Fiscal inaction as monetary support*

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October 13, 2025

Abstract

We study how fiscal adjustment rules shape macroeconomic dynamics when households are non-Ricardian and output is (partially) demand-determined. Following any disturbance that, in equilibrium, causes a budgetary shortfall—e.g., a recession lowering tax revenue—, slowing down the pace of fiscal consolidation unequivocally boosts economic activity. It follows that the fiscal framework most supportive of a central bank is one of very gradual (or even absent) fiscal adjustment: following demand shocks, slow adjustment endogenously stabilizes the macro-economy; and following supply shocks, it smoothes out and reduces tax distortions, improving the output-inflation trade-off. A quantitative exercise affirms these lessons in the U.S. context.

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1 Introduction

What kind of fiscal support does a central bank want? Conventional wisdom has it that the fiscal authority should be "passive" (Woodford, 2003; Galí, 2008): by adjusting taxes sufficiently quickly to ensure budget balance the fiscal authority "steps aside" and allows the central bank to achieve its core mandate. This conclusion, however, rests on models in which households are permanent-income, implying that their spending is invariant to the timing of fiscal policy changes (see Barro, 1974). Our headline result is that, when households are non-Ricardian, the conclusion is likely to flip, with slow fiscal adjustment, or even fiscal *in*action, supporting the central bank.

We first characterize how fiscal adjustment rules shape macroeconomic dynamics in an environment with three key ingredients: non-Ricardian consumers, nominal rigidities, and a tax-and-transfer system that features automatic stabilizers. The economy is subject to an exogenous disturbance that causes a budgetary shortfall, with the leading example being a recession that lowers tax revenue. Our main result is that a slowdown in the pace of the required fiscal consolidation uniformly increases economic activity, at every horizon. Intuitively, delaying tax hikes removes a short-run drag on demand, so the sole effect of fiscal policy is to provide automatic stabilization. This stabilization is surprisingly powerful: as adjustment is delayed further, output increases more and more, with its cumulative response converging to *zero*—i.e., perfect stabilization, in a present-value sense.

These positive results are the foundation for our main claim: that gradual (or in fact even absent) fiscal adjustment can support central banks in achieving their mandate. Following recessionary demand shocks, the central bank wishes to stabilize economic activity and thus inflation—exactly what slow adjustment delivers. Following stagflationary supply shocks, such stabilization may instead at first glance not appear desirable, as it reinforces inflationary pressures. However, slow adjustment at the same time smoothes out and, crucially, endogenously lessens the tax burden that needs to be imposed, thus improving the economy's output-inflation trade-off. A quantitative exercise affirms these lessons in the U.S. context, suggesting that even quite substantial delays in fiscal adjustment are likely to support—rather than hurt—the central bank in the quest to attain its (dual) mandate.

Environment. We consider an overlapping-generations New Keynesian model, as in Angeletos, Lian and Wolf (2024, 2025), and following the earlier contributions of Blanchard (1985) and Farhi and Werning (2019). As usual, the finite lives here can be interpreted as a proxy for liquidity constraints, connecting our analysis with the burgeoning Heterogeneous Agent New Keynesian (HANK) literature. We then subject the economy to two types of stochastic disturbances: shocks to consumer patience (i.e., a "demand" shock) and to firm mark-ups (i.e., a cost-push "supply" shock).

Policy is set by the fiscal and monetary authorities. Fiscal policy is represented by a rule for how quickly taxes adjust to ensure long-run government budget balance, as parameterized by a single

coefficient $\tau_d \in [0,1]$, ranging from absent to immediate tax adjustment. This tax adjustment may be either lump-sum or distortionary, and we will explicitly consider both cases. Total tax revenue furthermore automatically co-varies with overall economic activity, i.e., a conventional automatic stabilizer (e.g., as modeled in McKay and Reis, 2016; Blanchard, 2025), with the automatic feedback coefficient $\tau_y > 0$. Finally the monetary authority has a standard "flexible inflation-targeting" objective, seeking to stabilize fluctuations in output, inflation, and interest rates. While output and inflation objectives follow immediately from standard central bank mandates, the concern for interest rate fluctuations is a reduced-form reflection of the gradualism typical of modern central banks. Since stabilization is thus, just as in practice, imperfect, we can study our question of interest—how different fiscal rules, and in particular the speed of adjustment, support (or complicate) the tasks of the central bank.

Fiscal rules and macroeconomic dynamics. Our first objective is to understand how fiscal adjustment rules shape macroeconomic dynamics. To transparently isolate the incremental role of the fiscal rule we fix the stance of monetary policy as a given real interest rate path, and then characterize how equilibrium outcomes change with the fiscal adjustment speed τ_d. Whether the fiscal adjustment is lump-sum or distortionary is immaterial for this part of the analysis.

The first main result is that, following shocks that induce a budgetary shortfall—e.g., a demand shock-induced recession—, slowing the pace of the required fiscal consolidation unequivocally boosts economic activity, not only contemporaneously but also in the future. *Given* equilibrium prices and quantities, delaying fiscal adjustment of course only changes the timing of tax hikes, and not their present value. In a representative-agent (RANK) variant of our economy, such timing changes have no effect on equilibrium real activity.[1] With non-Ricardian households, in contrast, cutting taxes today and hiking them tomorrow is stimulative, as future tax hikes are discounted. But since economic activity increases, the initial budgetary shortfall endogenously eases via tomorrow's automatic stabilizer ($\tau_y > 0$), and so future taxes can increase by less—explaining why economic activity increases both today *and* in the future. This effect is surprisingly powerful: once fiscal adjustment is sufficiently delayed, the cumulative output impulse response converges to zero, corresponding to a perfect offset (in a present value) of the initial disturbance. This limit result is the endogenous fiscal rule analogue on our earlier work on self-financing deficit "shocks" (Angeletos, Lian and Wolf, 2024), with our results here revealing how the pace of fiscal adjustment shapes the propagation of *any* macroeconomic disturbance. At the heart of our findings is a key dynamic amplification of the familiar static automatic stabilizer: not only does the endogenous feedback via τ_y dampen the initial recession, it also—when not accompanied by short-term tax hikes—*dynamically* sows the seeds for the subsequent boom.

[1] Note that this statement is true independently of whether taxes are lump-sum or distortionary, as our analysis conditions on a path of *real* interest rates.

In the remainder of the paper we use these general insights to ask whether, following demand and supply disturbances, a slowdown in the pace of fiscal adjustment aids or harms the central bank in its attempts to fulfill a mandate of stabilizing output and inflation. We pay particular attention to the question of whether even *absent* fiscal adjustment—i.e., "active" fiscal policy (as in Leeper, 1991)—could be in the interest of the monetary authority, contrary to conventional wisdom. To answer these questions we solve the central bank's problem given demand and supply shocks, and then ask how the solution, and in particular the central bank loss, changes with adjustment speed τ_d. Throughout we assume that the budgetary effects of a given shock arise solely through output and thus tax revenue, rather than through rates or inflation; we will relax that assumption in our quantitative exercise.

Demand vs. supply shocks. Following a recessionary demand disturbance, the central bank would like to boost economic activity, thereby simultaneously stabilizing inflation. As the recession causes a budgetary shortfall, slow fiscal adjustment thus supports the central bank, though with a twist: dampening the recession today also necessarily brings with it a further overshooting of the economy, echoing a trade-off familiar from the forward guidance literature (e.g., Eggertsson and Woodford, 2003). We identify sufficient conditions and illustrate through numerical examples that, in practice, this trade-off is robustly (though not invariably) resolved in favor of slow fiscal adjustment, with even complete fiscal inaction often in the interest of the central bank. These results are starkest (and easiest to prove) if taxes are lump-sum, but extend with little change to the case of distortionary taxes.

Following a stagflationary supply disturbance, the optimal output-inflation trade-off features a recession that partially offsets the initial shock's inflationary pressures. Delaying the necessary fiscal adjustments undoes the recessionary pressure, thus further fueling inflation and so acting against the central bank's objectives. This demand-side channel, however, can be moderated or even dominated by a supply-side channel that is present as long as fiscal adjustments are distortionary. In that case, postponing taxes eases inflationary pressures both by smoothing tax distortions (in the classical sense of Lucas and Stokey, 1983) and, novel to our analysis here, by also endogenously lessening the overall amount of tax hikes. Slower fiscal adjustment thus improves the output-inflation trade-off available to the central bank, and we again give conditions—here in particular large inflationary effects of distortionary taxes—such that even complete fiscal *in*action may be desirable.

The conclusion from our analysis so far is that slow or even absent fiscal adjustment *can* in principle support a central bank in its objectives, through its endogenous stabilization effects. The analysis was limited, however, in two crucial respects. First, it relied on several simplifying assumptions, from the shape of the private demand and supply blocks to our specific fiscal and monetary policy rules. Second, even with those assumptions, we were only able to highlight relevant forces, leaving meaningful ambiguities. In particular, the question of whether complete fiscal inaction may be desirable is

inherently quantitative, with the answer necessarily sensitive to the mix of shocks driving macroeconomic fluctuations. We thus finally turn to a quantitative analysis.

Quantitative analysis. We as before wish to evaluate how macroeconomic dynamics and so the central bank loss vary with different assumptions on the underlying fiscal feedback rule, just now in a richer, quantitatively relevant structural environment. We first of all establish that, across a relatively large class of standard environments, the answer to our question depends only on two objects: the mix of shocks hitting the macro-economy; and the causal effects of changes in interest rates and taxes on the arguments of the central bank loss and the components of the government budget. To recover the latter, we build a much richer variant of our baseline model, allowing for greater household heterogeneity, some sluggishness in price-setting, and more general forms of feedback from economic activity to the government budget; we in particular make sure that this extended model is broadly consistent with empirical evidence on the propagation of monetary and fiscal shocks to the macroeconomy. To learn about shocks, we leverage insights of Caravello, McKay and Wolf (2025) to conclude that all relevant information is encoded in a simple and empirically estimable object: the joint autocovariance function of output, inflation, interest rates, and government debt. Importantly, our direct use of this autocovariance function frees us from the need to take any stand on whether the economy was actually driven by supply or demand disturbances; intuitively, all that matters are the *average* co-movements of output and inflation, and those we can easily measure in the data.

The main finding of our quantitative analysis is that central banks are indeed aided by even substantial delays in fiscal adjustment, with the central bank loss in our main exercise minimized for an adjustment half-life of almost ten years. This takeaway is driven by two key features of data and model. First, from the autocovariance function, we see that the "typical" macroeconomic co-movement in the data looks like an aggregate demand disturbance, consistent with the "main business-cycle shock" results of Angeletos, Collard and Dellas (2020). Second, delays in fiscal adjustment are strongly stimulative in our model, as it features both material fiscal revenue drops in recessions (the automatic stabilizer) and meaningful fiscal multipliers, due to an elevated average marginal propensity to consume (MPC). Putting the two together, our result necessarily follows—and breaking it requires breaking at least one of these two (empirically relevant) ingredients. We finally note that our conclusions are only further reinforced by the fact that, in our quantitative model, the supply-side channel of distortionary taxes is so strong that slow adjustment would be preferred even after supply shocks.

Discussion and qualifiers. Our results contradict the conventional wisdom, encapsulated in textbook New Keynesian treatments (like Woodford, 2003; Galí, 2008), that fiscal support for an inflation-targeting central bank necessarily means (sufficiently) fast fiscal adjustment, i.e., a fiscal authority that "steps aside." It is important to stress, however, that this qualification of the conventional wis-

dom is very particular and rather limited in scope: it applies to cyclical fiscal adjustment, but neither to long-run structural spending or taxation changes, nor to transitory fiscal (tax) shocks. The former is simply outside the purview of our analysis, as we work with a (linearized) New Keynesian model; and for the latter, it is straightforward to see that any fiscal disturbance—like for example the stimulus checks of 2021—is an additional source of volatility, and thus challenging for a central bank.

Literature. Our analysis relates and contributes to several strands of literature.

First, we add to a long literature on fiscal-monetary interactions. An important strand of this literature, going back to Leeper (1991), assumes that households are permanent-income and that taxes are lump-sum. Under those assumptions, fiscal policy is irrelevant for macroeconomic outcomes as long as it is "Ricardian" (see Woodford, 2003); further, the *optimal* fiscal-monetary policy mix features such a Ricardian fiscal backdrop. We establish that, if households are not permanent-income, then the fiscal backdrop instead always matters, and slower adjustment endogenously stabilizes the economy. A separate strand allows for distortionary taxes, connecting the Lucas and Stokey (1983) and New Keynesian frameworks (Benigno and Woodford, 2003; Angeletos, 2003; Schmitt-Grohé and Uribe, 2004). The tax smoothing motives discussed there are, in our setting, further reinforced by a new mechanism: that delaying tax adjustment endogenously reduces the overall size of the tax change.

Second, we contribute to a fast-growing literature on fiscal policy in HANK models. An important strand of that literature has studied how having non-Ricardian consumers changes the propagation of deficit shocks, e.g., lump-sum transfers or government spending increases (e.g., Hagedorn, Manovskii and Mitman, 2019; Auclert, Rognlie and Straub, 2024; Angeletos, Lian and Wolf, 2024). Other work, more focused on monetary policy, has stressed the importance of the fiscal backdrop for the propagation of monetary policy (Kaplan, Moll and Violante, 2018; Rachel and Ravn, 2025; Kaplan, 2025). We contribute here by analytically distilling how systematic fiscal policy shapes the propagation of *arbitrary* macroeconomic shocks.

Third, our paper sits in a small but growing literature on the importance of automatic stabilizers for macroeconomic fluctuations (Blanchard, 2006; McKay and Reis, 2016, 2021; Blanchard, 2025). Our analysis reveals that such static automatic stabilizers can, once dynamically combined with delayed fiscal adjustment, be extremely powerful, providing perfect (present-value) stabilization in the limit.

Outline. Section 2 presents the baseline model environment that we use for all of our analytical explorations. Section 3 then presents our main building block results on how delays in fiscal adjustment stabilize the macro-economy. In Sections 4 and 5 we turn to implications for monetary policy design, first if taxes are lump-sum to isolate the demand channel, and then for distortionary taxes. Our quantitative evaluation follows in Section 6, and Section 7 concludes. The appendix contains all proofs as well as various additional results.

2 Environment

Our model environment is a variant of the (log-linearized) perpetual-youth, overlapping-generations (OLG) version of the New Keynesian model, as studied in Farhi and Werning (2019), Aguiar, Amador and Arellano (2024), or Angeletos, Lian and Wolf (2024, 2025). Relative to our prior work, we make four material changes. First, to zero in on the budgetary effects of fluctuations in economic activity (through automatic stabilizers), we assume that government debt is real and that any feedback from real interest rate fluctuations to the budget is immediately offset. Second, we consider a simple static (rather than the usual dynamic) Phillips curve. Both assumptions are made in the interest of clarity and will be relaxed in the quantitative analysis. Third, we assume that monetary policy is set optimally to achieve an inflation-targeting mandate, rather than described by a simple feedback rule. Fourth, the economy is subject to stochastic demand and supply shocks. For notational simplicity, we will cast our analysis in terms of perfect-foresight transition paths to shocks realized at the beginning of period 0; as usual, by certainty equivalence, to first order, these transition paths can equivalently be interpreted as impulse response functions in the analogous economy with aggregate risk.

