. Eventually, in 2022, White House Press Secretary Jen Psaki said "It's important to note that we believe [federal transfers] should be provided on an emergency basis, not something where it would require offsets." Congress heavily borrowed and chose to keep taxes low despite potential inflationary consequences, which were then realized from 2022–2023. These events perfectly illustrate growing fiscal strength and its economic impacts.

5.2.1 Comparing to President-Fed Meeting Data

Drechsel (2024) extracts presidential meeting data from archival records and measures inflationary effects of presidential pressure on the Fed. One of the paper's major contributions is a novel dataset including the number of meetings between American presidents and Fed officials from 1933-2016 and the hours presidents spent with Fed officials from 1933-2008. Another is the definition and measurement of 'political pressure shocks.'

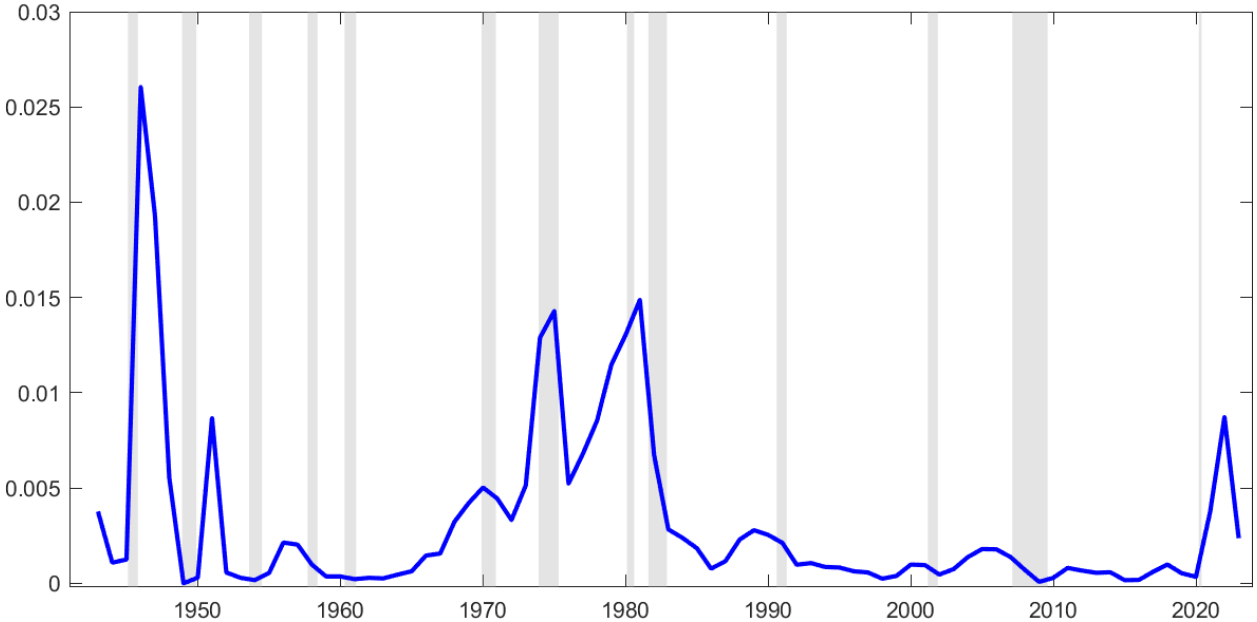


Figure 5: U.S. fiscal strength from 1943-2023. I re-solve the model every year, given that year's observed inherited debt and spending $\{b_{-1,t}, g_{0,t}\}_{t=1943}^{2023}$, and selecting fiscal strength $\{\alpha_t\}_{t=1943}^{2023}$ (y-axis) which sets time 0 inflation π_0 equal to observed inflation $\pi_{0,t}$ every year. Debt and spending data are measured as percentages of GDP.

[19] Anderson and Leeper (2023) break down the U.S.'s fiscal response to COVID.

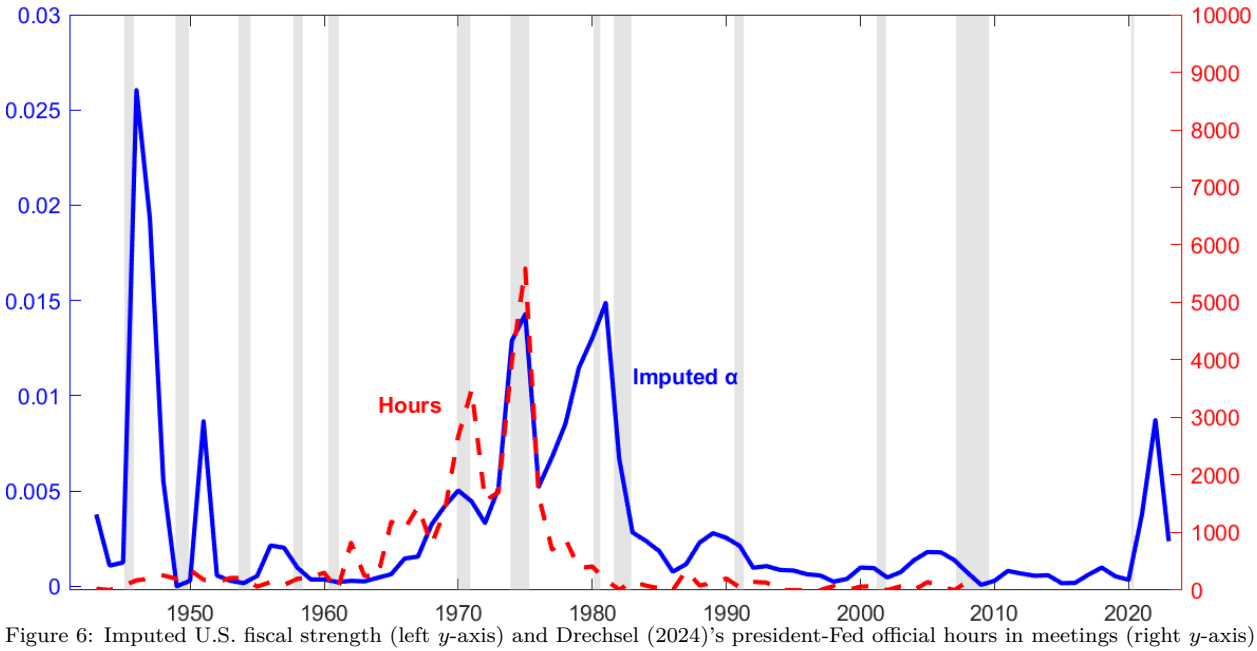


Figure 6: Imputed U.S. fiscal strength (left y-axis) and Drechsel (2024)'s president-Fed official hours in meetings (right y-axis) from 1943-2023.

I see fiscal strength as the theoretical counterpart to Drechsel (2024)'s political pressure, so I plot imputed fiscal strength against the number of hours the president met with Fed officials per year in Figure 6.

Prior to the Treasury-Fed Accord of 1951, the Fed lacked meaningful monetary policy independence despite limited direct presidential engagement, operating primarily in support of Treasury issuance. The 1951 Accord formally established the Fed's policy autonomy, and post-Accord fiscal strength declined as president-Fed hours remained low. Fiscal strength began to pick up in the mid-1960s when meeting hours began to increase, marking a new era of political influence on monetary policy through direct presidential pressure.[20]

From 1960–1970, the steady increase in imputed fiscal strength matches that in president-Fed meeting hours. Imputed fiscal strength and president-Fed hours each spike upwards twice between 1971–1981, with hours declining in the late-1970s before fiscal strength in the early-1980s. The two remain low from the mid-1980s until the end of hours data in 2008.

A major advantage of imputing fiscal strength through a model like the one described above is the availability of data. Records of presidential meeting duration ended in 2008 during W. Bush's final term. Those of presidential meetings ceased altogether in 2016 during Obama's final term. Fortunately, interpreting fiscal strength as political pressure allows one to implicitly derive political pressure for any year when aggregate economic data are available.

I follow Drechsel (2024) by classifying presidents and Fed chairs according to the average

[20]Drechsel (2024) explores strains on early-1970s fiscal and monetary relationships in more detail.

annual imputed fiscal strength during their terms from 1943–2023. I compare this to the average annual number of hours the president spent meeting with Fed officials over the same date range. Table 2 lists presidents in the left panel and Fed chairs in the right panel.

President	Fiscal Strength	Hours
Carter (D)	1.19	455.43
Ford (R)	0.75	1897.4
Nixon (R)	0.71	3021.1
Truman (D)	0.69	213.83
Biden (D)	0.55	
Roosevelt (D)	0.44	47
Reagan (D)	0.26	102.03
Johnson (D)	0.22	1169.3
Bush HW (R)	0.17	127.35
Trump (R)	0.16	
Bush W (R)	0.10	
Eisenhower (R)	0.08	158.77
Clinton (D)	0.07	24.742
Obama (D)	0.05	
Kennedy (D)	0.03	443.51

Fed Chair	Fiscal Strength	Hours
Miller	1.22	395.56
Eccles	0.92	122.84
Burns	0.77	2368.5
Volcker	0.46	124.76
Powell	0.32	
McCabe	0.28	232.44
Martin	0.13	632.95
Greenspan	0.12	61.731
Bernanke	0.06	
Yellen	0.05	

Table 2: President and Fed chair average annual imputed fiscal strength (in hundredths) and average annual president-Fed official meeting hours from 1943–2023. Hours data are from Drechsel (2024). Blank entries represent periods for which data are unavailable.

Jimmy Carter's (1977–1981) average annual imputed fiscal strength is substantially higher than any other eligible president at 1.19 despite spending relatively few hours with Fed officials. Carter's presidency succeeded Gerald Ford's (1974–1977) and Richard Nixon's (1969–1974) terms – the presidents with the next highest fiscal strengths and who spent the most hours meeting with the Fed. G. William Miller (1978–1979) tops eligible Fed chairs with 1.22 average annual fiscal strength, and, while his tenure at the Fed was brief, monetary policy had a reputation for being loose under his watch. Marriner S. Eccles (1934–1948) and Arthur Burns (1970–1978) are next on the list.