Throughout this section we present (log-)linearized relations around our economy's deterministic steady state. Detailed micro-foundations and linearization steps are presented in Appendix A.1. Time is discrete and indexed by $t \in \{0,1,\ldots\}$, uppercase variables denote levels, and lowercase variables denote (log-)deviations from steady state in which inflation is zero, real allocations are given by their flexible-price counterparts, and real government debt is fixed at some level $D^{ss} \geq 0$.[2]

2.1 Private sector

We summarize the private sector of our economy through two relations: an aggregate demand block and an aggregate supply block.

Aggregate demand. There is a unit continuum of households, with each household surviving from one period to the next with probability $\omega \in (0,1]$, and then replaced by newborns upon death, as in Blanchard (1985).[3] The households have separable preferences over consumption and labor, and they save and borrow through an actuarially fair, risk-free, one-period, real annuity, which is backed by government bonds. To facilitate aggregation, we will follow Angeletos, Lian and Wolf (2024, 2025) and assume that all households supply the same amount of labor (intermediated by labor unions), receive

[2] To accommodate the case of zero debt, all fiscal and household wealth variables are measured in absolute deviations from this steady state, scaled by steady-state output; all other variables are measured in log-deviations.

[3] We abstract from steady-state effects of finite lives and fiscal policy by introducing time-invariant transfers from older households to newborns through a social fund. Those transfers are designed to ensure that all households have identical wealth in the steady state.

the same wages and dividend payments, and pay the same taxes. Finally, households are subject to a stochastic "patience" shock as a simple reduced-form stand-in for aggregate demand shocks.

Deriving the (log-linearized) consumption function for each individual household, and then aggregating across households, we obtain the following aggregate consumption function,

$$c_t = (1-\beta\omega)\left(d_t + \sum_{k=0}^{\infty}(\beta\omega)^k (y_{t+k} - t_{t+k})\right) - \beta\left(\sigma\omega - (1-\beta\omega)\tfrac{A^{ss}}{Y^{ss}}\right)\left(\sum_{k=0}^{\infty}(\beta\omega)^k r_{t+k}\right) - \beta\sigma\omega\left(\sum_{k=0}^{\infty}(\beta\omega)^k v_{t+k}\right), \tag{1}$$

where: c_t is real consumption; y_t is real income (i.e., labor income plus dividends, which equals real aggregate output); t_t is real tax payments; r_t is the real rate of interest on the government bond; d_t is beginning-of-period real private wealth (which in equilibrium equals real government debt); v_t is the aggregate demand shock; β is the household discount factor (and thus also the reciprocal of the steady-state gross real rate); σ is the elasticity of intertemporal substitution; A^{ss}/Y^{ss} is the steady-state wealth-to-GDP ratio. (1) fully describes the (private) aggregate demand block of our economy. For future reference we note that, once we impose output market-clearing ($c_t = y_t$) and the government flow budget (to be introduced later in (4)), we can re-express (1) recursively as an Euler equation:

$$y_t = -\sigma\left(r_t - \frac{(1-\beta\omega)(1-\omega)}{\sigma\omega} d_{t+1}\right) + y_{t+1} - \sigma v_t. \tag{2}$$

Equation (2) is a natural generalization of the usual representative-agent Euler equation. If $\omega = 1$ (i.e., textbook RANK), then the real wealth term drops out, and so the growth rate of consumption (or in equilibrium of real output) is simply related to the real rate and the patience shock. If instead $\omega < 1$, then real wealth appears as an additional Euler equation wedge, increasing current aggregate demand relative to the future. For our purposes, it is most important to note that the aggregate demand function (1) closely mirrors key qualitative properties of consumption-savings behavior in HANK models: MPCs are elevated, here equal to $1-\beta\omega$, and spending out of income gains happens relatively quickly, decaying at rate $\omega < 1$ (instead of the usual random walk of the permanent-income consumption). Unless indicated otherwise we will throughout this paper for our analytical results assume that $\omega < 1$. The quantitative analysis in Section 6 will consider further generalized aggregate demand structures, allowing a closer quantitative fit to empirical consumption-savings behavior.[4]

Aggregate supply. The production side follows the textbook NK model: monopolistically competitive firms hire labor on a spot market, produce according to a linear labor-only production technology, reset prices subject to a Calvo friction, and are subject to an exogenous cost-push (i.e., mark-up) shock u_t—our stand-in for aggregate supply shocks. We furthermore, for analytical clarity, assume that price-setters are myopic. Combining optimal price-setting with optimal household labor supply,

[4] (1) in particular also features relatively elevated MPCs out of liquid wealth, inconsistent with empirical evidence. Our extended quantitative model will moderate these MPCs accordingly.

the supply block of the economy reduces to a simple *static* NKPC,

$$\pi_t = \kappa y_t + u_t, \tag{3}$$

where π_t denotes inflation and $\kappa > 0$ captures its slope, which increases with the degree of price flexibility. Equation (3) implicitly assumes that fiscal adjustments (which will be discussed in the next section) are lump-sum and so do not introduce any time-varying distortions in labor supply.

The two strong assumptions embedded in (3)—i.e., myopia of price setters and the absence of distortionary fiscal adjustments—are made purely for pedagogical reasons will be relaxed gradually. Assuming a static NKPC will simplify our analytical results in Sections 4 - 5, but is relaxed in the quantitative analysis of Section 6. Assuming that all fiscal adjustments are lump-sum allows us, in Section 4, to zero in on the *demand-side* implications of slowdowns in the pace of fiscal consolidation. Sections 5 - 6 instead consider the empirically relevant case of distortionary fiscal adjustments, studying the *supply-side* implications of fiscal inaction first analytically and then quantitatively. Finally we note that the results in Section 3, on the stabilizing effects of fiscal inaction, actually do not depend at all on these two simplifying assumptions.

2.2 Fiscal policy

The government issues non-contingent, short-term, real debt. The government flow budget is

$$d_{t+1} = \frac{1}{\beta}(d_t - t_t) + \frac{D^{ss}}{Y^{ss}} r_t, \tag{4}$$

where: d_t is real government debt; t_t denotes total tax revenue; and D^{ss}/Y^{ss} is the steady-state debt-to-GDP ratio, which by market-clearing will equal the aggregated household steady-state wealth-to-GDP ratio A^{ss}/Y^{ss}. Note that inflation does not enter (4) since government debt here is real; we remark further on this simplifying assumption below. Finally initial debt is given as $d_0 = 0$. In addition to the flow budget constraint (4), the government is also subject to the usual no-Ponzi condition.

Tax revenue t_t is given as

$$t_t = \tau_y y_t + \underbrace{\tau_d d_t}_{\text{fiscal adjustment } t_t^{\text{adj}}} + \beta \frac{D^{ss}}{Y^{ss}} r_t, \tag{5}$$

and consists of three terms. First, a static automatic stabilizer: fluctuations in economic activity automatically change tax revenue by $\tau_y y_t$, where $\tau_y \in (0,1]$ is a time-invariant, proportional (distortionary) tax on total household income. Second, taxes are adjusted endogenously ("fiscal adjustment") in response to fluctuations in outstanding real debt, by $t_t^{\text{adj}} \equiv \tau_d d_t$, where $\tau_d \in [0,1]$ parameterizes the speed of this fiscal adjustment. We note that, for now, these fiscal adjustments are assumed to be lump-sum; the distortionary tax case will be considered in Sections 5 - 6. Third, we assume that the

fiscal authority adjusts immediately and automatically (through a lump-sum tax) to offset the budgetary impacts of interest rate movements; we again do so for analytical clarity, and comment further on this assumption below.

For our subsequent analysis, the two key parameters will be τ_d and τ_y, and they play distinct roles. Given our assumptions that government debt is real and that the budgetary impact of interest rate expenses is immediately offset, the sole feedback from macroeconomic outcomes to the government budget is the automatic stabilizer τ_y, with reductions in economic activity causing a shortfall in government revenue. τ_d then governs the speed at which any such shortfall is offset through future tax hikes—i.e., the pace of fiscal adjustment. We here abstract from inflation and interest rate feedback to the government budget not because doing so is realistic, but because in our quantitative analysis the feedback through tax revenue is most important, and so we design our theoretical analysis to most cleanly speak to that margin. That said, as we will see, our results (in Section 3) on how fiscal adjustment delays shape macroeconomic dynamics actually apply entirely independently of *why* there is a budgetary shortfall, and so also generalize to interest rate and inflation effects; we will furthermore of course incorporate these (smaller) effects in our quantitative analysis in Section 6.

2.3 Monetary policy

The final actor in our model is the monetary authority. We consider a flexible inflation-targeting central bank that seeks to attain both standard dual-mandate goals and interest rate stability, as in Woodford (2003) and as is typical applied work on monetary policy evaluation (e.g., as considered in the Federal Reserve Tealbook, 2016). Specifically, the central bank loss is

$$\frac{1}{2}\mathbb{E}\left[\sum_{t=0}^{\infty}\beta^t\left\{\lambda_\pi\pi_t^2+\lambda_y y_t^2+\lambda_r r_t^2\right\}\right], \tag{6}$$

where $\mathbb{E}[\cdot]$ averages over the realizations of aggregate shocks $\{v_t, u_t\}_{t=0}^{\infty}$ at the beginning of period 0.

The objective function (6) is not microfounded, but empirically relevant as a positive description of actual central bank behavior. First, the objective to minimize fluctuations in inflation and output follows straight from the typical mandates of modern central banks. Second, central banks are often unwilling or unable to move interest rates abruptly to perfectly achieve those objectives, be it because of constraints (like the zero lower bound), a mandated desire to avoid excess interest rate volatility, financial stability considerations (Stein and Sunderam, 2018), or uncertainty about the transmission of its policy instrument (in the Brainard, 1967, sense).[5] Whatever the reason, our analysis will reveal how and how much different fiscal actions are aligned with and thus support a monetary authority in

[5] An explicit objective for interest rate stability is, in fact, directly mandated in Section 2A of the Federal Reserve Act: "so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."

attaining its objectives.

The central bank's optimal policy problem is to choose the path of its policy instrument, real interest rates $\{r_t\}_{t=0}^{\infty}$, to minimize the loss function (6) subject to constraints imposed by the (optimal) behavior of other entities: aggregate demand (2), aggregate supply (3), as well as the fiscal budget and tax rules (4) - (5), given the economy's shocks.[6] We consider a central bank with commitment, and so the path of real interest rates is allowed to depend on aggregate shocks arbitrarily flexibly. As usual, the solution to this optimal policy problem will take the form of as "implicit targeting rule" or "forecast target criterion" (as, e.g., discussed in Benigno and Woodford, 2003). Our quantitative analysis in Section 6 will instead consider a central bank that chooses, and has a loss function that features, the short-run *nominal* (rather than real) rate of interest.

2.4 Equilibrium definition

The economy begins in the deterministic steady state. Then, at date 0, an unexpected path of aggregate shocks $\{v_t, u_t\}_{t=0}^{\infty}$ is realized, and no further shocks occur afterwards; we restrict the paths of the shocks to be square-summable, and thus in particular bounded.[7] By familiar arguments, the resulting perfect-foresight transition paths can be interpreted as impulse response functions to stochastic shocks, and as such all of our results extend immediately to the analogous linearized economy with repeated stochastic disturbances. Our weak assumptions on the shock processes imply that our analysis will yield impulse responses for arbitrary MA(∞) processes; we will usually opt for such generality, but occasionally specialize our results to assume AR(1) disturbances.

We can now define an equilibrium. We will proceed in two steps, first defining an equilibrium for *arbitrary* monetary policy, before then turning to optimal monetary policy conduct.

Definition 1. Given paths of aggregate shocks $\{v_t, u_t\}_{t=0}^{\infty}$ and bounded real interest rates $\{r_t\}_{t=0}^{\infty}$, an equilibrium is a bounded path $\{y_t, \pi_t, d_{t+1}, t_t\}_{t=0}^{\infty}$ for output, inflation, public debt, and tax revenue that satisfies aggregate demand (2), aggregate supply (3), the law of motion for public debt (4), the government's no-Ponzi condition, and the tax rule (5).

In Section 3, we ask how changes in τ_d shape macroeconomic outcomes *given* monetary policy, i.e., given a path of real rates, allowing us to cleanly isolate the effects of changes in the pace of fiscal consolidation. That analysis will thus leverage Definition 1. The remainder of the paper assumes that monetary policy is instead set optimally, and studies how changes in τ_d affect the associated loss $\mathscr{L}_{CB}$.

[6] Note that, as long as there is any price stickiness (i.e., as long as $\kappa < \infty$), perfect control of real interest rates is feasible, thus allowing us to write the central bank's problem directly in terms of real interest rates.

[7] By boundedness for a variable x we mean that there exists some $M > 0$ such that $|x_t| < M$ for all dates t.

Definition 2. Given paths of aggregate shocks $\{v_t, u_t\}_{t=0}^{\infty}$, the optimal monetary policy equilibrium $\{y_t^*, \pi_t^*, d_{t+1}^*, t_t^*\}_{t=0}^{\infty}$ is the one that minimizes the central bank's loss function (6) among *all* equilibria. $\{r_t^*\}_{t=0}^{\infty}$ is the associated optimal monetary policy path and $\mathscr{L}_{CB}$ is associated central bank loss.

Note that the optimal monetary policy equilibrium $\{r_t^*, y_t^*, \pi_t^*, d_{t+1}^*, t_t^*\}_{t=0}^{\infty}$ is a function both of the underlying sequence of shocks and of the speed of fiscal adjustment $\tau_d \in [0,1]$; to ease the notation we suppress this dependence. In Sections 4 and 5 we analytically characterize properties of the optimal monetary policy equilibrium, focusing in particular on how the speed of fiscal adjustment τ_d shapes optimal policy design and the central bank loss. We do the same in our quantitative analysis in Section 6, but there for a model environment that substantially generalizes that considered here, in all facets—the demand block, the supply block, the fiscal rule, and the monetary policy objective.

3 The macroeconomic effects of delayed fiscal adjustment

This section presents our main "building block" results on how fiscal adjustment rules, and in particular the pace of fiscal consolidation, shape the propagation of shocks to the macro-economy. Throughout this section we keep monetary policy fixed, in the sense that the path of real rates $\{r_t\}_{t=0}^{\infty}$ is taken as given; doing so allows us to cleanly isolate the *incremental* effect of changes in the speed of fiscal adjustment τ_d on aggregate outcomes.

We begin with some preparatory discussion on equilibrium existence and uniqueness, before then turning to the main results. For most of this section we cast our results in terms of the effects of fiscal adjustment delays on the propagation of particular, primitive macroeconomic shocks. The analysis will reveal, however, that what actually matters is not *why* the government budget is affected, just by *how much*. We thus at the end briefly generalize our results to the effects of fiscal adjustment delays after arbitrary budgetary shortfalls.

3.1 Equilibrium existence and uniqueness

Throughout this section we study equilibria as defined in Definition 1. As a necessary backdrop for our analysis we here begin with results on equilibrium existence and uniqueness, extending our earlier work in Angeletos, Lian and Wolf (2024, 2025).

Lemma 1. *Suppose that* $\omega < 1$ *and* $\tau_d \in [0,1)$.[8] *There exists a unique equilibrium for every (bounded) path of real interest rates* $\{r_t\}_{t=0}^{\infty}$ *and aggregate shocks* $\{v_t, u_t\}_{t=0}^{\infty}$. *In this equilibrium, the equilibrium*

[8] When $\tau_d = 1$, there are potentially multiple equilibria; we will throughout focus on the unique one selected by the limit as $\tau_d \to 1$.

path of output depends on the demand shock and the real interest rate $\{v_t, r_t\}_{t=0}^{\infty}$*, but not on the supply shock* $\{u_t\}_{t=0}^{\infty}$*, and is given by*

$$y_t = \sum_{s=0}^{\infty} \mathscr{Y}_{t,s}(v_s + r_s), \quad t \geq 0. \tag{7}$$

For each (t,s)*,* $\mathscr{Y}_{t,s}$ *is the date-*t *output impulse response to a one-off, date-0 news shock to date-*s *aggregate demand. These impulse responses are continuous in the speed of fiscal adjustment* τ_d*.*

Lemma 1 establishes equilibrium existence and uniqueness given any bounded path of real interest rates. For future reference, we also note a useful implication for optimal monetary policy: letting $\{r_t^*\}_{t=0}^{\infty}$ denote the optimal monetary policy path, the optimal monetary policy equilibrium can be implemented uniquely through the nominal interest rate rule $i_t = r_t^* + \mathbb{E}_t[\pi_{t+1}]$.[9]

(7) characterizes the impulse response of output to arbitrary paths of real interest rates as well as demand and supply shocks. The lemma reveals that real rates and demand shocks under our assumptions propagate identically, and furthermore that, conditional on real rates, output is entirely independent of supply shocks, as familiar from prior work in RANK (see Woodford, 2011).[10] The main results of this section, to be discussed next, establish properties of these shock impulse responses, i.e., of the $\mathscr{Y}_{t,s}$'s. The irrelevance of the supply side conditional on real interest rates immediately implies that these properties will be independent of the shape of the NKPC and of whether fiscal adjustments are lump-sum or distortionary, as we previewed earlier in Sections 2.1 - 2.2.

3.2 Budgetary shortfalls and fiscal adjustment delays

We now turn to our key result on how, following a budgetary shortfall, delays in fiscal adjustment boost economic activity, all the way to perfect (present-value) stabilization in the case of fiscal inaction.

Our analysis proceeds in three steps. We begin by characterizing the effects of fiscal adjustment speed on the propagation of demand and supply shocks in our model. We then explain the economic mechanism, which suggests that our conclusions should in fact apply generically to *any* disturbance that causes a budgetary shortfall. We finally prove this most general result. Throughout we relate our discussion to the literature on automatic stabilizers (McKay and Reis, 2016), revealing that the *static* effects of such stabilizers are very potently *dynamically* amplified through slow fiscal adjustment.

Fiscal adjustment and shock impulse responses. Our first proposition shows how changes in the systematic fiscal adjustment rule—summarized by the speed of fiscal adjustment τ_d—shape impulse

[9] To be precise, by unique implementation we mean uniqueness within the set of bounded equilibria, per Definition 1. The question of global determinacy is outside the scope of this paper and does not affect the characterization of the optimum or its comparative statics.

[10] This property also extends to more general HANK models (e.g., Auclert, Rognlie and Straub, 2024) provided that inflation and supply shocks do not have distributional effects.

responses in our economy.

Proposition 1. *Suppose that $\omega < 1$. The output impulse response $\mathscr{Y}_{t,s}$ has the following properties.*

1. *For all impulse response and shock news horizons $t, s \geq 0$, the output impulse response $\mathscr{Y}_{t,s}$ increases with a delay in fiscal adjustment (decreases with $\tau_d \in [0,1]$), i.e., $\frac{\partial \mathscr{Y}_{t,s}}{\partial \tau_d} < 0$.*

2. *For all shock news horizons $s \geq 0$, the cumulative output impulse response $\sum_{t=0}^{\infty} \beta^t \mathscr{Y}_{t,s}$ increases with a delay in fiscal adjustment (decreases with $\tau_d \in [0,1]$) and converges to zero as $\tau_d \to 0$.*

Recall that $\mathscr{Y}_{t,s}$ is the impulse response of output to a *contractionary* aggregate demand shock. The first part of Proposition 1 establishes that lowering τ_d (i.e., delaying fiscal adjustment) unambiguously *increases* output for all impulse response and shock horizons $t, s \geq 0$. The result is surprisingly general: not only does it apply uniformly across the entire impulse response path (all t), it also holds for shocks at all horizons (all s), and thus extends to contractionary demand disturbances with arbitrary stochastic properties. This is the promised formalization of our claim that delaying fiscal adjustment robustly and endogenously stabilizes the macro-economy. The second part of the proposition then zeros in on the *cumulative* output response: lowering τ_d uniformly shifts up the entire path, and the limiting cumulative impulse response (as $\tau_d \to 0$) is necessarily *zero*, corresponding to perfect stabilization in a present value sense. This result again applies for all shock horizons s, and thus extends to disturbances with arbitrary stochastic time profiles.

Given these impulse responses for output, the resulting path of inflation is immediate:

Corollary 1. *For a given (bounded) path of aggregate shocks and real interest rates $\{v_s, u_s, r_s\}_{s=0}^{\infty}$, the path of inflation in the unique equilibrium satisfies, for all $t \geq 0$,*

$$\pi_t = \sum_{s=0}^{\infty} \kappa \mathscr{Y}_{t,s} (v_s + r_s) + u_t, \quad t \geq 0, \tag{8}$$

The corollary combines the economy's NKPC (3) with the equilibrium path of output to deliver the equilibrium path of inflation. As usual, given a fixed path of real interest rates, inflation is directly and one-to-one impacted by the supply shock, u_t. Output affects inflation proportional to the NKPC slope κ. It follows that, in response to recessionary shocks, delays in fiscal adjustment, by stabilizing economic activity, also increase inflation by raising demand. We note that this corollary can and will change when fiscal adjustments are instead distortionary, as will be discussed in Section 5.1.

The remainder of this section digs deeper into the mechanism underlying Proposition 1, culminating in a generalization of that result to *arbitrary* shocks causing a shortfall in the government budget.

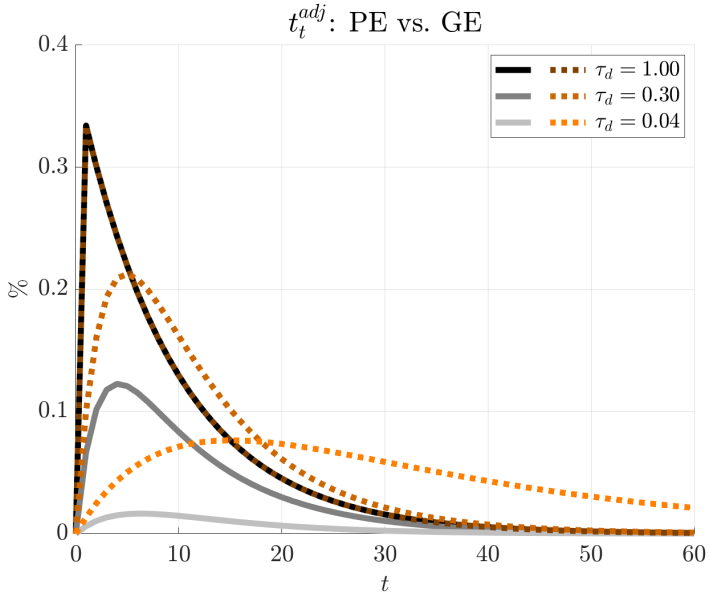


Figure 1: The solid gray lines show impulse responses of fiscal adjustments t_t^{adj} to a contractionary demand shock for different τ_d's. The dashed orange lines show the fiscal adjustment path corresponding to the different τ_d's but fixing the output path at the impulse response under $\tau_d = 1$.

Illustration and explanation. We provide an illustration of Proposition 1 in Figures 1 - 2, which show impulse responses of fiscal adjustment (t_t^{adj}), output (y_t), and government debt (d_t) to a persistent, AR(1) demand shock under different assumptions on fiscal adjustment speed (τ_d). The right panel of Figure 2 furthermore shows the cumulative output and fiscal adjustment impulse responses.[11]

To understand the effects of fiscal adjustment speed it is instructive to begin with the case of fast fiscal adjustment, i.e., $\tau_d = 1$. The contractionary demand shock by construction depresses consumer spending in the short run, lowering output and thus, through the automatic stabilizer $\tau_y > 0$, tax revenue. Since fiscal adjustment is fast, this necessitates a quick hike in taxes, shown as the solid black line in Figure 1. This quick tax hike in turn reinforces the demand shock-driven contraction, dynamically undoing the stabilizing effects of the automatic tax feedback through $\tau_y > 0$. The end result is materially and persistently depressed output, visible in the left panel of Figure 2. In net present value terms, output thus drops, and budgetary balance necessitates sharp fiscal adjustment—the right edge (corresponding to $\tau_d = 1$) in the right panel of Figure 2. Finally, the fast tax hike implies that government debt returns to steady state relatively quickly (middle panel).

We now turn to our main question: what happens if τ_d is lowered? Consider first the orange dotted lines in Figure 1, which show the fiscal adjustment path under smaller τ_d but counterfactually keeping

[11] The figure uses a simple example parameterization of our model; the exercise is purely illustrative, so magnitudes should not be taken seriously. For our purposes, it is important that households are non-Ricardian ($\omega = 0.7/\beta$ to deliver an MPC of 30 per cent) and automatic stabilizers are non-trivial ($\tau_y = 1/3$). The demand shock is furthermore persistent, following an AR(1) with persistence 0.9.

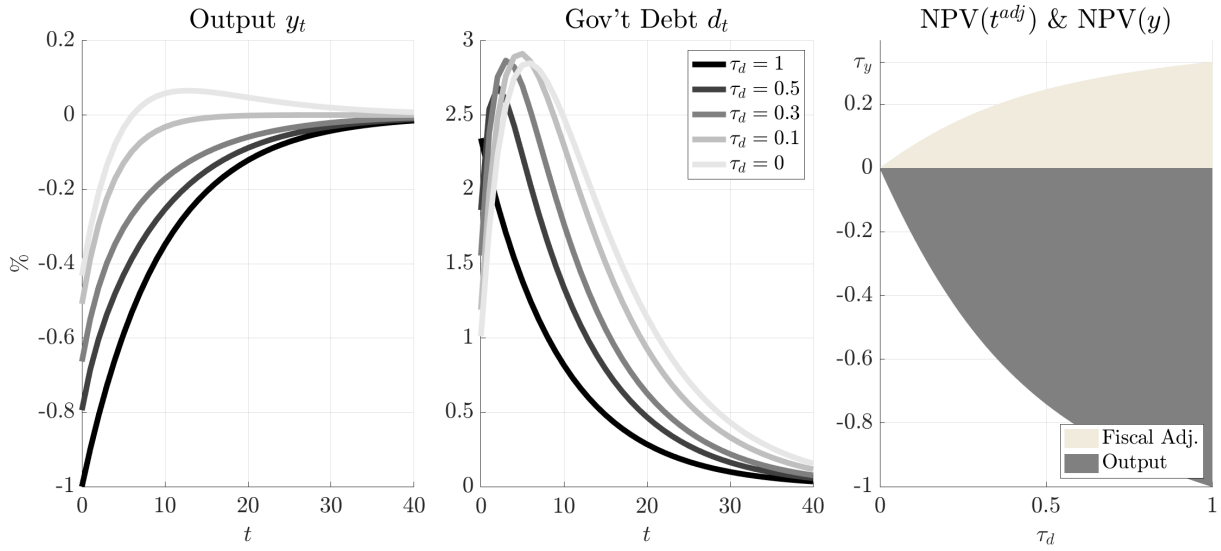


Figure 2: Impulse responses of output and government debt (left and middle panels) to a contractionary demand shock for different τ_d's (solid shades of grey). The right panel shows the net present value of the output and fiscal adjustment impulse responses, all normalized relative to the cumulative output impulse response for $\tau_d = 1$.

the output path at its equilibrium level under $\tau_d = 1$. Seeing how these lines change with τ_d reveals the direct, or partial equilibrium, effect of delaying fiscal adjustment: the tax path is shifted rightwards, but—by the government budget—the present value of the overall fiscal adjustment is unchanged. If households were permanent-income (i.e., $\omega = 1$), then this delay in tax hikes would be the only effect of lowering τ_d, with equilibrium output unaffected. If instead households are non-Ricardian (i.e., $\omega < 1$), then postponing tax hikes is expansionary, as any far-ahead tax hikes are discounted and do not affect spending today. This is exactly what the lighter grey lines in Figures 1 - 2 reveal: the endogenous delay in tax hikes boosts output (left panel in Figure 2), raising fiscal revenue through τ_y and thereby endogenously lessening the equilibrium fiscal adjustment (Figure 1) while still stabilizing government debt (middle panel in Figure 2). Intuitively, with small τ_d, the static automatic stabilizer ($\tau_y > 0$) is not offset through fast subsequent tax hikes, providing material stabilization not just statically but also *dynamically*, with lower tax burdens leading to persistently elevated demand. This mechanism of dynamic stabilization is also reminiscent of the "forward guidance" effects of monetary policy (as in Eggertsson and Woodford, 2003): debt and so output are allowed to increase and in fact overshoot tomorrow, thus providing additional stabilization today.

How strong can this dynamic amplification of the familiar static automatic stabilizer be? The right panel of Figure 2 gives the answer, showing the net present value of the output impulse response (in grey) as a function of τ_d. We there see that, the smaller τ_d and so the slower the fiscal adjustment, the smaller is the demand shock-induced recession, limiting to a present value of exactly zero as $\tau_d \to 0$.

This limit—and actually the broader discussion of the previous paragraph—can be understood as revealing how the "self-financing" mechanism analyzed in our previous work (Angeletos, Lian and Wolf, 2024), there studied for fiscal *shocks*, operates to shape how changes in endogenous fiscal feedback *rules* affect the macro-economy as a whole.[12] As illustrated in Figure 1, switching the fiscal rule from fast to slow adjustment is equivalent to an incremental expansionary fiscal shock, financing a tax cut today with higher taxes in the future. "Self-financing" of such an endogenous tax cut simply means that the future output boom raises exactly enough fiscal revenue to finance the budgetary costs of the initial recession: if the initial demand shock is not accommodated through increases in taxes, then we in general equilibrium *must* observe the initial contraction followed by an equally large boom, delivering the zero present value conclusion. The easiest way to see this limit is from the intertemporal government budget constraint:

$$\sum_{t=0}^{\infty}\beta^t t_t = \tau_y \sum_{t=0}^{\infty}\beta^t y_t + \sum_{t=0}^{\infty}\beta^t \underbrace{\tau_d d_t}_{t_t^{\text{adj}}} = 0. \tag{9}$$

In words, in any equilibrium, the present value of primary surpluses must be zero. Since, even with $\tau_d \to 0$, government debt converges back to steady state, it follows from (9) that, as $\tau_d \to 0$, the present value of fiscal adjustment, $\sum_{t=0}^{\infty}\beta^t t_t^{\text{adj}}$, and thus also of output, $\sum_{t=0}^{\infty}\beta^t y_t$, must converge to zero—i.e., the claimed full stabilization in a present value sense. We conclude that, when coupled with delays in fiscal adjustment, the familiar static automatic stabilizer becomes extremely powerful, providing perfect stabilization in a net present value sense.