The two presidential terms featuring the least amount of fiscal strength are those of Barack Obama (2009–2017) and John F. Kennedy (1961–1963). Inflation remained historically low during Obama's presidency after he announced "...I'm pledging to cut the deficit we inherited in half by the end of my first term in office" in 2009 during the Great Recession. Ben Bernanke's (2006–2014) and Janet Yellen's (2014–2018) terms feature the lowest amount of fiscal strength among in-sample Fed chairs, as their time heading the Fed featured low inflation in spite of high government debt.

Figure 7 plots the relationship between imputed fiscal strength and hours data from Table

2. The relationship between the two among presidential and Fed chair terms are positive, with R^2s of 0.15 and 0.04, respectively.

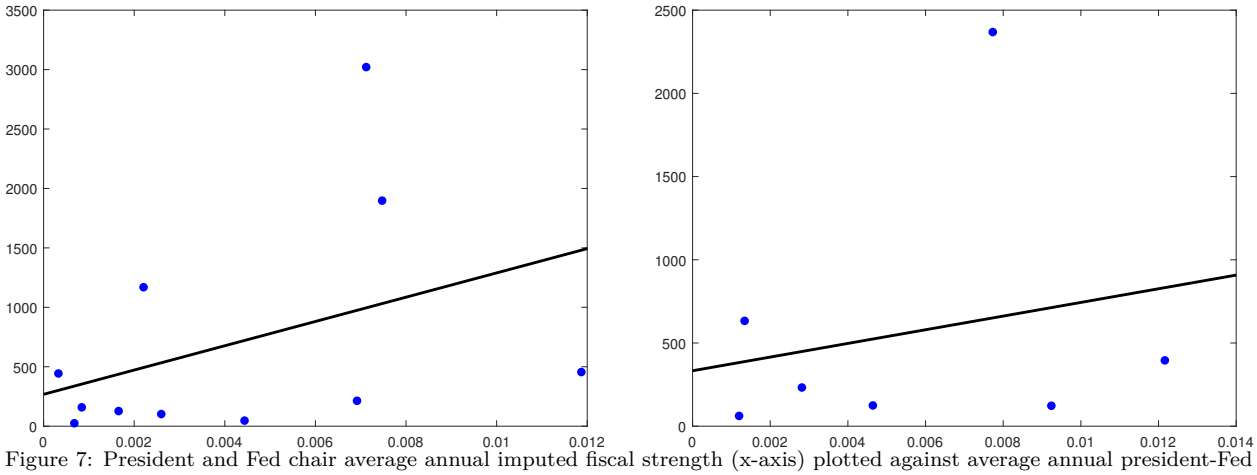


Figure 7: President and Fed chair average annual imputed fiscal strength (x-axis) plotted against average annual president-Fed official meeting hours (y-axis) from 1943–2023. Presidents plotted in the left panel and Fed chairs plotted in the right panel. Each term in office is one entry. Hours data are from Drechsel (2024).

5.2.2 Comparing to First-Best

This section's final exercise is a normative one. For each year from 1943–2023, how does imputed fiscal strength compare to that which would maximize welfare? Figure 8 plots imputed fiscal strength against first-best fiscal strength.

Wartime and post-war imputed strength, albeit with high variability, decline with first-best strength. Imputed strength in the 1970s is an order of magnitude larger than that which matches the Ramsey plan. Starting with the Great Recession in 2008 and moving forward until 2023, first-best fiscal strength is *larger* than imputed fiscal strength.

The discrepancies in Figure 8 largely relate to the link between inherited debt and welfare maximizing inflation. Surprise inflation is more powerful at financing high-debt governments than low-debt ones, but 1% of inflation reduces household welfare identically across the two. First-best fiscal strength rises in years where the U.S. inherits large levels of debt. Figure 9 visualizes this relationship.

The 1970s featured less than 27% outstanding debt/GDP, yet U.S. annual inflation topped out at around 10% over the period – high inflation financed a large portion of a small debt stock. From 2008–2018, inflation peaked at around 2% while government debt spiked in 2008 and gradually increased through 2018, where it reached around 86% of GDP – low inflation did little to finance a large debt stock. According to the model, if the rise in COVID fiscal strength (and resulting inflation) was surprising, such a surprise *improved* welfare relative to an alternative at the Fed's 2% target because it relieved the economy from solely tax-financing such a large increase in debt.

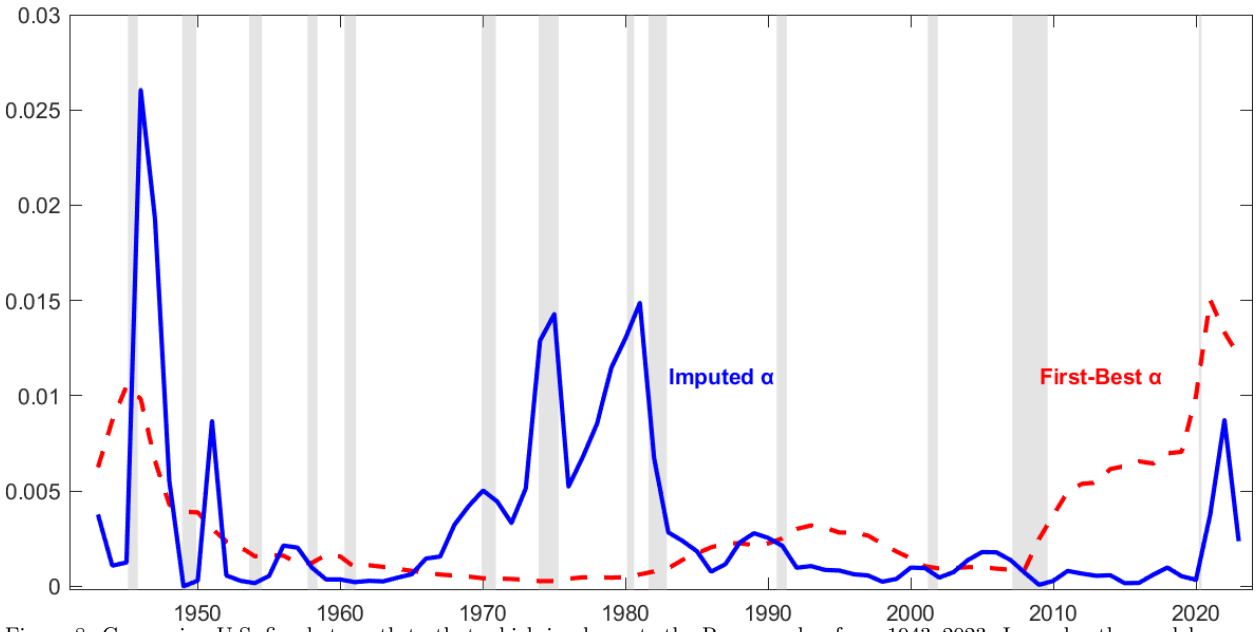


Figure 8: Comparing U.S. fiscal strength to that which implements the Ramsey plan from 1943–2023. I re-solve the model every year, given that year's observed inherited debt and spending $\{b_{-1,t}, g_{0,t}\}_{t=1943}^{2023}$, and select fiscal strengths $\{\alpha_t\}_{t=1943}^{2023}$ (y-axis) which result in allocations matching the model's Ramsey plan. Debt and spending data are measured as percentages of GDP.

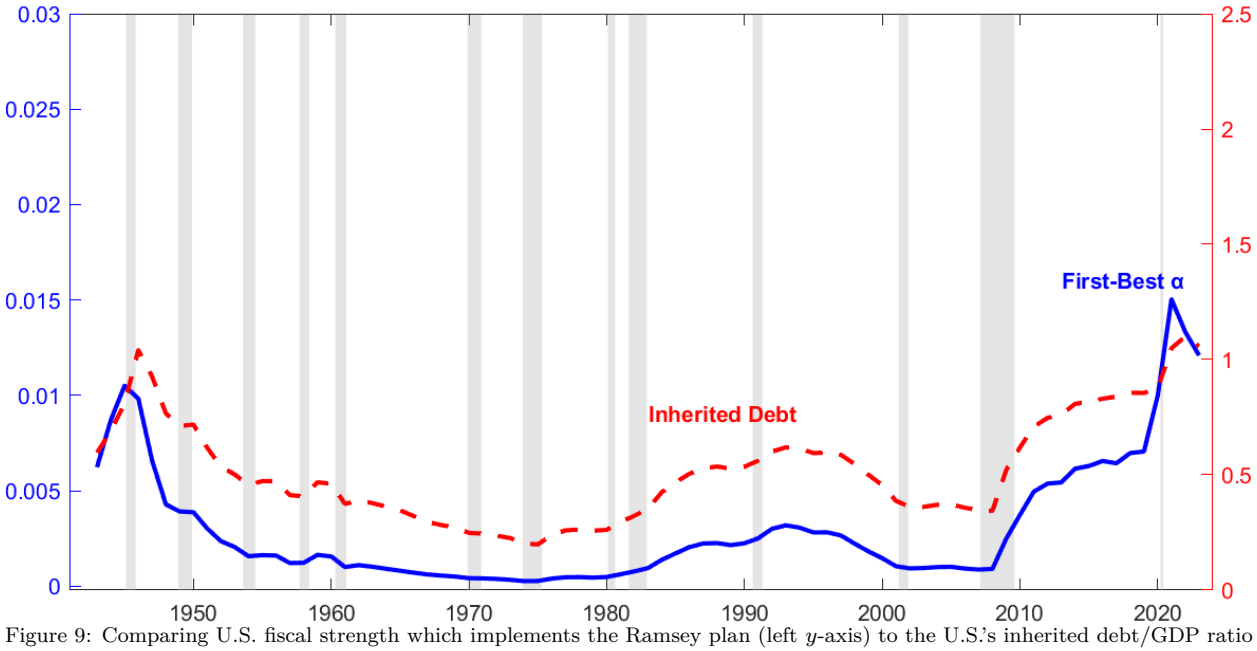


Figure 9: Comparing U.S. fiscal strength which implements the Ramsey plan (left y-axis) to the U.S.'s inherited debt/GDP ratio (right y-axis) from 1943–2023.