A generalization—generic budgetary shortfalls. Zooming out, we note that nothing in the foregoing discussion really hinged on *why* there was a budgetary shortfall in the first place—we only leveraged the simple idea that postponing any required amount of tax hikes endogenously stimulates the economy and raises fiscal revenue, thus endogenously lessening the actually (in equilibrium) needed fiscal adjustments. This suggests that our "dynamic automatic stabilizer" logic should actually extend to generic budgetary shortfalls. We confirm this conjecture through the following exercise. We suppose that the fiscal rule is just as considered above (for a baseline τ_d), but then, at some date H, the fiscal adjustment coefficient changes to $\tau_{d,H}$, i.e., the rule (5) is, for $t = H$, replaced by

$$t_H = \tau_y y_H + \tau_{d,H} d_H + \beta \frac{D^{ss}}{Y^{ss}} r_H. \tag{10}$$

We then ask how changes in $\tau_{d,H}$ away from τ_d affect the economy. This thought experiment is ideal as it allows us to cleanly isolate the causal effects of tax responses to endogenous budgetary shortfalls at arbitrary horizons H. We arrive at the following characterization of the effects of $\tau_{d,H}$.

[12] The formal connection between policy shocks and rules in general linearized model environments is explored in McKay and Wolf (2023). Our argument in Proposition 2 below explicitly leverages this connection.

Proposition 2. *Suppose that* $\omega < 1$ *and that the fiscal authority follows the rule* (5) $t \neq H$ *and* (10) *for* $t = H$*. Furthermore suppose that the paths of real interest rates* $\{r_t\}_{t=0}^{\infty}$ *and aggregate shocks* $\{v_t, u_t\}_{t=0}^{\infty}$ *are such that, for* $\tau_{d,H} = \tau_d$*, the date-*H *value of government debt is strictly positive, i.e.,* $d_H > 0$*. Then the equilibrium path of output satisfies, for all* $t \geq 0$*,*

$$\left.\frac{\partial y_t}{\partial \tau_{d,H}}\right|_{\tau_{d,H}=\tau_d} < 0. \tag{11}$$

Proposition 2 formalizes the intuition that, whatever the reason for a fiscal budgetary shortfall, and whatever the horizon of that shortfall, delaying endogenous fiscal adjustment in response boosts the macro-economy. The premise of the proposition is that, for whatever reason, debt at horizon H is elevated. As soon as that is the case, delaying fiscal adjustment at horizon H—i.e., marginally lowering $\tau_{d,H}$—uniformly boosts output, before, at, and after date H. The proof of the proposition furthermore exactly reflects our explanations above: delaying fiscal adjustment is shown to be formally equivalent to an expansionary date-H fiscal deficit shock, and such shocks are uniformly expansionary. In addition to substantiating our discussion from above, this result will also prove useful for our quantitative explorations in Section 6, where we allow for inflation and interest rates to also effect budgetary shortfalls (or surpluses), and thus d_t. By Proposition 2, not responding to such shortfalls with fiscal adjustment will necessarily be stimulative, and of course *vice versa* for budgetary surpluses.

Summary and outlook. The analysis in this section has established our key positive building block result, on how the fiscal rule—and in particular the interaction of automatic stabilizers τ_y and fiscal consolidation τ_d—shapes macroeconomic dynamics. The remainder of the paper is dedicated to working out implications of this result for monetary policy design, proceeding in three steps. First, in Section 4, we continue to assume that taxes are lump-sum, and ask whether—depending on the primitive underlying shock—fiscal inaction aids or hurts the central bank in its objectives. Second, in Section 5, we repeat the same analysis when taxes are distortionary. We in particular there zero in much more on the implications of the fiscal adjustment path for inflation, both through output and directly through taxes. And third, in Section 6, we provide a quantitative assessment in a much-extended model variant.

4 The demand channel of fiscal support

We now turn to our main questions of interest: what kind of fiscal support does a central bank want, and could fiscal *in*action possibly aid the central bank? Throughout this section we maintain the assumption of lump-sum fiscal adjustments, so any delays in the response of taxes to deficits will operate solely through the aggregate demand stabilization channel studied in the previous section.

Our discussion will be organized around an envelope theorem expression for how changes in the speed of fiscal adjustment, i.e., of τ_d, shape the loss of the central bank. We split our analysis by type of primitive shock, beginning with demand and then turning to supply.

4.1 An envelope theorem for monetary policy

We return to the central bank problem described in Section 2.3. Using an envelope theorem argument, we connect the sensitivity of the central bank's loss, $\mathscr{L}_{CB}$, to the fiscal adjustment parameter τ_d with objects characterized in Section 3.2.

Proposition 3. *The sensitivity of the central bank's loss $\mathscr{L}_{CB}$ to the speed of fiscal adjustment $\tau_d \in [0,1]$ satisfies*

$$\frac{\partial \mathscr{L}_{CB}}{\partial \tau_d} = \mathbb{E}\left[\frac{1}{2}\sum_{t=0}^{\infty}\beta^t\left\{\left(\lambda_\pi \kappa \pi_t^* + \lambda_y y_t^*\right)\left(\sum_{s=0}^{\infty}\frac{\partial \mathscr{Y}_{t,s}}{\partial \tau_d}\left(v_s + r_s^*\right)\right)\right\}\right] \tag{12}$$

where $\{r_t^*, y_t^*, \pi_t^*, d_{t+1}^*, t_t^*\}_{t=0}^{\infty}$ are equilibrium paths under optimal monetary policy (as in Definition 2) and $\{\mathscr{Y}_{t,s}\}_{t,s\geq 0}$ is as characterized in Proposition 1.

Proposition 3 will guide our discussion in the remainder of this section. It reveals that, to gauge whether a change in the pace of fiscal consolidation will help or hurt the central bank, it suffices to know the responses of output, inflation, and real interest rates in that equilibrium. Combining those with our prior results on $\mathscr{Y}_{t,s}$ will then inform us about the sign of (12) and thus allow us to answer our question of interest. We will in particular seek to evaluate whether the loss is monotone in τ_d across all of $[0,1]$, or whether the derivative switches sign anywhere.

4.2 Demand shocks

We begin with shocks to aggregate demand, $\{v_t\}_{t=0}^{\infty}$, proceeding in three steps: we first give some general intuition, then present numerical explorations, and finally turn to analytical results. Throughout, we will anchor our discussion around (12). Supply shocks are set to zero (i.e., $u_t = 0$ for all $t \geq 0$), while the demand shock path is unrestricted (beyond square-summability).

Intuition. Consider a contractionary shock to aggregate demand (i.e., $v_t > 0$, at least temporarily). If the central bank is able to perfectly and instantaneously adjust real rates to stabilize aggregate demand (i.e., $\lambda_r = 0$), then our environment echoes the familiar textbook conclusion: as long as fiscal adjustment is strong enough to bring government debt back to steady state, its speed is otherwise irrelevant.[13] In the practically relevant case of imperfect stabilization (i.e., $\lambda_r > 0$), the envelope con-

[13] In our environment, since the budgetary effects of interest rates are immediately offset, any speed of fiscal adjustment $\tau_d \in [0,1]$ can support the optimum, as output and thus tax revenue does not move in equilibrium. More general model variants require $\tau_d > 1-\beta$, as familiar from RANK.

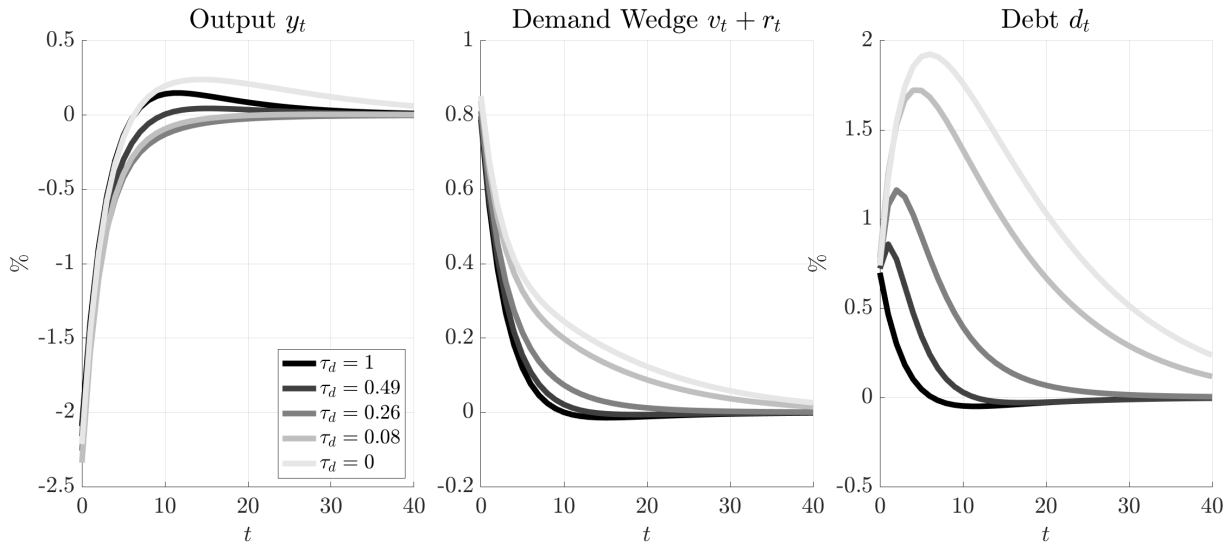


Figure 3: Impulse responses of output, the demand wedge, and government debt to a contractionary demand shock for different τ_d's (solid shades of grey) under optimal monetary policy.

dition (12) together with our results in Section 3 instead suggest that slow fiscal adjustment—perhaps even all the way to fiscal *in*action—may be desirable: at least in the short run, $v_s + r_s$ is likely positive (since interest rates are not cut enough) while $\lambda_\pi \kappa \pi_t^* + \lambda_y y_t^*$ is likely negative (since stabilization is imperfect), and so, with $\frac{\partial \mathscr{Y}_{t,s}}{\partial \tau_d} < 0$, we would expect the overall derivative to be positive. In words, we saw in Section 3 that a delay in fiscal consolidation endogenously (and very powerfully) moderates recessionary pressures, thus supporting the central bank in its objectives.

This basic intuition leaves two questions unanswered, however. First, there is an offsetting force: delayed fiscal adjustment necessarily causes subsequent overheating (recall Figure 2 as well as the zero present value result), dynamically destabilizing the economy—a trade-off familiar from the forward guidance literature (Eggertsson and Woodford, 2003). Second, the discussion is qualitative, and thus silent on how far (if at all) fiscal adjustment should be delayed. In the remainder of the section we will explore these subtleties, first through numerical illustrations and then analytically.

Numerical explorations. We provide a visual illustration in Figures 3 - 4, using the same model parameterization and the same AR(1) demand shock as in Section 3, and assuming equal weights in the central bank objective on output, inflation, and interest rates, as is typical in practice (e.g., see Federal Reserve Tealbook, 2016). The purpose of this discussion is purely illustrative; we will later argue both analytically (later in this section) and quantitatively (in Section 6) that the case depicted here is of general practical relevance.

Together, Figures 3 - 4 suggest that the intuition given in the previous paragraph is potent: slower fiscal adjustment stabilizes the economy and is unambiguously desirable for the central bank, all the

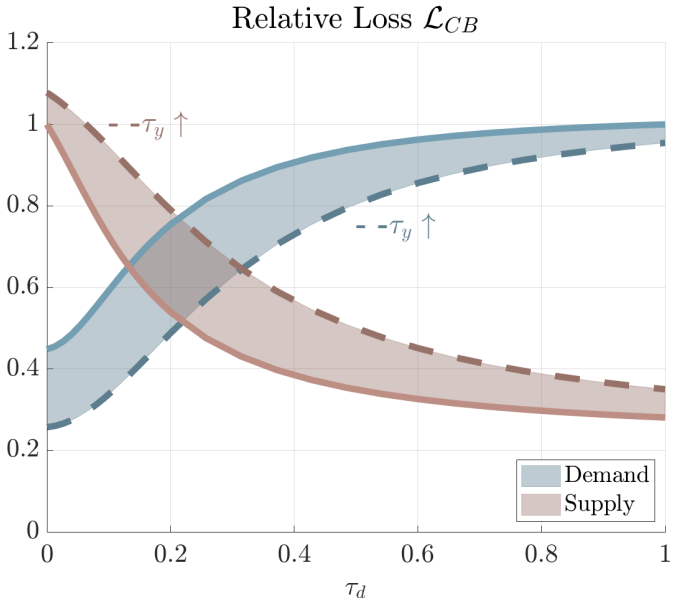


Figure 4: Minimized central bank loss $\mathscr{L}_{CB}$ as a function of τ_d for demand shocks (blue) and supply shocks (red), for a baseline (solid) and higher (dashed) level of the static automatic stabilizer τ_y.

way to the *absence* of fiscal adjustment ($\tau_d = 0$). Figure 3 begins by showing impulse responses of output y_t^*, the demand wedge $v_t + r_t^*$, and government debt d_t^* in the optimal monetary policy equilibrium for different values of τ_d. If fiscal adjustment is fast, then interest rates are cut relatively aggressively, though insufficiently to stabilize output: the demand wedge is positive (middle panel), and output declines (left panel). As fiscal adjustment is delayed, the initial contraction is dampened, and there is some dynamic output overshooting (left panel), even though interest rates are now adjusted by much less and so the demand wedge remains larger (middle panel). All of this is intermediated through a persistently elevated (but still ultimately stable) path of government debt (right panel). The solid blue line in Figure 4 then translates these impulse responses into the central bank loss: we see that the loss is increasing in τ_d, and, crucially, here in fact over all of $\tau_d \in [0,1]$. We next turn to an analytical discussion to understand why *complete* inaction is desirable here, and how robust that result is likely to be. That discussion will also comment on the blue dashed line in Figure 4, which corresponds to larger τ_y (i.e., a larger static automatic stabilizer).

Analytical results. We now present two analytical results that explain why the conclusions displayed in Figures 3 - 4—that slow and in fact even absent fiscal adjustment is desirable—are not automatic, but nevertheless quite typical and thus robust. We begin by considering a restricted special case of our model, with two key properties. First, the demand shock v_t is now fully transitory, lasting only for one period. Second, the monetary and fiscal authority together can frictionlessly implement perfect stabilization of the economy after $t = 2$, i.e., $y_t = \pi_t = r_t = d_{t+1} = 0$ for all $t \geq 2$. All interesting dynam-

ics thus occur only at dates 0 and 1; as it turns out, studying this simplified environment suffices to characterize the main forces shaping our results. We provide a complete closed-form characterization of equilibrium dynamics in this restricted economy in Appendix A.4, and only summarize the main result here, in the form of a proposition.

Proposition 4. *Suppose that $\omega < 1$. The central bank loss $\mathscr{L}_{CB}$ in the restricted, two-period, problem following a date-0, one-off demand shock v_0 is increasing in τ_d over $[0,1]$ if and only if*

$$\tau_y \leq \frac{\beta\omega}{(1-\beta\omega)(1-\omega)}. \tag{13}$$

If this condition holds, then the loss is minimized for $\tau_d = 0$.

The two takeaways from Proposition 4 are, first, that monotonicity in τ_d over the entire $[0,1]$ range is *not* automatic but relies on condition (13), and second, that this condition is very loose, and easily satisfied for standard values of τ_y (around 0.3) and ω (around 0.8). The intuition for the condition is as follows. As discussed in Section 3, delaying fiscal adjustment stabilizes output today (at $t = 0$) with subsequent overshooting (here at $t = 1$). If τ_y is small, then the date-0 output drop is significant, and the subsequent overshooting is small, so lowering τ_d all the way to zero is desirable. If instead τ_y is large and so static automatic stabilization is powerful, then output is already relatively stable at $t = 0$, and delayed fiscal adjustment achieves some further stabilization at the cost of a large subsequent overshoot at $t = 1$, increasing the central bank's loss.[14]

We can establish the presence of the exact same forces in our general model. The following proposition does so, giving sufficient conditions for monotonicity of the central bank loss in τ_d across $[0,1]$.