6 Conclusion

This paper develops a framework for understanding fiscal and monetary policy interactions through the lens of relative institutional strength. By modeling the strategic interaction between an inflation-targeting central bank and a tax-minimizing debt-manager as a non-cooperative game with asymmetric Nash bargaining, the model connects tax/inflation trade-

offs in government financing to intra-governmental relations.

The paper makes three main contributions to the literature. First, it develops a theory by which intra-governmental bargaining power both determines a unique equilibrium under individually optimizing fiscal and monetary policy and provides a measure of fiscal strength relative to monetary policy. Second, it provides theoretical underpinnings for the president-Fed meeting data in Drechsel (2024) and offers a way to extend them to the present. Third, it documents the history of fiscal and monetary interactions in post-war America and compares those interactions to a first-best measure of fiscal strength.

As the U.S. government continues to accumulate debt at an impressive rate, it is useful to consider how America's tax rates need to adjust in order to finance itself without the need for inflation. If those distortions are too much to stomach, it may be worthwhile to consider the surprise inflation tax as a source of financing. Especially because such a tax provides more revenue as debt – the inflation tax's tax base – rises. Such discussions may be able to guide Fed and Treasury leadership to arrive at amicable agreements in policy despite their obvious differences in objectives.

As policymakers debate potential reforms to the U.S.'s fiscal-monetary architecture, including proposals to alter the Fed's mandate, increase presidential influence or otherwise erode the Fed's independence, it is important to emphasize that *institutional cooperation is not necessarily a good thing.* A fiscal authority and a non-independent central bank work cooperatively in a fiscal dominance regime. A central bank that uses interest rates and remittance/recapitalization policy to unilaterally adjust taxes and keep inflation at zero is cooperative with the fiscal authority in a monetary dominance regime. Both miss welfare gains from using available tools to finance the consolidated government. Non-cooperative policy can work just as well, if not better, than cooperative policy. Especially when factoring in real-world financial frictions, incomplete markets, political motives and asymmetric information, dividing government objectives among operationally independent institutions creates and enforces checks and balances needed to maintain credible policy, high employment, stable prices and financial stability.

Future research can extend this work in many directions. First may be to incorporate a bargaining equation with time-varying fiscal strength in a model that includes a full suite of economic shocks, estimating the effect movements in fiscal strength have on model variables. It would be interesting to see what a fiscal strength IRF looks like in such a model. A second direction would be to include fiscal strength as an endogenous variable, asking what economic and societal factors play into its movements.

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A Appendix: Trump's Recent Quotes Towards Powell and the Fed

This appendix contains a list of quotes levied by President Donald Trump towards the Fed and its chair, Jerome Powell, since May 1st, 2025.

Date	Quotes	Link
5/2	Gasoline just broke $1.98 a Gallon, lowest in years, groceries (and eggs!) down, energy down, mortgage rates down, employment strong, and much more good news, as Billions of Dollars pour in from Tariffs. Just like I said, and we're only in a TRANSITION STAGE, just getting started!!! Consumers have been waiting for years to see pricing come down. NO INFLATION, THE FED SHOULD LOWER ITS RATE!!! DJT	https://truthsocial.com/@realDonaldTrump/114438304481024140
5/4	Well, he should lower [rates]. And at some point, he will. He'd rather not because he's not a fan of mine. You know, he just doesn't like me because I think he's a total stiff... No, no, no [I would not remove him before his term ends]. That was a total – why would I do that? I get to replace the person in another short period of time.	https://www.reuters.com/world/us/trump-says-wont-remove-fed-chair-powell-before-term-ends-2026-tv-interview-2025-05-04/
5/8	"Too Late" Jerome Powell is a FOOL, who doesn't have a clue. Other than that, I like him very much! Oil and Energy way down, almost all costs (groceries and "eggs") down, virtually NO INFLATION, Tariff Money Pouring Into the U.S. — THE EXACT OPPOSITE OF "TOO LATE!" ENJOY!	https://truthsocial.com/@realDonaldTrump/114471750357100883

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Date	Quotes	Link
5/13	No Inflation, and Prices of Gasoline, Energy, Groceries, and practically everything else, are DOWN!!! THE FED must lower the RATE, like Europe and China have done. What is wrong with Too Late Powell? Not fair to America, which is ready to blossom? Just let it all happen, it will be a beautiful thing!	https://truthsocial.com/@realDonaldTrump/114501759958997511
6/4	ADP NUMBER OUT!!! "Too Late" Powell must now LOWER THE RATE. He is unbelievable!!! Europe has lowered NINE TIMES!	https://truthsocial.com/@realDonaldTrump/114625064616541014
6/6	If "Too Late" at the Fed would CUT, we would greatly reduce interest rates, long and short, on debt that is coming due. Biden went mostly short term. There is virtually no inflation (anymore), but if it should come back, RAISE "RATE" TO COUNTER. Very Simple!!! He is costing our Country a fortune. Borrowing costs should be MUCH LOWER!!!	https://truthsocial.com/@realDonaldTrump/114636734825372318
6/6	"Too Late" at the Fed is a disaster! Europe has had 10 rate cuts, we have had none. Despite him, our Country is doing great. Go for a full point, Rocket Fuel!	https://truthsocial.com/@realDonaldTrump/114636703372425608
6/11	CPI JUST OUT. GREAT NUMBERS! FED SHOULD LOWER ONE FULL POINT. WOULD PAY MUCH LESS INTEREST ON DEBT COMING DUE. SO IMPORTANT!!!	https://truthsocial.com/@realDonaldTrump/114665067086649498
6/12	We're going to spend $600 billion a year, $600 billion because of one numbskull that sits here... I don't see enough reason to cut the rates now... [Inflation is] down and I may have to force something.	https://www.cnbc.com/2025/06/12/trump-powell-numbskull-fed-rates.html

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Date	Quotes	Link
6/18	We have a stupid person, frankly, at the Fed. He probably won't cut today... Maybe I should go to the Fed. Am I allowed to appoint myself at the Fed?	https://www.c-span.org/clip/white-house-event/president-trump-calls-fed-chair-powell-stupid/5165846
6/19	"Too Late" Jerome Powell is costing our Country Hundreds of Billions of Dollars. He is truly one of the dumbest, and most destructive, people in Government, and the Fed Board is complicit. Europe has had 10 cuts, we have had none. We should be 2.5 Points lower, and save $BILLIONS on all of Biden's Short Term Debt. We have LOW inflation! TOO LATE's an American Disgrace!	https://truthsocial.com/@realDonaldTrump/114710405985383754

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Date	Quotes	Link
6/20	"Too Late" Powell complains about costs, much of which were produced by the Biden Fake "Government," but he could do the biggest and best job for our Country by helping to lower Interest Rates and, if he reduced them to the number they should be, 1% to 2%, that "numbskull" would be saving the United States of America up to $1 Trillion Dollars per year. I fully understand that my strong criticism of him makes it more difficult for him to do what he should be doing, lowering Rates, but I've tried it all different ways. I've been nice, I've been neutral, and I've been nasty, and nice and neutral didn't work! He's a dumb guy, and an obvious Trump Hater, who should have never been there, I listened to someone that I shouldn't have listened to, and Biden shouldn't have reappointed him. We have virtually No Inflation, our Economy is doing really well, and will soon be doing, with the tremendous Tariff Income coming in, and Factories being built all over the Country, better than it has ever done before. If he was concerned about Inflation or anything else, then all he has to do is bring the Rate down, so we can benefit on Interest Costs, and raise it in the future when and if these "other elements" happen (which I doubt they will!). Don't say that you think there will be Inflation sometime in the future, because there isn't now but, if there is, raise the Rates! We should be at the TOP of the attached List, not the bottom. I don't know why the Board doesn't override this Total and Complete Moron! Maybe, just maybe, I'll have to change my mind about firing him? But regardless, his Term ends shortly!	https://truthsocial.com/@realDonaldTrump/114717929371967424

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Date	Quotes	Link
6/24	"Too Late" Jerome Powell, of the Fed, will be in Congress today in order to explain, among other things, why he is refusing to lower the Rate. Europe has had 10 cuts, we have had ZERO. No inflation, great economy – We should be at least two to three points lower. Would save the USA 800 Billion Dollars Per Year, plus. What a difference this would make. If things later change to the negative, increase the Rate. I hope Congress really works this very dumb, hardheaded person, over. We will be paying for his incompetence for many years to come. THE BOARD SHOULD ACTIVATE. MAKE AMERICA GREAT AGAIN!	https://truthsocial.com/@realDonaldTrump/114736702510423652
6/25	I think [Powell] is terrible. Yeah, I know within three or four [Fed candidates] who [I am] going to pick. I mean, he goes out pretty soon, fortunately, because I think he's terrible. We have no inflation. We have a tremendous economy. Hundreds of billions of dollars of tariff money is pouring in. Factories are being built because they don't want to pay the tariffs, so they're building them all over the country.	https://rollcall.com/factbase/trump/transcript/donald-trump-press-conference-nato-summit-the-hague-netherlands-june-25-2025/
6/27	You have a guy in there that, with the stroke of a pen, could save us hundreds of billions of dollars a year...but he won't because he's a stupid person... We have a guy that's just a stubborn mule and a stupid person that is making a big mistake... If inflation goes up in a year or two, then we'll raise rates again... We'll get rid of the inflation.	https://www.msn.com/en-us/news/politics/trump-warns-stupid-fed-chair-is-a-stubborn-mule-making-a-big-mistake/ar-AA1HyUZN

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Date	Quotes	Link
6/27	If I think somebody's going to keep the rates where they are or whatever, I'm not going to put them in... I'm going to put somebody that wants to cut rates. There are a lot of them out there.	https://www.reuters.com/world/us/trump-says-he-wont-appoint-anyone-fed-who-doesnt-back-rate-cuts-2025-06-27/
6/27	He's an average mentally person... low IQ for what he does... I think he's a very stupid person, actually.	https://www.indy100.com/politics/trump/donald-trump-very-average-mentally-person-jerome-powell-2672444766
6/30	Jerome "Too Late" Powell, and his entire Board, should be ashamed of themselves for allowing this to happen to the United States. They have one of the easiest, yet most prestigious, jobs in America, and they have FAILED — And continue to do so. If they were doing their job properly, our Country would be saving Trillions of Dollars in Interest Cost. The Board just sits there and watches, so they are equally to blame. We should be paying 1% Interest, or better!	https://truthsocial.com/@realDonaldTrump/114773418889111055
6/30	You have cost the U.S.A. a fortune – and continue to do so... You should lower the rate by a lot!	https://www.axios.com/2025/06/30/trump-fed-powell-interest-rates

Continued on next page

Date	Quotes	Link
7/1	We have a moron at the head of the Fed. He's a moron... The Board just sits there and watches, so they are equally to blame. We should be paying 1% Interest, or better.	https://www.nbcnews.com/business/economy/trumps-tariffs-kept-fed-cutting-rates-jerome-powell-says-rcna216220
7/2	"Too Late" should resign immediately!!!	https://truthsocial.com/@realDonaldTrump/114785927683921380
7/9	Our Fed Rate is AT LEAST 3 Points too high. "Too Late" is costing the U.S. 360 Billion Dollars a Point, PER YEAR, in refinancing costs. No Inflation, COMPANIES POURING INTO AMERICA. "The hottest Country in the World!" LOWER THE RATE!!!	https://truthsocial.com/@realDonaldTrump/posts/114823635614745836
7/9	ANYBODY BUT "TOO LATE."	https://truthsocial.com/@realDonaldTrump/114823519364945627

Continued on next page

Date	Quotes	Link
7/9	A new Study by the Council of Economic Advisers (CEA), led by Highly Respected Chair, Dr. Stephen Miran, has found that Tariffs have had ZERO IMPACT on Inflation. In fact, the Study shows that Import Prices are actually DROPPING, just like I always said they would. The Fake News and the so-called "Experts" were wrong again. Tariffs are making our Country "BOOM." Many new Factories, Jobs, and TRILLIONS OF DOLLARS in Investments are pouring into the U.S.A. Someone should show this new Study to "Too Late" Jerome Powell, who has been whining like a baby about non-existent Inflation for months, and refusing to do the right thing. CUT INTEREST RATES JEROME — NOW IS THE TIME!	https://truthsocial.com/@realDonaldTrump/114819184205071380
7/10	"Too Late" DEMEANS THE GREAT CREDIT OF THE USA. We are now, again, the Number One Credit in the World! "Gigantic Comeback." The Fed Rate should be reflective of this. We should be at the top of the list!!! LOWER THE RATE!!!	https://truthsocial.com/@realDonaldTrump/114829442018326447

B Appendix: Proofs

Proof for Proposition 1

Let $\left\{\left\{c_t\left(x_t\right), n_t\left(x_t\right), g_t, \pi_t\left(x_t\right)\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ represent a stochastic sequence. Substituting (1), (9), and the definitions $b_t^{(s)} = \frac{B_t^{(s)}}{P_t}$ and $\pi_t = \frac{P_t}{P_{t-1}} > 0$ into (6), while considering (7), forward-iterating, and applying (10), results in (12). If a stochastic sequence $\left\{\left\{c_t\left(x_t\right), n_t\left(x_t\right), g_t\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ is generated by a competitive equilibrium, then it necessarily satisfies (1) and (12).

Let government institutions jointly choose the associated level of debt $\left\{\left\{\left\{\boldsymbol{b}_t^{(s)}\left(x_t\right)\right\}_{s=1}^{S}\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$, let the debt-manager choose a tax sequence $\left\{\left\{\tau_t\left(x_t\right)\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ and the central bank choose a sequence of inflation rates $\left\{\left\{\pi_t\left(x_t\right)\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ such that (9) is satisfied. (12) and (1) imply (6) and (8) as well as (5) are satisfied, given definitions $\boldsymbol{b}_t^{(s)} = \frac{\boldsymbol{B}_t^{(s)}}{P_t}$ and $\pi_t = \frac{P_t}{P_{t-1}} > 0$. All optimality conditions, dynamic budget constraints, and market clearing criteria are satisfied, so the equilibrium is competitive.

Proof for Lemma 1

By definition, if $\pi_0 > 1$ is not required for a CNE, then the debt-manager can feasibly individually satisfy (1) and (12) under $\pi_t = 1\ \forall t$.

$0 < b_{t-1} < \hat{b}_{t-1} \implies \exists \varepsilon \in \mathbb{R}_{++}^S$ for which $b'_{t-1} = b_{t-1} + \varepsilon < \hat{b}_{t-1}$. Due to the properties of u, v and w and the definition of $\hat{b}_{t-1}$, $\exists \left\{\left\{\tau_t\left(x_t\right)\right\}_{g^t \in G^t}\right\}_{t=0}^{\infty}$ for which an economy inheriting b'_{t-1} requires $\pi_0 < 1$ for (1) and (12) to hold. Finally, by (19)–(20), $\pi_0 < 1 \implies \lambda_0^{cb} < 0$.

C Appendix: CNE Sensitivity

C.1 Inherited Debt

This section finds to what degree an increased inherited debt position affects the baseline model's CNE. I begin by calibrating the model's inherited debt position to match the average par value/GDP ratio of privately held U.S. debt during the post-COVID era from 2020 to 2022, so that $b_{-1}^{(s)'} = 1.07$, keeping the rest of the model calibration fixed. Figure 10 plots the two economies' Pareto frontiers.

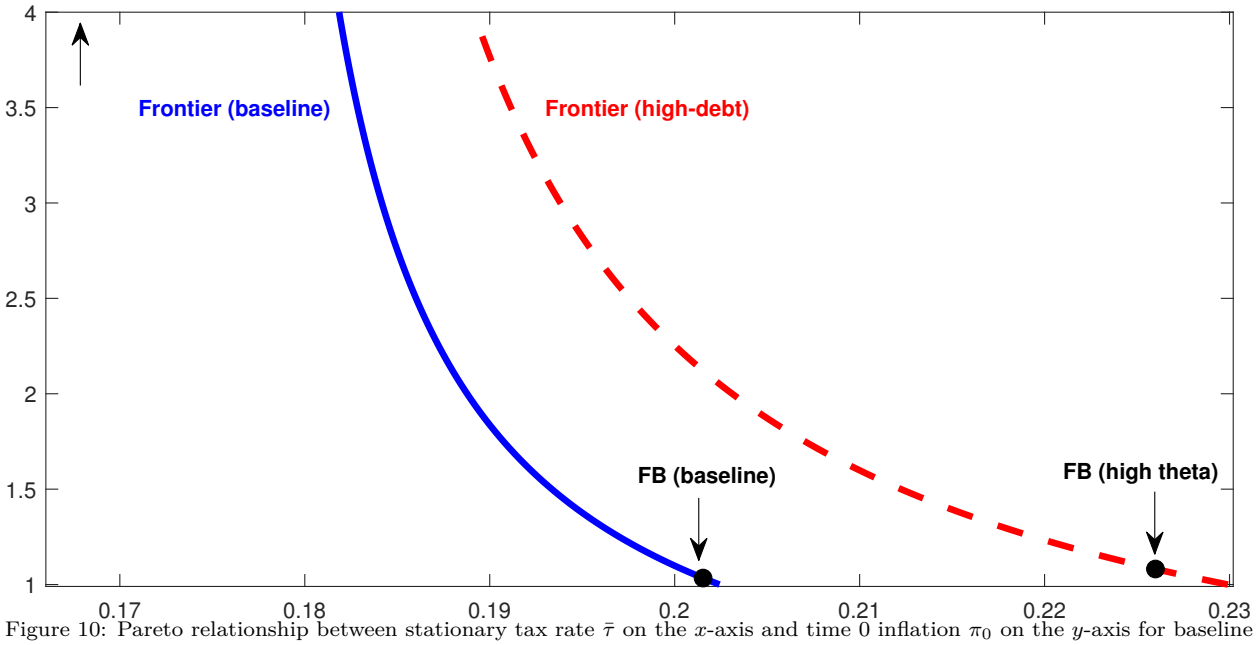


Figure 10: Pareto relationship between stationary tax rate $\bar{\tau}$ on the x-axis and time 0 inflation π_0 on the y-axis for baseline (blue solid line) and high-debt (red dotted line) economies. Feasible equilibria lie along the frontier: points to the left violate the household budget constraint (6) and points to the right violate household, government optimization (9), (17)–(20).

Increasing $b_{-1}^{(s)}$ tightens the government budget constraint, shifting its Pareto frontier to the right. The Ramsey plan in the high-debt economy thus includes higher taxes and greater inflation. Also apparent from the curvature of the two frontiers is that surprise inflation, as opposed to explicit taxation, does a better job of financing high-debt economies.

How does institutional non-cooperation factor into equilibrium determination? Figure 11 visualizes the two frontiers as functions of fiscal strength, and Table 4 displays tax and inflation at the economies' corners and Ramsey plans where $\alpha \in [0, .02]$.