Proposition 5. *Suppose that $\omega < 1$. Furthermore suppose that $\beta = 1$, $\lambda_r = \infty$ (so that real interest rates are fixed), and that the demand shock follows an AR(1) process. Then, if τ_y is sufficiently small,*

$$\frac{\partial \mathscr{L}_{CB}}{\partial \tau_d} < 0 \quad \textit{for all } \tau_d \in [0,1].$$

Proposition 5 captures the same intuition as before, now generalized back to our baseline infinite-horizon economy, but with auxiliary assumptions on the shock process and central bank objective. If τ_y is sufficiently small, then static automatic stabilization alone is weak, and so dynamic stabilization through delayed fiscal adjustment is necessarily welcome. If τ_y instead is large, then static automatic stabilization of the initial recession is already strong, and delayed fiscal adjustment leads to quick and

[14] Formally, the envelope theorem expression in this case can be shown to become

$$\frac{\partial \mathscr{L}_{CB}}{\partial \tau_d} \propto \frac{\partial \mathscr{Y}^d_{0,1}}{\partial \tau_d} \mathbb{E}\left[\left(y_0^* + \left(1 + \frac{(1-\beta\omega)(1-\omega)\tau_y}{\beta\omega}\right)\beta y_1^*\right)\left(\left(1 + \frac{(1-\beta\omega)(1-\omega)\tau_y}{\beta\omega}\right)(e_0 + r_0^*) + r_1^*\right)\right].$$

where still $\frac{\partial \mathscr{Y}^d_{0,1}}{\partial \tau_d} < 0$. If (13) is violated then first term in the expectation becomes positive for small but still positive values of τ_d, flipping the sign of the derivative.

significant output overshooting. Visually, we see this conclusion reflected in the blue-dashed line in Figure 4, which shows the central bank loss for a larger value of τ_y. Naturally the loss is now uniformly lower, since the static automatic stabilizers already provide stronger output support. Furthermore, and echoing the present discussion, the slope of the loss in τ_d is somewhat shallower (for small τ_d): there is already stronger static automatic stabilization through τ_y, so there is now less need to supplement it through the forward guidance-like dynamic effects of small τ_d. However, consistent with (13), implausibly large values of τ_y would be needed to actually lead to a sign flip.

Summary. The takeaway of this section is that, following demand shocks, delays in fiscal adjustment are not automatically, but in practice very likely, supportive of the central bank. We have seen that this conclusion relies on two key, and empirically relevant, ingredients: first, that contractions in economic activity lead to a budgetary shortfall, so that adjustment delays stabilize the economy; and second, that static automatic stabilizers alone are relatively weak. Once the second condition is satisfied, the forward guidance-like stabilizing effects of fiscal inaction are welcome, with stabilization benefits today outweighing overshooting costs tomorrow. We will later, in Section 6, affirm the relevance of these conclusions in a much richer quantitative variant of our model.

4.3 Supply shocks

We now turn to shocks to aggregate supply, $\{u_t\}_{t=0}^{\infty}$, proceeding as before: first general intuition, then numerical explorations, and finally analytical results. Demand shocks are set to zero (i.e., $v_t = 0$ for all $t \geq 0$), while the supply shock path is unrestricted (beyond square-summability).

Intuition. Consider a stagflationary aggregate supply shock (i.e., $u_t > 0$, at least temporarily). In the absence of a central bank reaction (i.e., without real interest rates changing in response), these cost-push supply shocks pass through one-to-one into inflation, without output changing (recall Corollary 1). If the central bank is able to perfectly and instantaneously adjust real interest rates (i.e., if $\lambda_r = 0$), then we again get the familiar textbook conclusion about the optimal dual-mandate equilibrium: real interest rates are increased, depressing output and thereby reducing inflation. In the empirically relevant case of imperfect real interest rate adjustment (i.e., $\lambda_r > 0$), we would now expect slow fiscal adjustment to be undesirable. In the envelope condition (12), both the demand wedge r_t^* (since real rates are increased) and the term $\lambda_\pi \kappa \pi_t^* + \lambda_y y_t^*$ (since the output contraction only partially stabilizes inflation) are likely positive, and so, with $\frac{\partial \mathcal{Y}_{t,s}}{\partial \tau_d} < 0$, the overall derivative will be negative. Intuitively, more delayed fiscal adjustment endogenously stabilizes output, counteracting the central bank's efforts to raise rates and depress output to reduce inflation. We also note that now there is no dynamic ambiguity: a slowdown in the pace of fiscal consolidation boosts output today and in the future, and

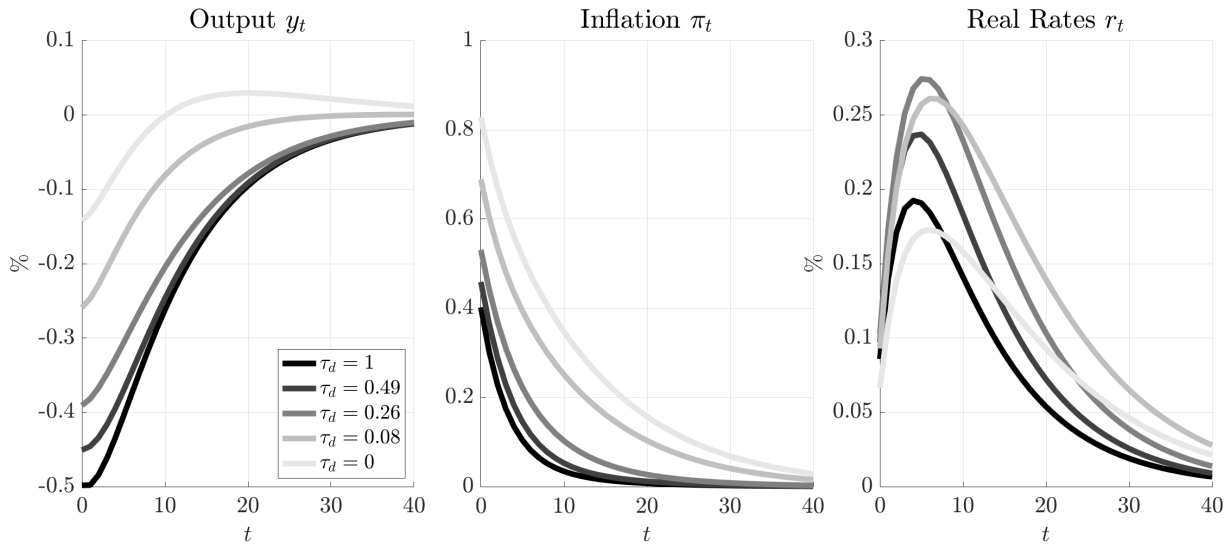


Figure 5: Impulse responses of output, the demand wedge, and government debt to a stagflationary supply shock for different τ_d's (solid shades of grey) under optimal monetary policy.

now *both* act against the central bank's objectives.

The preceding intuition suggests that fast fiscal adjustment, in fact all the way to $\tau_d = 1$, should be robustly desirable following supply shocks, at least in the present environment with lump-sum fiscal adjustments. The remainder of the section substantiates this view.

Numerical explorations. We provide a visual illustration in Figures 4 - 5, using the same model parameterization as in our previous analysis of demand shocks, now for a persistent AR(1) supply disturbance (again with persistence 0.9). As before the purpose is illustration, not quantitative realism.

The two figures reveal, consistent with the preceding intuition, that *faster* fiscal adjustment is now indeed desirable for the central bank. Figure 5 shows impulse responses to supply shocks in the optimal monetary policy equilibrium for different values of the fiscal adjustment speed τ_d. If fiscal adjustment is slower, then output contracts by less, so inflation spikes by more. Intuitively, the stabilizing effects of slower fiscal adjustment frustrate the monetary authority's attempts to moderate inflation through a contraction in economic activity. In fact, the right panel of the figure reveals an interesting non-monotonicity: as τ_d is lowered from 1 to 0, the central bank initially moves interest rates by more to counteract fiscal stabilization, but at some point relents, as prohibitively large rate movements would be required to implement the desired balance of output and inflation.[15] The solid red line in Figure 4 translates these impulse responses into central bank loss space: the central bank loss $\mathscr{L}_{CB}$ is now uniformly decreasing in τ_d, and thus smallest for an immediate fiscal adjustment ($\tau_d = 1$). Finally, the red dashed line in that same figure again offers a complementary lesson: if τ_y is large, then

[15] If λ_r is very small, then there is no such non-monotonicity: the central bank always tries to approximate the dual-mandate optimum, which requires larger rate hikes for smaller τ_d, counteracting the stabilizing effects of slow adjustment.

the usual static automatic stabilizers are already strong enough to frustrate the monetary authority's attempts. This leads to a larger central bank loss and to an overall shallower slope with respect to τ_d, as the strength of dynamic stabilization matters less, echoing the earlier demand discussion.

Analytical results. We establish analytical insights using a restricted framework similar to that considered above for shocks to demand: the supply disturbance u_t is fully transitory, and the monetary and fiscal authority can frictionlessly implement perfect stabilization of the economy after $t = 2$, i.e., $y_t = \pi_t = r_t = d_{t+1} = 0$ for all $t \geq 2$. We again state the main result here, with a complete characterization of the equilibrium allocation in Appendix A.4.

Proposition 6. *Suppose that $\omega < 1$. The central bank loss $\mathscr{L}_{CB}$ in the restricted, two-period, problem following a date-0, one-off supply shock u_0 is decreasing in τ_d over $[0,1]$, and so the loss is minimized for $\tau_d = 1$.*

The monotonicity of τ_d over $[0,1]$ now holds without any qualifiers: as long as there is some static automatic stabilizer ($\tau_y > 0$), delaying fiscal adjustment increases the potency of that stabilizer and counteracts central bank interest rate hikes, thus increasing the central bank loss. This agrees with the intuition given above: monotonicity always holds, since delayed fiscal adjustment increases output both today and in the future, with both contributing to the central bank's loss.

4.4 Outlook

The analysis of this section suggests a tension: that whether fiscal inaction supports or hinders the objectives of the central bank critically depends on the nature of shocks buffeting the macro-economy.

Such theoretical ambiguity calls for a quantitative exercise, exploring whether this trade-off extends to a richer model, and if so, how it is likely to be resolved. While we will provide such a quantitative exercise in Section 6, we first continue with theory, because the analysis of this section actually ignored a key mechanism—how fiscal inaction shapes inflation when fiscal adjustments are distortionary. We will see that this feedback to inflation—a "supply-side" channel—can moderate or even overturn the present section's results on supply shocks.

5 The supply channel of fiscal support

We now alter our model environment and assume that fiscal adjustments are distortionary. We begin in Section 5.1 with an analysis of what we will refer to as a "supply-side" channel of fiscal support: by increasing output and thus generating tax revenue, fiscal inaction in recessions endogenously lessens the need for future distortionary fiscal adjustments, thus lowering inflation. We then show how this

margin, together with standard tax smoothing incentives, can moderate or even flip the message of Section 4.3—now fiscal inaction even following supply shocks may support the central bank.

5.1 Fiscal inaction, distortionary fiscal adjustments, and inflation

This section extends our positive equilibrium characterization results in Section 3 to an environment in which fiscal adjustments are instead distortionary. Our main focus is on how this switch changes the mapping from aggregate demand wedges, and hence real rates, to inflation—the key margin relevant to understanding whether the central bank is supported or undermined by fiscal inaction in the face of stagflationary supply shocks.

Switch to distortionary fiscal adjustments. We assume that fiscal adjustment comes from a change in the tax rate on household income, thus introducing a time-varying distortion in household labor supply choices.[16] The simple NKPC (3) is then replaced by

$$\pi_t = \kappa y_t + \tilde{\kappa} t_t^{\text{adj}} + u_t, \tag{14}$$

where we recall that $t_t^{\text{adj}} = \tau_d d_t$ denotes the overall date-t fiscal adjustment, and $\tilde{\kappa}$ reflects both nominal rigidities as well as household preferences (see Appendix A.1).

We now characterize the macroeconomic implications of fiscal inaction in this extended model environment; analogously to Section 3, all results in this subsection will be presented *given* a path of real interest rates, allowing us to isolate cleanly the causal effects of changes in the speed of fiscal adjustment.[17] As stated above, our main objective is to understand how fiscal adjustment delays affect the mapping from any given path of real interest rates to inflation.

Delaying fiscal adjustment dampens it. We begin with a preparatory result, characterizing how delays in fiscal adjustment shape the actual equilibrium path of those tax changes. We note that the discussion actually applies independently of whether fiscal adjustments are lump-sum or distortionary—that margin will only matter later, once we go from taxes to the equilibrium inflation path.

Given equilibrium prices and quantities and thus given fiscal budgetary shortfalls, slowing down the pace of fiscal adjustment delays the path tax hikes without affecting their present value—the effect discussed in Section 3 and visible in Figure 1, as the orange dotted lines. The same figure reveals that, because fiscal inaction boosts output and thus also tax revenue, the *equilibrium* fiscal adjustment is endogenously lessened. The following proposition formalizes these insights.

[16] Specifically, the income tax rate is changed to $\tau_y + t_t^{\text{adj}}$. As fiscal variables are measured in absolute deviations from the steady state, scaled by steady-state output, this increases tax revenue to first order by t_t^{adj}.

[17] The equilibrium existence and uniqueness results in Lemma 1 apply without any change. All subsequent results apply to this unique equilibrium.

Proposition 7. *Given bounded paths of real interest rates* $\{r_t\}_{t=0}^{\infty}$ *and aggregate shocks* $\{v_t, u_t\}_{t=0}^{\infty}$*, the equilibrium path of fiscal adjustment satisfies*

$$t_t^{adj} = \sum_{s=0}^{\infty} \mathcal{T}_{t,s}\,(v_s + r_s)\,, \quad t \geq 0, \tag{15}$$

independently of whether fiscal adjustments are distortionary or lump-sum. If $\omega < 1$*, then the impulse response* $\mathcal{T}_{t,s}$ *furthermore has the following properties:*

1. $\mathcal{T}_{t,s}$ *can be decomposed as follows:*

$$\frac{\partial \mathcal{T}_{t,s}}{\partial \tau_d} = \underbrace{-\frac{\tau_y}{\beta}\sum_{k=1}^{t}\left(1-(k-1)\frac{\tau_d}{1-\tau_d}\right)\left(\frac{1-\tau_d}{\beta}\right)^{k-1}\mathcal{Y}_{t-k,s}}_{\text{direct effect of } \tau_d \text{ given output} \equiv \mathcal{B}_{t,s}} \underbrace{-\frac{\tau_y \tau_d}{\beta}\sum_{k=1}^{t}\left(\frac{1-\tau_d}{\beta}\right)^{k-1}\frac{\partial \mathcal{Y}_{t-k,s}}{\partial \tau_d}}_{\text{indirect effect of } \tau_d \text{ through output} \equiv \mathcal{F}_{t,s}}\Bigg] \tag{16}$$

   The second term, $\mathcal{F}_{t,s}$*, is positive for all response and shock horizons* $t, s \geq 0$*.*

2. *For all shock horizons* s*, the cumulative impulse response of fiscal adjustments* $\sum_{t=0}^{\infty}\beta^t \mathcal{T}_{t,s}$ *decreases with a delay in those fiscal adjustments (i.e., it increases with* $\tau_d \in [0,1]$*) and converges to zero as* $\tau_d \to 0$*.*

The proposition provides a characterization and decomposition of the impulse response path of the fiscal adjustment term t_t^{adj} to aggregate shocks, and in particular to interest rates. Our two simplifying assumptions—that government debt is real, and that interest rate costs do not affect the government budget (or equivalently are immediately offset)—imply that the dynamics of government debt and thus of fiscal adjustments are driven entirely by the budgetary effects of fluctuations in economic activity, as propagated through the automatic stabilizer τ_y. This allows us to split the impact of fiscal adjustment speed τ_d on impulse response of fiscal adjustment into the two terms displayed in (16). The first component here is the direct, or mechanical, effect of changing τ_d. Given any path of aggregate output, there is a net shortfall or surplus in fiscal tax revenue, with fiscal adjustments over time providing the necessary financing to balance the government's intertemporal budget. τ_d then governs the speed of this adjustment: if τ_d is large then adjustment is quick, and if τ_d is small then adjustment is delayed—illustrated by the orange dotted lines in Figure 1.[18] This mechanical margin is a standard implication of the government's intertemporal budget and is always present, irrespective of whether households are non-Ricardian ($\omega < 1$) or not.