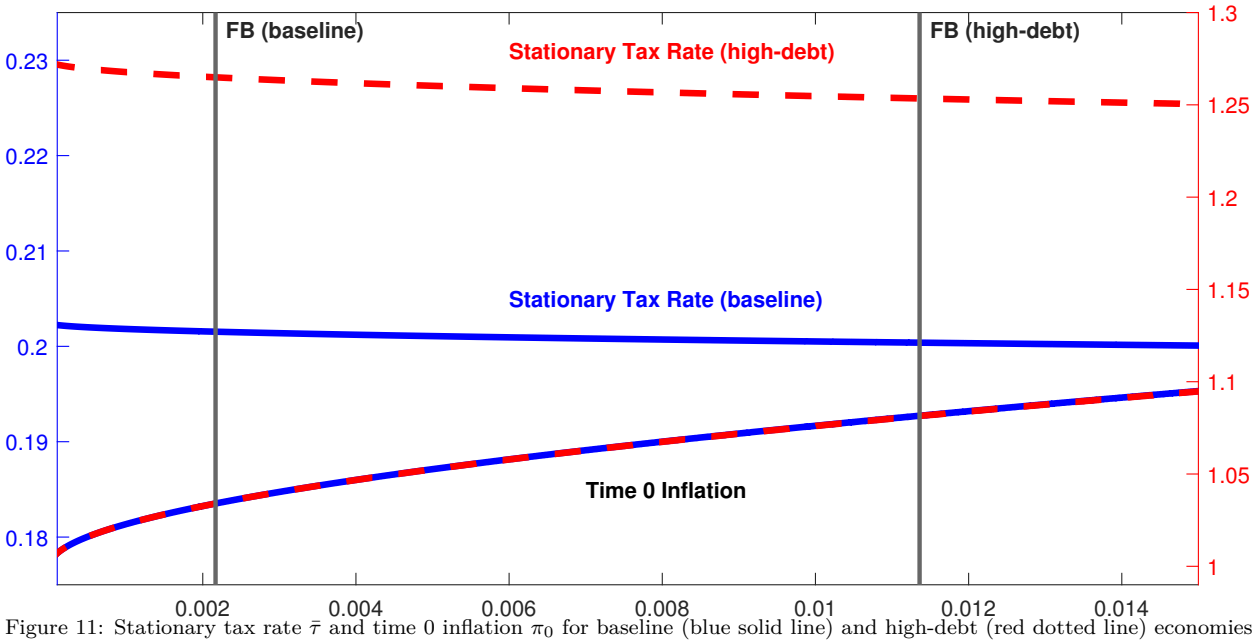


Figure 11: Stationary tax rate $\bar{\tau}$ and time 0 inflation π_0 for baseline (blue solid line) and high-debt (red dotted line) economies across fiscal strengths, $\alpha \in [0, 0.015]$.

CNE	α	$\bar{\tau}$	π_0
All-powerful central bank (baseline)	0	0.2024	1
Ramsey plan (baseline)	0.0022	0.2015	1.0340
All-powerful debt-manager (baseline)	1	0.1665	∞
All-powerful central bank (high-debt)	0	0.2299	1
Ramsey plan (high-debt)	0.0114	0.2260	1.0814
All-powerful debt-manager (high-debt)	1	0.1665	∞

Table 4: Fiscal strengths, stationary tax rates and time 0 inflation rates in corner and first-best CNE for baseline and high-debt economies.

Feasible stationary tax rates $\bar{\tau}$ are more than 2.5% higher between the baseline and high-debt economies, yet inflation is identical. This is because the figure is displaying policy close to $\alpha = 0$, where time 0 inflation π_0 equals 1 regardless of the government's outstanding debt position.

Households with more indebted governments prefer stronger fiscal policy. The intuition is an extension of that discussed above: surprise inflation is more effective at financing high-debt economies *and* imposes no more welfare costs than inflation in a low-debt economy.

Figure 12 compares the baseline and high-debt economies' relative time 0 consumption-equivalent welfares as functions of fiscal strength. Households in the high-debt economy not only prefer more fiscal strength, deviations from first-best are less impactful than those in the low-debt economy. This is largely due to the fact that, in absolute terms, welfare is higher in the low-debt economy along its Ramsey plan than the high-debt economy along its Ramsey

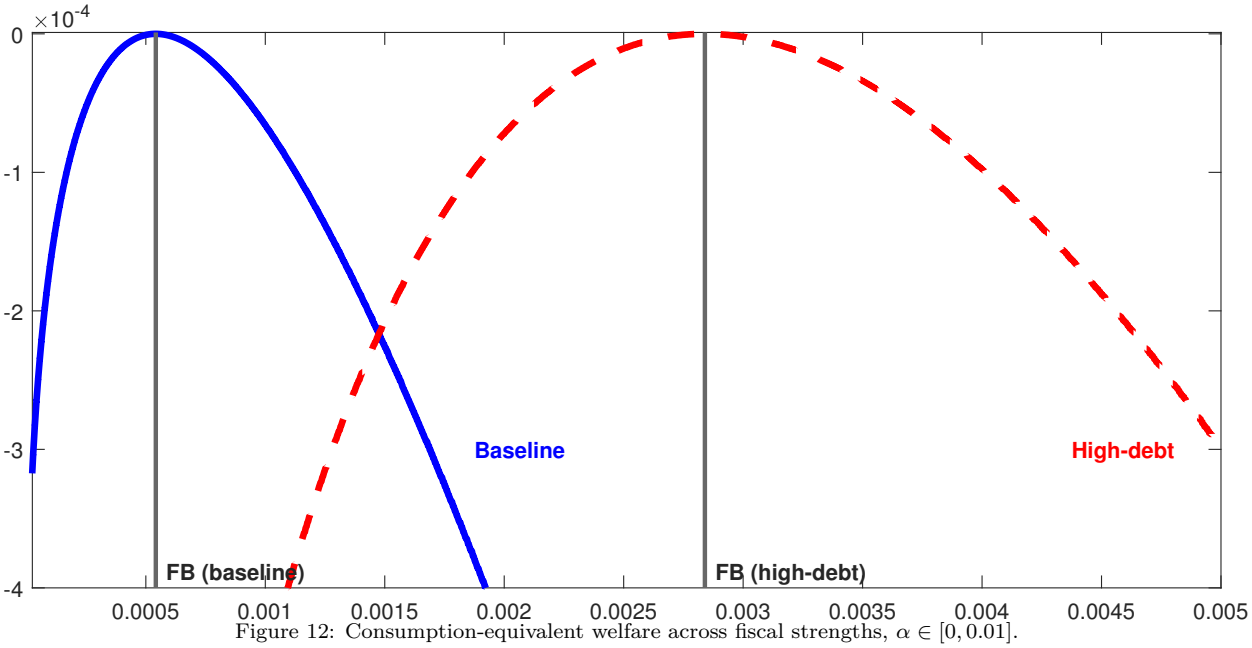


Figure 12: Consumption-equivalent welfare across fiscal strengths, $\alpha \in [0, 0.01]$.

plan, which is apparent from the frontiers in Figure 10.

The main takeaway from this section is that, while surprise inflation is costly, its benefits positively co-move with the government's outstanding debt stock.

C.2 Welfare's Sensitivity to Inflation

This section investigates how the baseline model's equilibrium changes after increasing θ, the parameter governing relative welfare costs to inflation. I compare the baseline model to one where θ is twice as large $\theta' = 2.344$ so that households are more sensitive to inflation. Figure 13 plots the relationship of the two economies' Pareto frontiers.

Adjusting θ does nothing to adjust either the ARC (1) or IC (12). The continuum of feasible equilibria (and supporting policy choices) is thus unchanged. Unsurprisingly, the welfare-maximizing policy mix adjusts to include more tax financing and less financing from surprise inflation. While using inflation is no more and no less advantageous for government financing in the high-θ economy, inflation is more welfare-reducing and thus used less by the Ramsey planner. Figure 14 visualizes the same frontier plotted as a function of fiscal strength.

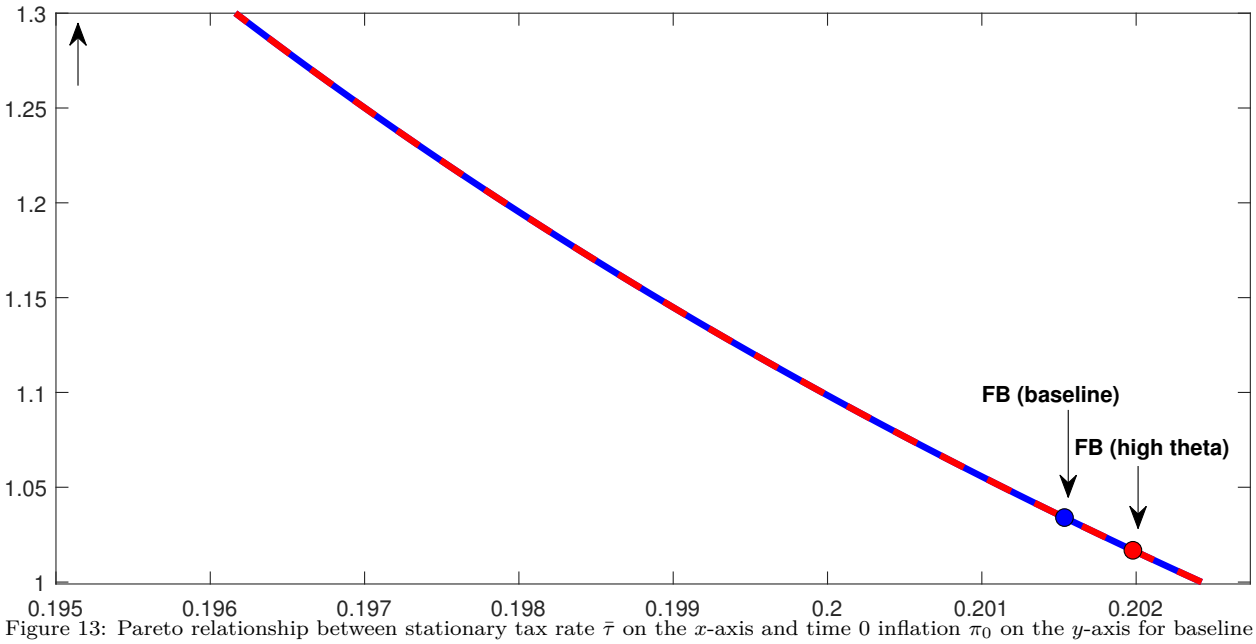


Figure 13: Pareto relationship between stationary tax rate $\bar{\tau}$ on the x-axis and time 0 inflation π_0 on the y-axis for baseline (blue solid line) and high-θ (red dotted line) economies. Feasible equilibria lie along the frontier: points to the left violate the household budget constraint (6) and points to the right violate household, government optimization (9), (17)–(20).

CNE	α	$\bar{\tau}$	π_0
All-powerful central bank	0	0.2024	1
Ramsey plan (high-θ)	0.0005	0.2020	1.0168
Ramsey plan (baseline)	0.0022	0.2015	1.0340
All-powerful debt-manager	1	0.1665	∞

Table 5: Fiscal strengths, stationary tax rates and time 0 inflation rates in corner and first-best CNE for baseline and high-θ economies.

The feasible set of tax/inflation combinations that satisfy the joint government's relevant constraints overlap everywhere, as in Figure 14. Welfare-maximizing monetary policy is all-powerful $\alpha \to 0$ when households are infinitely sensitive to inflation $\theta \to \infty$. The symmetric case also holds: optimal fiscal policy is all-powerful $\alpha \to 1$ when households do not care about inflation $\theta \to 0$.

Figure 15 plots economy-specific consumption-equivalent welfare along the fiscal strength continuum. While more inflation-sensitive households imply a stronger welfare-maximizing central bank, deviations from first-best joint-policy become more costly in such economies. For low values of θ, policy away from first-best is less welfare-reducing.

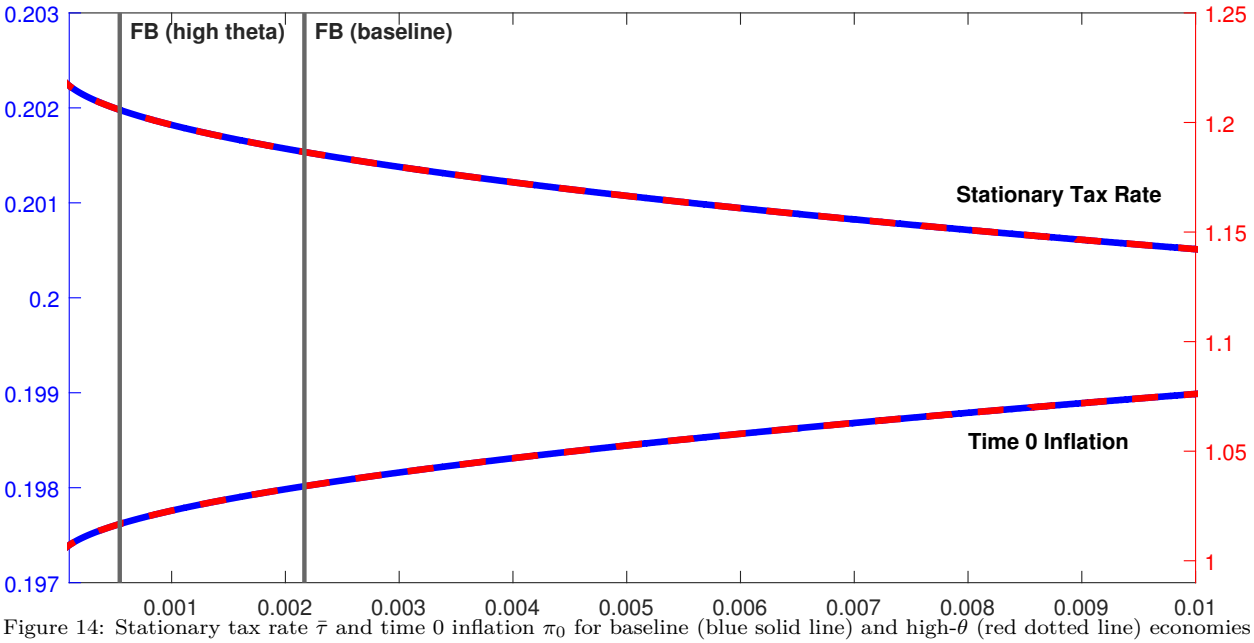


Figure 14: Stationary tax rate $\bar{\tau}$ and time 0 inflation π_0 for baseline (blue solid line) and high-θ (red dotted line) economies across fiscal strengths, $\alpha \in [0, 0.01]$.

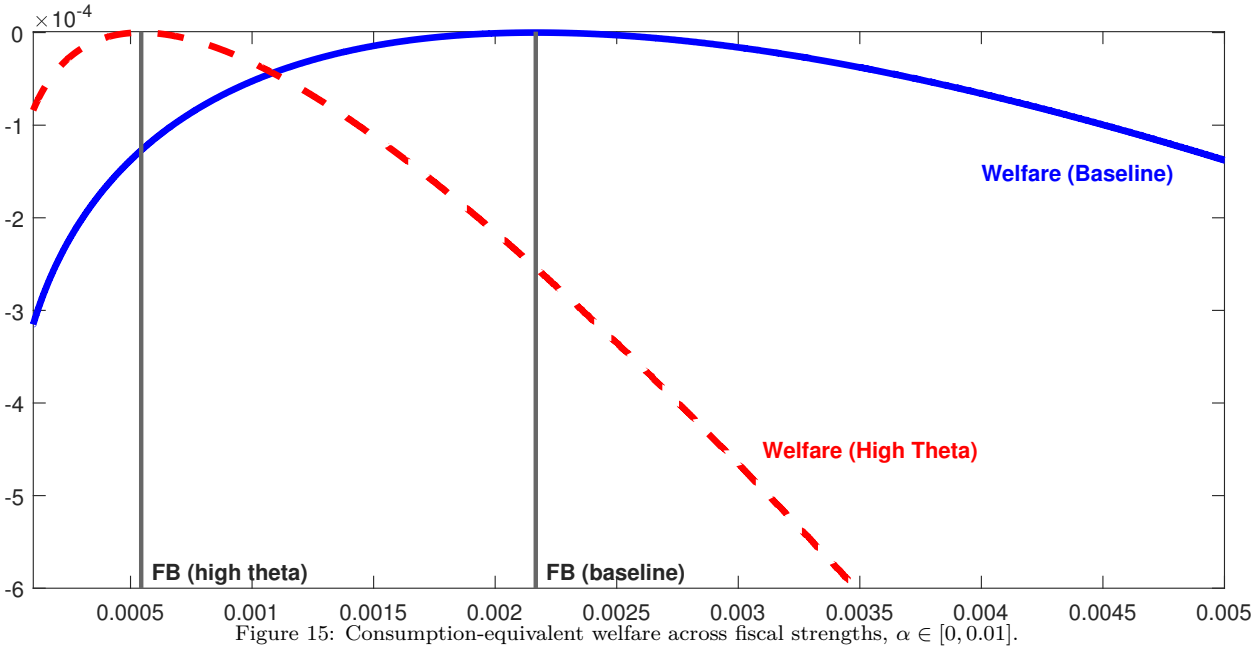


Figure 15: Consumption-equivalent welfare across fiscal strengths, $\alpha \in [0, 0.01]$.

D Appendix: Under a Maturity Structure of Non-Contingent Debt

Greenwood et al. (2015) argue the Treasury partially neutralized Fed QE after the GFC through longer newly-issued debt. Miran and Roubini (2024) claim the Treasury offset the Fed's post-COVID quantitative tightening efforts by issuing large amounts of short-term debt. The set of exercises in this section examines how a maturity structure of government debt interacts with fiscal strength.

This section answers two main questions. First, "What is the value of borrowing in long-term debt along the Ramsey plan?" Second, "How well does the maturity structure of government debt mitigate welfare loss when the government settles on policy away from first-best?"

I answer these questions in three steps. First, I re-specify the baseline model's debt portfolio so that the government issues an effectively-complete markets maturity structure of debt, re-calibrating inherited debt to target the average U.S. maturity structure from 1943–2023.[21] Second, I specify two analogous Arrow security economies by varying the baseline model's inherited debt stock: a welfare-equivalent economy and a debt-equivalent economy. In the welfare-equivalent Arrow security economy, I set inherited debt such that households are indifferent between living in the maturity structure economy and the welfare-equivalent economy when both economies operate along their own Ramsey plans. In the debt-equivalent Arrow security economy, I set inherited debt such that the real (deflated) market value of inherited debt is identical to that of the inherited maturity structure, holding policy constant across the two. Third, I compare the three economies' welfare outcomes, both at first-best and along the fiscal strength continuum $\alpha \in [0, 1)$.

I find that replacing one-period inherited debt with one- and two-period inherited debt matching the average privately held U.S. debt structure from 1942–2022 results in debt savings analogous to \$247B (in 2024 dollars) along the Ramsey plan. When the market value of inherited debt can be devalued through commitments about future policy, the government can better smooth tax and inflation policy over time, increasing welfare as in models by Lustig, Sleet, and Yeltekin (2008), Debortoli, Nunes, and Yared (2017), Faraglia et al. (2019) and Leeper and Zhou (2021), among others.

Long-term government debt provides better insurance against monetary-fiscal non-

[21] Lucas and Stokey (1983), Angeletos (2002), Buera and Nicolini (2004) and Faraglia, Marcet, and Scott (2010), among others, explore how a Ramsey planner completes markets using a maturity structure of public debt. Such an assumption is tractable yet counter-factual (see Faraglia, Marcet, and Scott (2010) for a critique). I assume effectively complete markets here in an effort to fairly compare such an economy to baseline.

cooperation. Given two welfare-equivalent economies along their respective Ramsey plans, one with a maturity structure and one without, deviations from the Ramsey plan (in both directions) are more welfare-reducing in the economy without a maturity structure. A debt structure allows for even a weak fiscal or monetary policymaker to better smooth its own financing tool.

To be concrete, assume an identical model to that described in Section 2 and specified in Section 4.2, except that households now lend (borrow) in dollars using a portfolio of nominal, non-contingent government debt $B_t = \left\{B_t^{(t+j)}\right\}_{j=1}^{J}$, where j represents a bond's term to maturity. Additionally, the number of debt maturities J is equal to the number of Markov states $S = 2$ so that, according to arguments similar to those made in Angeletos (2002) and Buera and Nicolini (2004), the government may implement almost any complete market allocation by replicating state-contingent debt using unique linear combinations of debt maturities.[22] As a result, Proposition 1 continues to hold: the ARC, IC and opponent's choices remain each institution's relevant constraints.

The debt-manager now chooses (issues) a maturity structure $\boldsymbol{B}_t^{dm} = \left\{\boldsymbol{B}^{(t+j),dm}\right\}_{j=1}^{2}$ and the central bank simultaneously chooses (demands) debt holdings $\boldsymbol{B}_t^{cb} = \left\{\boldsymbol{B}^{(t+j),cb}\right\}_{j=1}^{2}$ to maximize their respective objectives (3)–(4). Debt markets continue to clear according to (5).