The second term instead is non-mechanical, and novel to our analysis here, reflecting the endogenous stabilization benefits of fiscal inaction. As emphasized in Proposition 1, fiscal adjustment delays following budgetary shortfalls boost output and thus, through the automatic stabilizer τ_y, endogenously raise fiscal revenue and hence lessen the need for future fiscal adjustments. The proposition

[18] Strictly speaking these statements are true as long as $\tau_d > 1-\beta$, which ensures that fiscal adjustments balance the government budget in net present value terms.

reveals that this new term is always positive: at all response and shock news horizons $t, s \geq 0$, delaying fiscal adjustment (i.e., lowering τ_d) stabilizes output and thus endogenously lowers equilibrium fiscal adjustments. This is exactly what we see in the grey lines in Figure 1: fiscal inaction not only delays but also endogenously lessens the equilibrium change in taxes. The second part of the proposition then puts the pieces together in present-value terms: since the first term merely re-shuffles the tax path, while the second term implies that fiscal adjustment increases with faster fiscal consolidation, the total amount of fiscal adjustment, measured by the cumulative impulse response, necessarily increases in τ_d. Finally, as $\tau_d \to 0$, the fiscal adjustment impulse response converges to zero—not just cumulatively (as was the case for output) but at all horizons.

Implications for inflation. We now turn to this section's main results: how delays in fiscal adjustment shape inflation *through* their implications for the path of distortionary fiscal adjustments. Combining Proposition 7 with the distortionary fiscal adjustment NKPC (14), we immediately obtain the following characterization of the path of inflation.

Corollary 2. *The equilibrium path of inflation satisfies*

$$\pi_t = \sum_{s=0}^{\infty} \left(\kappa \mathcal{Y}_{t,s} + \tilde{\kappa} \mathcal{T}_{t,s}\right)(v_s + r_s) + u_t, \quad t \geq 0. \tag{17}$$

For the purposes of this section, the importance of equation (17) is that it reveals how the switch from lump-sum to distortionary fiscal adjustments shapes the effect of real interest rate hikes on inflation. $\mathcal{Y}_{t,s}$ is the response of output at date t to the interest rate hike, which is unaffected by the switch to distortionary fiscal adjustment and is (typically, though not necessarily) negative; it is the conventional channel of interest rate hikes moderating inflation by reducing economic activity. The second term, $\mathcal{T}_{t,s}$, comes from the response of date-t distortionary fiscal adjustments, and is typically positive, as the contraction in output sooner or later necessitates tax hikes, distorting the consumption-labor margin and thus increasing inflation. It follows that, when fiscal adjustments are distortionary, interest rate hikes becomes less effective as a tool to moderate inflationary pressures.

To zero in further on how the speed of fiscal adjustment shapes this mapping from interest rates to inflation, we differentiate the inflation impulse response to rate changes with respect to τ_d, giving

$$\kappa \frac{\partial \mathcal{Y}_{t,s}}{\partial \tau_d} + \tilde{\kappa} \underbrace{\frac{\partial \mathcal{T}_{t,s}}{\partial \tau_d}}_{\equiv \mathcal{B}_{t,s} + \mathcal{F}_{t,s}}, \tag{18}$$

where $\mathcal{B}_{t,s}$ and $\mathcal{F}_{t,s}$ are the direct and the indirect (through output) effects of τ_d on the path of distortionary fiscal adjustments t_t^{adj}, as characterized in Proposition 7. The first term in (18) is negative because delays in fiscal adjustment boost output and thus, through the conventional NKPC channel, increase inflation. This is exactly the tension that we discussed at length in Section 4.3: slow fiscal

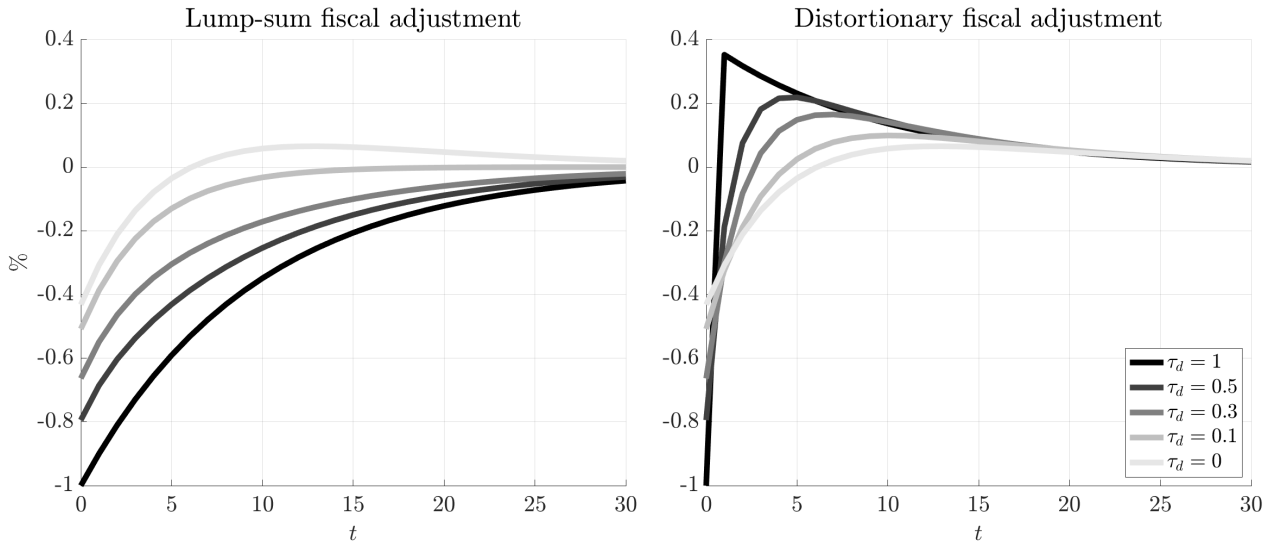


Figure 6: Impulse responses of inflation to a real interest rate hike (AR(1), persistence of 0.9), for different τ_d's (shades of grey), if fiscal adjustments are lump-sum (left panel, corresponding to $\tilde{\kappa} = 0$) or distortionary (right panel, so $\tilde{\kappa} \gg 0$).

adjustment interferes with the central bank's ability to lower inflation through interest rate hikes. The second term, on the other hand, is new, and it is likely positive: $\mathscr{B}_{t,s}$ is positive at short horizons (since fiscal adjustments there mechanically increase with τ_d), and $\mathscr{F}_{t,s}$ is always positive (since delays in fiscal adjustment endogenously lessen the need for future tax hikes). We thus now have an offsetting effect that can moderate or even overturn the logic of Section 4.3.

We provide a visual illustration of this reversal in Figure 6, which shows the impulse response of inflation to a persistent real interest rate hike when fiscal adjustments are lump-sum (left panel) and distortionary (right panel), for several different τ_d's (in grey).[19] If fiscal adjustments are lump-sum then, as expected, interest rate hikes do more to moderate inflation the larger τ_d. But if instead fiscal adjustments are distortionary, then fast tax responses make any attempt to use rate hikes to lower inflation self-defeating: distortionary taxes increase rapidly, here more than undoing the negative effect through the induced contraction in economic activity (which is unchanged across the two panels). For slow fiscal adjustment, on the other hand, real interest rate hikes remain useful as a tool to moderate inflation, as the (still-present, and still negative) output channel now dominates.

[19] For illustration, we consider a relatively large $\tilde{\kappa}$ here, around three times as large as κ. All other model parameters are kept as before. We stress that, again, this exercise is purely qualitative and illustrative.

5.2 Implications for the central bank's loss

We now use the previous positive insights to re-assess our earlier conclusions about the desirability of slow fiscal adjustment. Our main result is that, when fiscal adjustments are distortionary, then the findings of Section 4.3—fast fiscal adjustment is welcome by the central bank after supply shocks—are overturned or at least materially weakened, as slow fiscal adjustment now supports (or at least undermines less) the central bank's desire to lower inflation. We establish these results by proceeding exactly as before: general intuition, numerical explorations, and then analytical results. We mainly focus on supply shocks, with a brief discussion of demand shocks at the end; throughout our analysis is guided by the following generalized envelope theorem.

Proposition 8. *The sensitivity of the central bank's loss $\mathscr{L}_{CB}$ to the speed of fiscal adjustment $\tau_d \in [0,1]$ satisfies*

$$\frac{\partial \mathscr{L}_{CB}}{\partial \tau_d} = \underbrace{\mathbb{E}\left[\frac{1}{2}\sum_{t=0}^{\infty}\beta^t\left\{\left(\lambda_\pi \kappa \pi_t^* + \lambda_y y_t^*\right)\left(\sum_{s=0}^{\infty}\frac{\partial \mathscr{Y}_{t,s}}{\partial \tau_d}\left(v_s + r_s^*\right)\right)\right\}\right]}_{\text{term with lump-sum fical adjustment}}$$
$$+ \underbrace{\mathbb{E}_0\left[\frac{1}{2}\sum_{t=0}^{\infty}\beta^t\left\{\lambda_\pi \tilde{\kappa}\pi_t^*\left(\sum_{s=0}^{\infty}\frac{\partial \mathscr{T}_{t,s}}{\partial \tau_d}\left(v_s + r_s^*\right)\right)\right\}\right]}_{\text{additional term with distortionary fiscal adjustment}}, \quad (19)$$

where $\{r_t^*, y_t^*, \pi_t^*, d_{t+1}^*, t_t^*\}_{t=0}^{\infty}$ are equilibrium paths under optimal monetary policy (as in Definition 2), and $\{\mathscr{Y}_{t,s}, \mathscr{T}_{t,s}\}_{t,s\geq 0}$ are as characterized in Propositions 1 and 7, respectively.

Intuition for supply shocks. The discussion of the previous section suggests that, following supply shocks, fast fiscal adjustment will likely be much less desirable than in the lump-sum case: real interest rate hikes depress output and will thus quickly lead to distortionary fiscal adjustments, thereby increasing inflation and undoing the benefits of the induced output contraction. We see this in (19), where π_t^*, r_s^*, and $\frac{\partial \mathscr{T}_{t,s}}{\partial \tau_d}$ in the second line are all likely to be positive following a contractionary supply shock (at least at short horizons), dampening or even reversing the negative sign of $\frac{\partial \mathscr{L}_{CB}}{\partial \tau_d}$.

Some complementary intuition comes from a Ramsey perspective. In the absence of cost-push disturbances, a Ramsey planner constrained to raise a certain amount of tax revenue would increase distortionary taxes in a smooth manner; and when such disturbances are present, then the planner has an additional incentive to lower distortionary taxes precisely when the disturbance is large. Fast, distortionary fiscal adjustment runs directly counter to both objectives, raising distortionary taxes in the short run precisely when the cost-push distortion is large. In contrast, postponing distortionary fiscal adjustments not only smoothes out but also endogenously reduces the overall amount of distortionary tax hikes (by Proposition 7), thus through two channels getting closer to the Ramsey optimum.

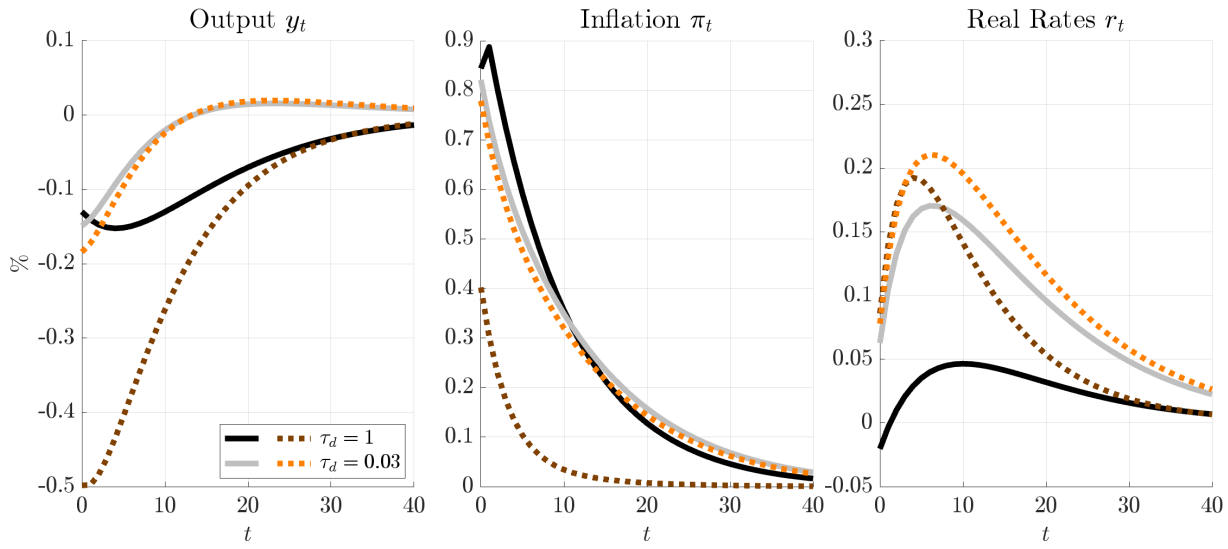


Figure 7: Impulse responses of output, inflation, and real interest rates to a stagflationary supply shock for different τ_d's under optimal monetary policy. The solid lines (grey) are for the model with distortionary fiscal adjustments, while the dashed lines (orange) are for lump-sum fiscal adjustments.

Numerical explorations. We provide a visual illustration of these forces in Figures 7 - 8, which as before show impulse responses to stagflationary supply shocks and central bank losses under optimal monetary policy and for different assumptions about the speed of fiscal adjustment τ_d.