The household budget constraint now reads

$$P_t c_t + \sum_{j=1}^{2} Q_t^{(t+j)} \left(B_t^{(t+j)} - B_{t-1}^{(t+j)}\right) \leq P_t \left(1 - \tau_t\right) n_t + B_{t-1}^{(t)}$$

and the no-Ponzi condition now reads

$$B_t^{(t+j)} \in \left[\underline{B}, \overline{B}\right] \quad \forall t, j \in \{1, 2\}$$

where the sum on the left side of the household budget constraint represents new household borrowing across maturities.

Household optimization is now governed by

$$1 - \tau_t = \frac{v'\left(n_t\right)}{u'\left(c_t\right)} \text{ and } Q_t^{(t+j)} = \beta^j \mathbb{E}_t \left[\frac{u'\left(c_{t+j}\right) P_t}{u'\left(c_t\right) P_{t+j}}\right] \quad \forall j \in \{1, 2\}$$

[22] There is a question of whether state-contingent inflation may be chosen such that the government cannot insure itself with ex-post prices of unmatured, deflated debt. This is not an issue in the following numerical exercises.

which implies a new TVC, reading

$$\lim_{i\to\infty}\left(\frac{\sum_{j=0}^{1}\beta^{j+i}\mathbb{E}_t\left[\frac{u'\left(c_{t+j+i}\right)P_t}{u'\left(c_t\right)P_{t+j+i}}\right]B_{t-1+i}^{(t+j+i)}}{P_t}\right)=0$$

and where the household FOC on taxes τ_t is unchanged from (9).

The economy's IC now reads

$$\underbrace{\frac{1}{\pi_t}\left\{b_{t-1}^{(t)}+\beta\mathbb{E}_t\left[\frac{1}{\pi_{t+1}}\frac{u'\left(c_{t+1}\right)}{u'\left(c_t\right)}\right]b_{t-1}^{(t+1)}\right\}}_{\text{MV(debt)}/P_t}=\underbrace{\frac{1}{u'\left(c_t\right)}\mathbb{E}_t\sum_{i=0}^{\infty}\beta^i\left[u'\left(c_{t+i}\right)c_{t+i}-v'\left(n_{t+i}\right)n_{t+i}\right]}_{\mathbb{E}_t[\text{PV(primary surpluses)}]}$$

where a household's real (indexed) debt holdings are $b_t^{(t+j)}\equiv\frac{B_t^{(t+j)}}{P_t}$, the government's real debt supply is $\boldsymbol{b}_t^{(t+j)}\equiv\frac{\boldsymbol{B}_t^{(t+j)}}{P_t}$.

The left-hand side of the economy's IC (D) includes the market value of unmatured debt, which depends on future policy. Because τ_{t+1} and π_{t+1} now affect the level of initial government indebtedness, institutions may choose to smooth welfare losses from surprise debt devaluation over time by using time t and time $t+1$ policy.[23]

The Ramsey planner's FOCs on $\{\pi_t\}$ are now

$$\begin{aligned}
w'\left(\pi_0\right)\pi_0^2&=\lambda_0\left\{u'\left(c_0\right)b_{-1}^{(0)}+\beta\mathbb{E}_0\left[\frac{u'\left(c_1\right)}{\pi_1}\right]b_{-1}^{(1)}\right\} && \text{and}\\
w'\left(\pi_1\right)\pi_1^2&=\lambda_0\mathbb{E}_0\left[\frac{u'\left(c_1\right)}{\pi_0}\right]b_{-1}^{(1)} && \text{and}\\
\pi_t&=1 && \forall t>1
\end{aligned}$$

As in the economy with state contingent debt, institutional FOCs are identical to Ramsey FOCs with the exception of the Lagrange multipliers.

[23]More generally, smoothing occurs from period 0 to period $J-1$.

The debt-manger's FOCs on $\{c_t\}$ and $\{n_t\}$ now imply

$$u'(c_0)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}\left[u''(c_0)\left(c_0-\frac{b_{-1}^{(0)}}{\pi_0}\right)\right]=v'(n_0)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}v''(n_0)\,n_0 \quad \text{and}$$

$$u'(c_1)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}\left[u''(c_1)\left(c_1-\frac{b_{-1}^{(1)}}{\pi_0\pi_1}\right)\right]=v'(n_1)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}v''(n_1)\,n_1 \quad \text{and}$$

$$u'(c_t)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}u''(c_t)\,c_t=v'(n_t)\left[1+\lambda_0^{dm}\right]+\lambda_0^{dm}v''(n_t)\,n_t \quad \forall t>1$$

The central bank's FOCs on $\{\pi_t\}$ are now

$$w'(\pi_0)\,\pi_0^2=\lambda_0^{cb}\left\{u'(c_0)\,b_{-1}^{(0)}+\beta\mathbb{E}_0\left[\frac{u'(c_1)}{\pi_1}\right]b_{-1}^{(1)}\right\} \quad \text{and}$$

$$w'(\pi_1)\,\pi_1^2=\lambda_0^{cb}\mathbb{E}_0\left[\frac{u'(c_1)}{\pi_0}\right]b_{-1}^{(1)} \quad \text{and}$$

$$\pi_t=1 \quad \forall t>1$$

A government may use linear combinations of debt maturities to implement complete markets allocation paths when $J \geq S$, understanding how ex-post, unmatured debt prices move in each potential future state.[24] Buera and Nicolini (2004) prove that the $S \times J$ (payoff) matrix of ex-post debt prices being invertable along such a path is necessary and sufficient for this result to hold under a Markovian stochastic process.

Given that the matrix

$$\begin{bmatrix}\left(\frac{1}{\pi_t}|s=1\right) & \beta\mathbb{E}_t\left(\frac{u'(c_{t+1})}{u'(c_t)\,\pi_t\pi_{t+1}}|s=1\right)\\ \left(\frac{1}{\pi_t}|s=2\right) & \beta\mathbb{E}_t\left(\frac{u'(c_{t+1})}{u'(c_t)\,\pi_t\pi_{t+1}}|s=2\right)\end{bmatrix}$$

is invertable for every period and possible state along a complete-markets path of allocations; such an equilibrium is implementable using linear combinations of nominal debt.[25] This matrix is always invertable in the calibrated version of this economy.

[24] Angeletos (2002) and Buera and Nicolini (2004) are the first to point this equivalence out. When $J = S$ the implementing debt maturity combination is unique.

[25] This requirement is satisfied when inflation is always 1 as $u'(c_t)$ differs across potential time t spending states when taxes are smooth.

D.1 Two Welfare Comparisons

I continue to use Section 5's utility specification and numerical calibration except for the model's initial maturity structure, which is now $\left\{b_{-1}^{(0)}, b_{-1}^{(1)}\right\} = \{0.2261, 0.2949\}$, matching U.S. average debt-to-GDP ratios from 1943–2023 of debt maturing within 1 year and in greater than 1 year, respectively.

To responsibly measure welfare improvements when introducing a maturity structure to an economy, I compare three economies: the recently-described 'maturity structure economy,' a 'welfare-equivalent economy,' and a 'debt-equivalent economy.' The latter two are Arrow security economies with structures like the baseline economy discussed in sections 2–5.

The welfare-equivalent economy is defined by simply setting this paper's baseline economy's inherited debt stock $b_{-1}^{(s)}$ so that welfare along the maturity structure economy's Ramsey plan is equivalent to that along the welfare-equivalent economy's Ramsey plan.

The debt-equivalent economy is defined by setting this paper's baseline economy's inherited debt stock $b_{-1}^{(s)}$ so that its market value of inherited debt is equivalent to that of the maturity structure economy's inherited debt, holding policy constant at the debt-equivalent economy's Ramsey plan, so that

$$\underbrace{b_{-1}^{(s)}}_{\text{Debt-Equivalent}} = \underbrace{b_{-1}^{(0)} + \beta \mathbb{E}_0 \left[\frac{1}{\pi_1} \frac{u'(c_1)}{u'(c_0)}\right] b_{-1}^{(1)}}_{\text{Maturity Structure}} \tag{23}$$

I define the debt-equivalent economy this way to ensure that any additional debt devaluation by the maturity structure's planner is not bestowed upon the debt-equivalent economy in par value terms in its definition.

D.1.1 Value of Long-Term Debt

What is the value of borrowing in long-term debt along the Ramsey plan? Table 6 compares welfare improvements from moving from the debt-equivalent economy to the welfare-equivalent economy.

Economy (Ramsey Plan)	b_{-1}	W_0 (CE)
Welfare-Equivalent	$\{0.5093, 0\}$	0
Debt-Equivalent	$\{0.5182, 0\}$	-0.0005

Table 6: Inherited debt and consumption-equivalent welfare in the welfare-equivalent and debt-equivalent economies.

Households in the first-best debt-equivalent economy are indifferent between consuming 0.0005, or 0.054%, more in period 0 and moving to the first-best welfare-equivalent economy.

A more salient measure of improvement across economies may be that households in the debt-equivalent economy are indifferent between their Ramsey planner inheriting 0.89% less debt and moving to the first-best welfare-equivalent economy. This 0.89% times 2023 U.S. GDP ($27.72T) is about $247B.

Adding a maturity structure allows the Ramsey planner to improve welfare by smoothing surprise debt devaluation across time. Such a result is not unique to effectively complete markets. Work by Lustig, Sleet, and Yeltekin (2008), Debortoli, Nunes, and Yared (2017), Faraglia et al. (2019) and Leeper and Zhou (2021) in incomplete market settings discuss unmatured long-term debt's role in absorbing unforeseen monetary and fiscal shocks through movements in its ex-post market price. The added flexibility of debt revaluation without the exclusive use of contemporaneous taxes and inflation results in a planner that can push financing costs further into the future.

D.1.2 Maturity Structure and Non-Cooperation

How well does the maturity structure of government debt mitigate welfare loss when the government chooses policy away from first-best? Figure 16 compares time 0 consumption-equivalent welfare from the maturity structure economy and welfare-equivalent economy along $\alpha \in [0, 0.01]$.

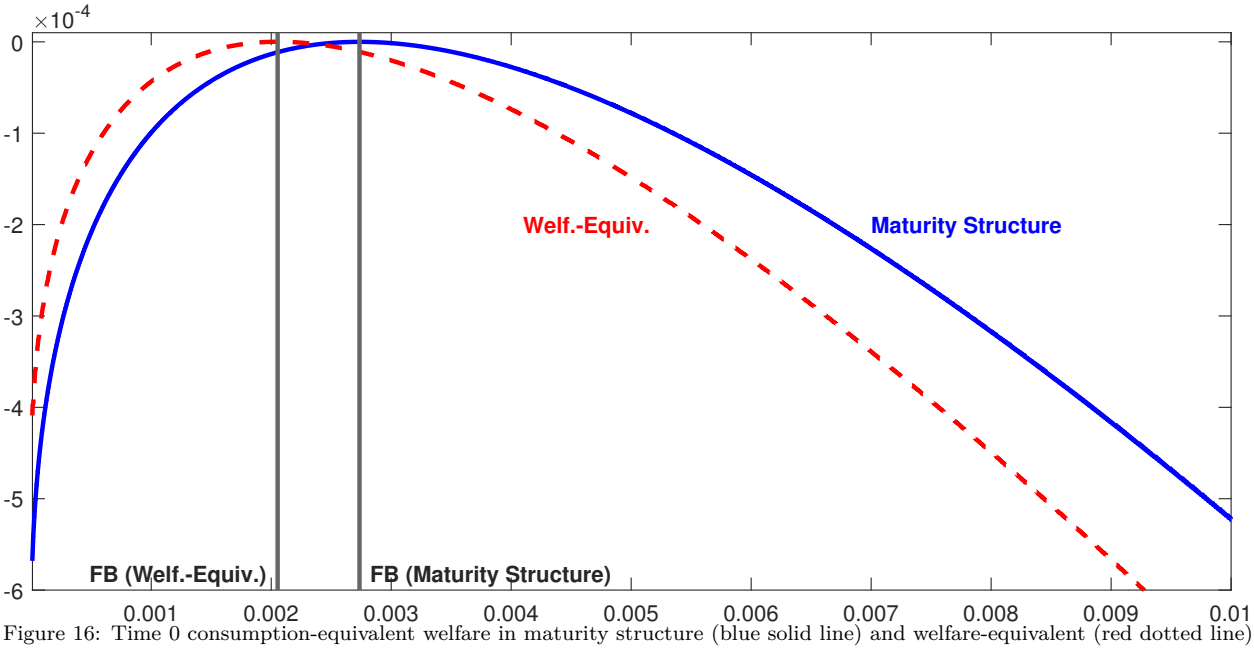


Figure 16: Time 0 consumption-equivalent welfare in maturity structure (blue solid line) and welfare-equivalent (red dotted line) economies across fiscal strengths $\alpha \in [0, 0.01]$ (x-axis).

While the two economies are welfare-equivalent at each of their Ramsey plans, the Ramsey plan with a maturity structure includes more fiscal strength than that with only maturing

one period debt. Households prefer the welfare-equivalent economy when FP is weak and prefer the maturity structure economy when FP is strong. To better compare the two welfare relations to *deviations* in fiscal strength from first-best, Figure 17 overlays these curves so that the x-axis is now the difference in realized and first-best fiscal strength in each economy.

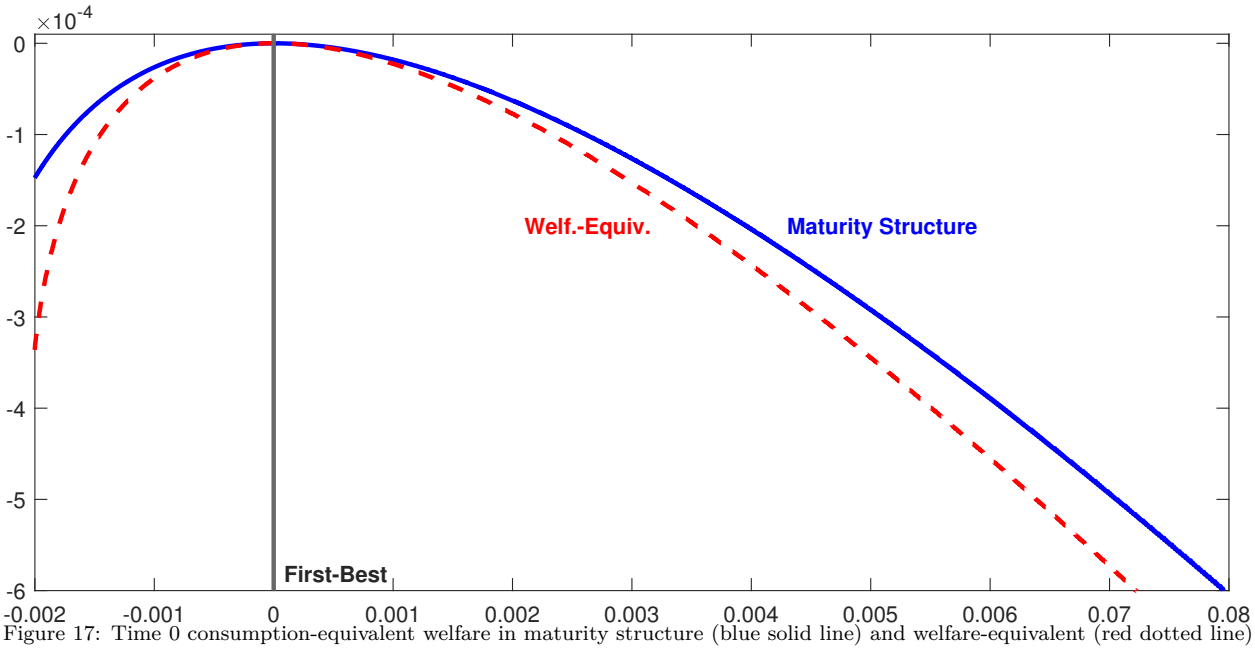


Figure 17: Time 0 consumption-equivalent welfare in maturity structure (blue solid line) and welfare-equivalent (red dotted line) economies by deviations in fiscal strength from first-best (x-axis).

Households living in the maturity structure economy enjoy better welfare insurance against jointly implemented government policy away from the Ramsey plan than those living in the economy without a maturity structure. Even at relative deviations of only $\alpha - \alpha^* = -0.002$, the maturity structure economy has lost less than half of the welfare compared with the welfare-equivalent economy. Similar to an envelope theorem result, when monetary and fiscal policies have additional ways to smooth their costly policy over time, deviations from welfare maximization hurt them less than they would otherwise.

Even when federal institutions act non-cooperatively with respect to how they manage the maturity structure of government, as suggested by Greenwood et al. (2015) and Miran and Roubini (2024), the existence of a maturity structure softens the blow better than a comparable, alternative economy without a maturity structure.

E Appendix: Data Sources

Apart from Drechsel's (2024) data on president-Fed official meetings, which is available on his website, this paper uses three main time series: U.S. inflation (1943–2023), U.S. spending-to-GDP (1943–2023) and U.S. par value debt-to-GDP (1942–2022).

- U.S. Inflation (1943–2023)
  - Growth rate in annual GDP deflator. Section 1, table T10109-A, line 1 in the NIPA from the BEA. Found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`
- U.S. Spending-to-GDP (1943–2023)
  - GDP: Annual nominal GDP. Section 1, table T10105-A, line 1 in the NIPA from the BEA. Found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`
  - Spending: Annual nominal spending. Calculated as (Total expenditures) - (Interest payments) + (Interest receipts) - (federal employee pension interest accrual), as in Hall and Sargent (2022).
    - Total expenditures. Section 3, table T30200-A, Line 43 in the National Income and Product Accounts (NIPA) from the BEA and found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`.
    - Interest payments: Section 3, table T30200-A, line 33 in the National Income and Product Accounts (NIPA) from the BEA and found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`.
    - Interest receipts: Section 3, table T30200-A, line 14 in the National Income and Product Accounts (NIPA) from the BEA and found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`.
    - Federal employee pension interest accrual: Section 3, table T31800(A,B)-A, line 22 in the National Income and Product Accounts (NIPA) from the BEA and found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`.

- U.S. Par Value Debt-to-GDP (1942–2022)
  - Calculated as (Reserves Outstanding) + (Privately-Held Treasurys). All reserves outstanding is considered <1 year duration.
    - GDP: Annual nominal GDP. Section 1, table T10105-A, line 1 in the NIPA from the BEA. Found at `https://apps.bea.gov/iTable/?isuri=1&reqid=19&step=4&categories=flatfiles&nipa_table_list=1`
    - Reserves Outstanding (2002–2022). calculated as (Federal Reserve Notes, Net of F.R. Bank Holdings) + (Deposits with F.R. Banks, Other Than Reserve Balances) + (Other Deposits at the Fed) + (Term Deposits Held by Depository Institutions) - (U.S. Treasury, Supplementary Financing Account) - (Treasury balance in TGA) + (Reverse Repurchase Agreements).
      - Federal Reserve Notes, Net of F.R. Bank Holdings. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/WLFN`.
      - Deposits with F.R. Banks, Other Than Reserve Balances. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/WDFOL`.
      - Other Deposits at the Fed. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/WLODL`.
      - Term Deposits Held by Depository Institutions. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/TERMT`.
      - U.S. Treasury, Supplementary Financing Account. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/WLSFAL`.
      - Treasury balance in TGA. Daily Treasury Statements, found at `https://fsapps.fiscal.treasury.gov/dts/issues`.
      - Reverse Repurchase Agreements. Table H.4.1.T5 on the Fed's weekly balance sheet and found at `https://fred.stlouisfed.org/series/WLRRAL`.
    - Reserves Outstanding (1942–2001). Calculated as the average reserves outstanding/GDP from 2002–2022 multiplied by GDP from 1942–2001.
    - Privately-Held Debt (1942–2022). Center for Research in Security Prices (CRSP) U.S. Treasury Database