The takeaway is that, as expected, distortionary fiscal adjustments make faster fiscal adjustment less desirable. Consider first the supply shock impulse responses under optimal monetary policy displayed in Figure 7. If fiscal adjustment is slow then there is only little difference between the lump-sum (dashed orange lines) and distortionary-adjustment (solid blue lines) models, because the equilibrium fiscal adjustment converges to zero either way if $\tau_d \to 0$, as discussed in Proposition 7. If fiscal adjustment is instead fast, then with distortionary fiscal adjustments the central bank endogenously decides to depress output by much less, as a large output drop would necessitate very quick distortionary tax hikes, thereby undoing much of the desired inflation reduction. Figure 8 then reports the associated central bank loss, plotting the central bank loss as a function of τ_d for $\tilde{\kappa} = 0$ (i.e., lump-sum fiscal adjustment, solid) and $\tilde{\kappa} > 0$ (i.e., distortionary fiscal adjustment, dashed). The key result is that, for $\tilde{\kappa} > 0$, the slope of the loss in τ_d for supply shocks (in red) *flips*: steeply downward-sloping for lump-sum adjustments, but moderately upward-sloping when tax hikes are distortionary. The figure thus shows the two offsetting effects in (19) in action: if $\tilde{\kappa}$ is zero (or small), then the loss slope in τ_d is negative, because the distortionary tax effect is negligible; but the larger $\tilde{\kappa}$, the more important the second effect, dampening and ultimately overturning our previous conclusion, so that now slow fiscal adjustment actually supports the central bank.

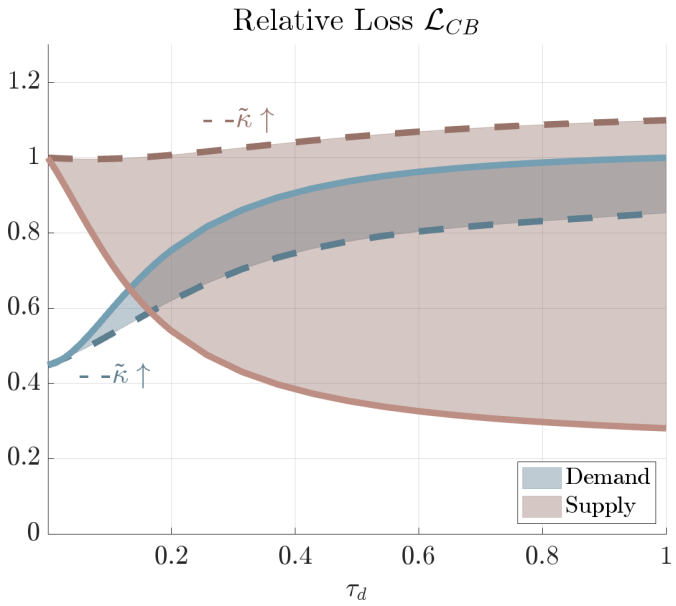


Figure 8: Minimized central bank loss $\mathscr{L}_{CB}$ as a function of τ_d for demand shocks (blue) and supply shocks (red), with lump-sum fiscal adjustments (solid, corresponding to $\tilde{\kappa} = 0$) and distortionary fiscal adjustments (dashed, corresponding to $\tilde{\kappa} > 0$).

Analytical results. We finally establish analytical insights along similar lines to what we did in Section 4: we again consider a restricted model environment in which the supply disturbance u_t is fully transitory and the monetary and fiscal authority can frictionlessly implement perfect stabilization of the economy after $t = 2$, i.e., $y_t = \pi_t = r_t = d_{t+1} = 0$ for all $t \geq 2$. We describe the detailed environment and equilibrium allocation in Appendix A.4 and here state the main result.

Proposition 9. *Suppose that* $\omega < 1$. *If* $\tilde{\kappa}$ *is sufficiently positive and* (13) *holds, then the central bank loss* $\mathscr{L}_{CB}$ *in the restricted, two-period, problem following a date-*0*, one-off supply shock* u_0 *is increasing in* τ_d *over* $[0,1]$ *and so the loss is minimized for* $\tau_d = 0$.

The proposition affirms the intuition and numerical results given above: if $\tilde{\kappa}$ is sufficiently large, then the second effect in (19) dominates, and so the central bank is supported by fiscal inaction even following supply disturbances. The analysis in this section thus offers an important qualification of our initial takeaways in Section 4.3.

Demand shocks. We conclude our analysis by noting that, for demand shocks, the switch to distortionary fiscal adjustments matters much less. Intuitively, following a contractionary demand shock, fast fiscal adjustment will now have one benefit: when output is depressed, higher distortionary taxes in the short run increase and thus stabilize inflation. This is what we see with the blue lines in Figure 8, where the dashed line (for distortionary fiscal adjustments) is shallower than the solid line (for lump-sum adjustments). That said, this dampening effect is likely to be moderate in practice, for a

simple reason: as long as the NKPC is not extremely steep, losses following aggregate demand shocks will be dominated by the output component, for which the conclusions of Section 4.2 apply without any change. This basic logic is visible in Figure 8 (where, unlike for supply shocks, the slope does *not* flip), and will be confirmed further in our quantitative explorations.

5.3 Summary and outlook

In the preceding two sections we have seen how the speed of fiscal adjustment shapes the propagation of macroeconomic shocks, and then identified conditions under which fiscal *in*action may actually be in the interest of the central bank. Our analysis was, however, limited in two main respects. First, we considered a relatively simple model environment, with restricted feedback from the macro-economy to the government budget, and relatively stripped-down private demand and supply blocks. Second, even in that simple model, we identified several offsetting effects, in particular related to the types of shocks buffeting the macro-economy. We thus now turn to a quantitative analysis.

6 Quantitative analysis

This section provides a quantitative assessment of how macroeconomic outcomes vary with the speed of fiscal adjustment, and in particular of whether fiscal inaction can plausibly provide monetary support. Methodologically, our approach here is designed specifically to address the limitations and ambiguities of the qualitative analysis conducted in the preceding sections. First, we now build a much-extended variant of our baseline model to allow for richer, empirically relevant transmission from both interest rate policy and fiscal tax adjustments to the macro-economy. Second, we use reduced-form time series data—the autocovariance function of macroeconomic aggregates—to learn about the *average* mix of shocks hitting the economy. This will turn out to be the key step to resolving our theory's ambiguities in an empirically grounded way.

6.1 An extended model environment

We begin with a description of the extended model environment. We first discuss how we generalize the demand and supply blocks of the economy, before turning to policy.

Aggregate demand. We generalize the aggregate demand block to allow for multiple types of households with heterogeneous survival probabilities ω_i and heterogeneous steady-state wealth holdings D_i^{ss}. We do so for two reasons. First, heterogeneity in survival probabilities allows us to match empirical evidence on intertemporal marginal propensities to consume (as discussed, e.g., in Angeletos, Lian

and Wolf, 2024), thus allowing for empirically realistic consumption-savings behavior. Second, wealth being predominantly held by lower-MPC households prevents the model from implying a counterfactually fast pass-through from wealth revaluation effects and government debt issuance to consumer spending (e.g., see the empirical evidence in Chodorow-Reich, Nenov and Simsek, 2021).

We furthermore allow for shocks to the demand relations of all consumers. We allow for all shocks to follow (possibly correlated) ARMA(p,q) processes with absolutely summable MA(∞) coefficients, allowing us to capture in reduced form a large menu of possible changes in aggregate private demand. We provide the resulting generalized Euler equation for each type i in Appendix B.1.

Aggregate supply. We now consider a dynamic, hybrid NKPC. We will throughout assume that tax adjustments are distortionary, delivering the aggregate supply relation

$$\pi_t = \kappa y_t + \tilde{\kappa} t_t^{\text{adj}} + \xi\beta\pi_{t-1} + (1-\xi)\beta\mathbb{E}_t[\pi_{t+1}] + u_t, \tag{20}$$

where $\xi \in (0,1)$ parameterizes the degree of backward-lookingness in price-setting. The supply (cost-push) disturbance follows a general ARMA(p,q) process, again assuming only that the coefficients of the associated MA(∞) representation are absolutely summable.

Policy. The central bank's instrument is the rate of interest on one-period, nominally risk-free bonds, denoted by i_t. Slightly adjusting the set-up of Section 2.3 we will now consider a central bank with the triple-mandate loss function

$$\mathscr{L}_{CB} = \frac{1}{2}\mathbb{E}_0\left[\sum_{t=0}^{\infty}\beta^t\left\{\lambda_\pi\pi_t^2 + \lambda_y y_t^2 + \lambda_i i_t^2\right\}\right] \tag{21}$$

The only difference is that the central bank loss now contains nominal interest rates (i.e., the policy instrument), rather than real rates.

As before we wish to evaluate how the loss of the central bank varies with assumptions on the behavior of the fiscal authority. Specifically, we will now consider a fiscal authority that issues long-term, nominal government debt, and adjusts distortionary labor taxes to achieve long-term budget balance. The (linearized) government flow budget constraint in this generalized environment is

$$d_{t+1} = \frac{1}{\beta}(d_t - t_t) + \frac{D^{ss}}{Y^{ss}}r_t - \frac{D^{ss}}{Y^{ss}}\left(\pi_{t+1} - \mathbb{E}_t[\pi_{t+1}] - \beta\delta\left(q_{t+1} - \mathbb{E}_t\left[q_{t+1}\right]\right)\right), \tag{22}$$

where $\delta \in [0,1]$ is the geometric maturity rate of government debt (i.e., $\delta = 0$ is short-term debt, and $\delta = 1$ indicates perpetuities), $r_t = i_t - \mathbb{E}_t[\pi_{t+1}]$ denotes the date-t expected real interest rate between t and $t+1$,and q_t to denote the post-coupon dollar price for a unit of government debt. The two new terms at the end (compared to (4)) reflect the real debt value-eroding effects of inflation surprises and changes in the price of government bonds, respectively. Total tax revenue t_t is given as

$$t_t = \tau_y y_t + \tau_d d_t, \tag{23}$$

the sum of an automatic stabilizer effect, $\tau_y y_t$, and the endogenous fiscal adjustment, $t_t^{\text{adj}} = \tau_d d_t$, which is assumed to be distortionary and responds to fluctuations in government debt. We stress that, relative to our earlier analysis, feedbacks from the macro-economy to the government budget are now much richer: we still have tax revenue-related feedback (via τ_y), but now inflation and interest rates show up as driving budgetary surpluses or shortfalls, as in (22) and (23) (which does not include the adjustment for budgetary impacts of interest rate movements). The fiscal authority now responds quickly (if τ_d is large) or slowly (if τ_d is small) to changes in *all* arguments of the government flow budget, intermediated through d_t in (23).

Echoing our theoretical analysis we wish to evaluate how, in this generalized quantitative model economy, the loss of an optimizing central bank with objective (21) would be affected by the speed of adjustment τ_d of a fiscal authority that follows the rule (22) - (23). The next section describes our strategy for answering this question.

6.2 Model discipline and empirical measurement

A textbook strategy to answering our question of interest would be as follows: using likelihood-based methods, estimate the extended model environment of Section 6.1 to provide an adequate fit to actual aggregate time series data (e.g., as in Smets and Wouters, 2007); evaluate the behavior of that economy if fiscal and monetary policy were (counterfactually) described by (21) - (23) for a range of τ_d's; and finally compute the optimal central bank loss $\mathscr{L}_{CB}(\tau_d)$. We will instead follow a different and, in our assessment, more transparent and thus robust approach to parameterizing our model.

Background: an identification result. Consider the generalized model environment of Section 6.1, with the private-sector block as described there, the government budget constraint (22), and the policy instruments (i_t, t_t^{adj}) set according to a pair of arbitrary but determinacy-inducing rules, and possibly subject to stochastic policy shocks.[20] Rather than arriving at the parameters of this model through likelihood-based estimation, we begin with a preliminary observation: in this model, the object of interest $\mathscr{L}(\tau_d)$ can actually be pinned down as a function of just two objects: policy causal effects, and unconditional second moments of macroeconomic aggregates.

To formally state this identification result we begin with two further definitions. First, letting $x_t \equiv (y_t, \pi_t, i_t, d_t)$, write the Wold representation of x_t in the stochastic economy as

$$x_t = \sum_{\ell=0}^{\infty} \Psi_\ell u_{t-\ell}, \tag{24}$$

where the Wold innovations u_t are orthogonalized, i.e., $\text{var}(u_t) = I$. Second, write the causal effects of

[20] Formally, we assume that the model economy is closed with rules for (i_t, t_t^{adj}) that ensure existence and uniqueness of the equilibrium. This assumption is all we will use in the proof of Proposition 10.

policy shocks to the monetary and fiscal rules at all horizons—defined exactly as in McKay and Wolf (2023, Section 2.3)—on x as $\{\Theta_{x,m}, \Theta_{x,f}\}$. We can now state the identification result.

Proposition 10. *Suppose that the Wold representation (24) is invertible. Then the function $\mathscr{L}_{CB}$, which gives, for any given $\tau_d \in [0,1]$, the central bank loss evaluated at the optimal monetary policy equilibrium, can be calculated as a function of the policymaker preferences, $\{\lambda_\pi, \lambda_y, \lambda_i\}$, as well as the following two objects:*

1. *The causal effects of monetary and fiscal shocks, $\{\Theta_{x,m}, \Theta_{x,f}\}$.*
2. *The Wold representation coefficients, $\{\Psi_\ell\}_{\ell=0}^{\infty}$.*

The intuition underlying this identification result is relatively simple. On the one hand, the Wold representation completely summarizes the stochastic properties of the economy, and so in particular it reflects all the (unknown) shocks that shape macroeconomic fluctuations. On the other hand, fiscal and monetary policy shock causal effects allow us to evaluate how changes in policy design (of the sort we contemplate here) would alter those macroeconomic fluctuations. Thus these two ingredients are all we need to recover our object of interest. The complete proof is provided in Appendix C.13.

Using the identification result. The point of the preceding discussion is that it suggests an alternative, simple approach to recovering our object of interest, $\mathscr{L}_{CB}(\tau_d)$.

The approach proceeds in three steps. First, calibrate the private-sector block of the economy described in Section 6.1 to imply causal effects of monetary and fiscal policy (i.e., of i_t and t_t^{adj}) that are broadly in line with prior empirical evidence. This delivers $\{\Theta_{x,m}, \Theta_{x,f}\}$, and requires us to take *no* stance on the stochastic shocks buffeting the macro-economy. Second, estimate the Wold representation of x_t in actual data, using standard reduced-form time series techniques. Third, use Proposition 10 to turn those two "sufficient statistics", together with central banker preferences plus the assumed fiscal adjustment speed τ_d, into the object of interest, $\mathscr{L}_{CB}(\tau_d)$. This is the approach to model discipline and measurement that we will implement in the next section.

Why this strategy? Before proceeding with the actual implementation and our results, we conclude here with a brief discussion of why we adopt this particular approach. The principal reason is transparency, and thus robustness. By Proposition 10, all of the conclusions that we will report in the next section are simply driven by two "sufficient statistics": policy causal effects, and seconds moments of actual data. Furthermore, while that proposition is stated and proved in the context of the particular model sketched in Section 6.1, the logic is actually much more general: as established in McKay and Wolf (2023) and Caravello, McKay and Wolf (2025), policy causal effects together with autocovariance functions allow evaluation of policy counterfactuals in a large family of structural models—a family

of which our particular environment is just one member. It follows that any alternative strategy that delivers different results would need to disagree either in terms of unconditional second moments, or on policy causal effects. Since we take the former straight from the data, and derive the latter from a model disciplined by relevant empirical evidence, we can expect our conclusions to be robust.[21]

6.3 Model estimation and main quantitative results

We now turn to the main results of our quantitative exercise. We first briefly discuss what time series estimation and calibrated model imply for the two sufficient statistics of our identification result. We then report the object of interest—the central bank loss as a function of the fiscal adjustment speed, $\mathscr{L}(\tau_d)$—and explain what features of the data drive our conclusions.

Getting the sufficient statistics. We only discuss the main takeaways of our model discipline and empirical second-moment estimation here, with implementation details relegated to Appendix B.2.

The first sufficient statistic are the dynamic causal effects of changes in policy instruments. Those effects are fully pinned down given the private sector block of the economy as well as the steady-state tax-and-transfer and government debt profiles; parameter values for these model parts are displayed in Table 1. Since the purpose of the model is to deliver policy causal effects, we discipline it with an eye towards the available empirical evidence on such effects; specifically, we ensure consistency with evidence on, first, consumer spending responses to income gains (as taken from Fagereng, Holm and Natvik, 2021), and second, the aggregate causal effects of changes in monetary policy (here following Romer and Romer, 2004; Aruoba and Drechsel, 2024).[22] The rest of the model structure then further extrapolates beyond this matched empirical evidence to deliver the full set of policy causal effects $\{\Theta_{x,m}, \Theta_{x,f}\}$, i.e., the causal effects of arbitrary paths of interest rates and fiscal adjustments.[23]

The second sufficient statistic are the estimated second-moment properties of $x_t \equiv (y_t, \pi_t, i_t, d_t)$, allowing us to substitute for any indirect estimation of the primitive shocks driving cyclical fluctua-

[21] Given the generality of the identification results in McKay and Wolf (2023) and Caravello, McKay and Wolf (2025), one may of course contemplate a purely empirical evaluation of our policy counterfactuals of interest, taking not just second moments but also policy causal effects from the data. Such a strategy is, unfortunately, not practical here, for two reasons. First, empirical evidence on the causal effects of (distortionary) fiscal adjustments is scant. Second, for our analysis, it is essential that the counterfactual policy rules of interest are implemented exactly and not approximately, precluding the "approximate counterfactuals" approach of McKay and Wolf (2023).

[22] For monetary policy, a 100 basis point transitory nominal interest rate increase lowers output by around 0.6 per cent and inflation by slightly below 0.1 per cent, broadly consistent with the literature review in Caravello, McKay and Wolf (2025, Figure 2). For fiscal transfers, we note that the direct effect of one-off transfers on spending is given by the first column of the overall iMPC matrix (Auclert, Rognlie and Straub, 2024). That column is matched to the evidence in Fagereng, Holm and Natvik (2021), exactly as in Angeletos, Lian and Wolf (2024, Figure 4, bottom panel).

[23] To restrict attention to bounded equilibria (as in Definitions 1 - 2), we assume that, after some large but finite horizon H, the fiscal authority perfectly stabilizes real government debt, and the monetary authority does the same for real interest rates. See Angeletos, Lian and Wolf (2025) for a justification of such a boundary condition.

Parameter	Description	Value	Target
Demand Block			
χ_i	Population shares	$\{0.218, 0.629, 0.153\}$	Fagereng, Holm and Natvik (2021)
ω_i	Survival rates	$\{0.972, 0.833, 0\}$	Fagereng, Holm and Natvik (2021)
A_i^{ss}/A^{ss}	Wealth shares	$\{0.6, 0.4, 0\}$	See text
σ	EIS	1	Standard
φ	Frisch elasticity	1	Standard
β	Discount factor	0.998	Annual real rate
Supply Block			
κ	Slope of NKPC	0.02	Romer and Romer (2004); Aruoba and Drechsel (2024)
ξ	Backward-lookingness	0.29	Barnichon and Mesters (2020)
Policy			
τ_y	Tax rate	0.33	Average Labor Tax
D^{ss}/Y^{ss}	Gov't debt level	1.04	See text
δ	Gov't debt maturity	0.9	Av'g debt maturity

Table 1: Quantitative model, calibration.

tions. For our purposes, the key feature of the average in-sample co-movement of these variables is that the typical short-run fluctuation in output coincides with partial interest rate offset and a muted co-movement of inflation—the so-called "main business-cycle" shock of Angeletos, Collard and Dellas (2020). Aggregate fluctuations thus mostly reflect what tends to looks like an "aggregate demand"-type disturbance along a rather flat NKPC, suggesting that our theoretical conclusions for demand shocks are likely to be most relevant. This observation will loom large in our subsequent results.

Results on fiscal inaction and monetary support. We now put all the pieces together and leverage Proposition 10 to report our main object of interest: the central bank loss as a function of fiscal adjustment speed, $\mathscr{L}_{CB}$. Figure 9 plots this object for a central bank loss function that puts equal weight on output as well as (annualized) inflation and interest rates, exactly as in the Federal Reserve Tealbook (2016). The figure normalizes the largest loss across $\tau_d \in [0,1]$ to 1.

The headline takeaway of the figure is that the central bank would indeed welcome slow fiscal adjustment or in fact even fiscal inaction, with the smallest loss achieved for $\tau_d \approx 0.02$, corresponding to a half life of government debt somewhat below ten years. The grey solid line and area show the overall central bank loss $\mathscr{L}_{CB}$, with the shaded area reflecting estimation uncertainty for the Wold representation of the data, and the solid line giving the median. We see that the loss is monotone in

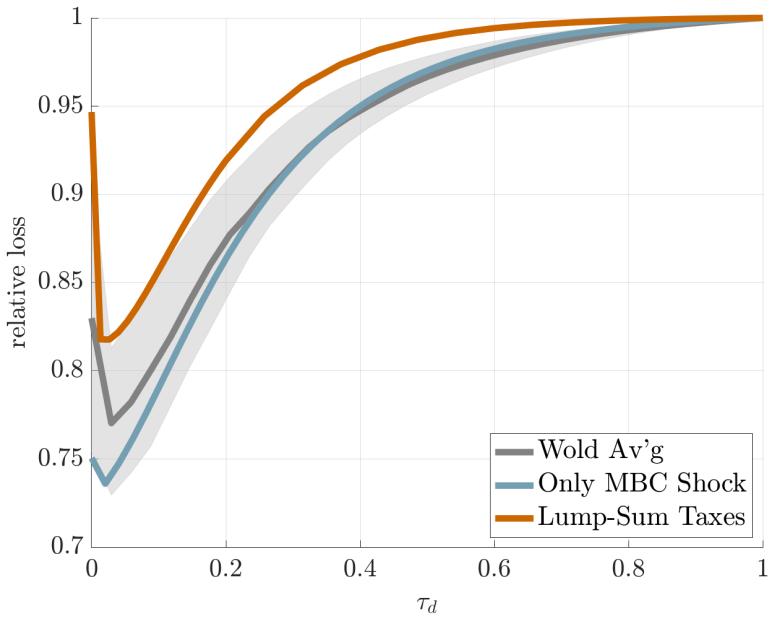


Figure 9: Central bank losses $\mathscr{L}_{CB}$ in the quantitative model, with aggregate stochasticity from the estimated Wold representation of the data. For the grey line and area, we draw from the posterior of the estimated Wold representation, and then report percentiles (16th, 50th, 84th) of the computed losses. The blue and orange lines are point estimates considering instead only the main business-cycle shock (blue) or using a model with lump-sum fiscal adjustments for policy causal effects (orange).

τ_d across almost the entire unit interval, and furthermore that the loss associated with slow or absent fiscal adjustment is materially smaller than that with fast adjustment (note the y-axis). Finally the blue and orange lines provide further insights into where these results are coming from. First, to construct the blue line, we do not consider the full Wold representation, but only a single "shock"—a rotation of Wold innovations identified exactly as the "main business-cycle shock" in Angeletos, Collard and Dellas (2020). That shock looks like a conventional demand shock, and so itself delivers an upward slope, exactly as expected in light of our theory. Since the overall data are of course also driven by other (non-demand) shocks, the upward slope here is more pronounced than its unconditional analogue (in grey); that said, given that the main business-cycle shock is a dominant source of macroeconomic fluctuations, we would expect the grey and blue lines to be close, and that is indeed what we see. Second, the orange line plots the overall loss if instead we consider an alternative model variant with lump-sum (rather than distortionary) fiscal adjustment. Since now supply shocks call for fast fiscal adjustment, the orange line lies somewhat above the grey line; but since we know that demand-type shocks overall dominate, we would expect even the lump-sum fiscal adjustment loss to be mostly upward-sloping in τ_d, and again that is what we see.[24]

[24]The dips in the loss close to but above $\tau_d = 0$ are related to the fact that now we allow for interest rates to also feed back to the government budget. If we allowed for such feedback in our baseline analytical model, then equilibrium determinacy

Summary. The analysis of this section has allowed us to evaluate the practical relevance and quantitative bite of our earlier theoretical conclusions. Since household marginal propensities to consume are high, delays in fiscal adjustment are very meaningfully stabilizing; and since aggregate fluctuations are dominated by demand-type disturbances, such endogenous stabilization through fiscal inaction is welcome, only reinforced further by delays and endogenous reductions in distortionary tax hikes. Our headline finding—that central banks may welcome slow fiscal adjustment, or even fiscal inaction, over the business cycle—is thus not just a theoretical possibility, but indeed a quite robust feature of empirically relevant equilibrium models, driven by our two "sufficient statistics."

7 Conclusions

Does fiscal inaction help or hurt a central bank? While the conventional wisdom holds that fast fiscal adjustment is desirable (to avoid "fiscal dominance"), we have argued both theoretically and quantitatively that slow or even absent fiscal adjustment may aid the central bank in achieving its objectives. The simple intuition is that, in structural models with non-Ricardian households, slowing down the pace of fiscal consolidation following budgetary shortfalls boosts the macro-economy. As long as such stabilization is desirable—e.g., because the economy is in a demand-driven recession, or because tax distortions should be smoothed out and reduced—fiscal inaction will provide monetary support.

An important qualifier for our results is that fiscal inaction is desirable following *non-fiscal* disturbances. A fiscal authority that itself is a source of macroeconomic volatility of course remains undesirable. An important avenue for future work is to study what kind of fiscal frameworks can harness the advantages of fiscal inaction discussed here without subjecting the monetary authority to broader fiscal imprudence.

under the textbook dual mandate implicit targeting rule (as in Woodford, 2003) would require $\tau_d > 1-\beta$. This effect is what we see at the boundary here.

References

Aguiar, Mark, Manuel Amador, and Cristina Arellano. 2024. "Pareto Improving Fiscal and Monetary Policies: Samuelson in the New Keynesian Model." *NBER Working Paper*.

Angeletos, George-Marios. 2003. "Comments on Benigno and Woodford's 'optimal monetary and fiscal policy'." *NBER Macroeconomics Annual*.

Angeletos, George-Marios, Chen Lian, and Christian K Wolf. 2024. "Can Deficits Finance Themselves?" *Econometrica*, 92(5): 1351–1390.

Angeletos, George-Marios, Chen Lian, and Christian K Wolf. 2025. "Deficits and Inflation: HANK meets FTPL." Working Paper.

Angeletos, George-Marios, Fabrice Collard, and Harris Dellas. 2020. "Business-cycle anatomy." *American Economic Review*, 110(10): 3030–3070.

Aruoba, S Boragan, and Thomas Drechsel. 2024. "Identifying Monetary Policy Shocks: A Natural Language Approach." CEPR Discussion Paper No. DP17133.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub. 2024. "The intertemporal keynesian cross." *Journal of Political Economy*, 132(12): 4068–4121.

Barnichon, Regis, and Geert Mesters. 2020. "Identifying modern macro equations with old shocks." *The Quarterly Journal of Economics*, 135(4): 2255–2298.

Barro, Robert J. 1974. "Are government bonds net wealth?" *Journal of political economy*, 82(6): 1095–1117.

Benigno, Pierpaolo, and Michael Woodford. 2003. "Optimal monetary and fiscal policy: A linear-quadratic approach." *NBER macroeconomics annual*, 18: 271–333.

Blanchard, Oliver. 2006. "Comments on 'The Case Against the Case Against Discretionary Policy', by Alan Blinder." *The macroeconomics of fiscal policy, MIT Press, Boston*, 62–67.

Blanchard, Olivier J. 1985. "Debt, deficits, and finite horizons." *Journal of Political Economy*, 93(2): 223–247.

Blanchard, Olivier J. 2025. "Fiscal Policy as a Stabilization Tool. The Case for Quasi-Automatic Stabilizers, With an Application to the VAT." National Bureau of Economic Research.

Brainard, William C. 1967. "Uncertainty and the Effectiveness of Policy." *The American Economic Review*, 57(2): 411–425.

Caravello, Tomás E, Alisdair McKay, and Christian K Wolf. 2025. "Evaluating Monetary Policy Counterfactuals: (When) Do We Need Structural Models?" Working Paper.

Chodorow-Reich, Gabriel, Plamen T Nenov, and Alp Simsek. 2021. "Stock market wealth and the real economy: A local labor market approach." *American Economic Review*, 111(5): 1613–1657.

Eggertsson, Gauti B, and Michael Woodford. 2003. "Optimal monetary policy in a liquidity trap."

Fagereng, Andreas, Martin B Holm, and Gisle J Natvik. 2021. "MPC heterogeneity and household balance sheets." *American Economic Journal: Macroeconomics*, 13(4): 1–54.

Farhi, Emmanuel, and Iván Werning. 2019. "Monetary policy, bounded rationality, and incomplete markets." *American Economic Review*, 109(11): 3887–3928.

Federal Reserve Tealbook. 2016. "Report to the FOMC on Economic Conditions and Monetary Policy."

Galí, Jordi. 2008. *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton University Press.

Hagedorn, Marcus, Iourii Manovskii, and Kurt Mitman. 2019. "The fiscal multiplier." National Bureau of Economic Research.

Kaplan, Greg. 2025. "Implications of Fiscal-Monetary Interaction from HANK Models." National Bureau of Economic Research.

Kaplan, Greg, Benjamin Moll, and Giovanni L Violante. 2018. "Monetary policy according to HANK." *American Economic Review*, 108(3): 697–743.

Leeper, Eric M. 1991. "Equilibria under 'active'and 'passive'monetary and fiscal policies." *Journal of monetary Economics*, 27(1): 129–147.

Lucas, Robert E, and Nancy L Stokey. 1983. "Optimal fiscal and monetary policy in an economy without capital." *Journal of monetary Economics*, 12(1): 55–93.

McKay, Alisdair, and Christian K Wolf. 2023. "What can time-series regressions tell us about policy counterfactuals?" *Econometrica*, 91(5): 1695–1725.

McKay, Alisdair, and Ricardo Reis. 2016. "The role of automatic stabilizers in the US business cycle." *Econometrica*, 84(1): 141–194.

McKay, Alisdair, and Ricardo Reis. 2021. "Optimal automatic stabilizers." *The Review of Economic Studies*, 88(5): 2375–2406.

Rachel, Lukasz, and Morten O Ravn. 2025. "Brothers in Arms: Monetary-Fiscal Interactions Without Ricardian Equivalence."

Romer, Christina D, and David H Romer. 2004. "A new measure of monetary shocks: Derivation and implications." *American Economic Review*, 94(4): 1055–1084.

Schmitt-Grohé, Stephanie, and Martın Uribe. 2004. "Optimal fiscal and monetary policy under sticky prices." *Journal of economic Theory*, 114(2): 198–230.

Smets, Frank, and Rafael Wouters. 2007. "Shocks and frictions in US business cycles: A Bayesian DSGE approach." *American economic review*, 97(3): 586–606.

Stein, Jeremy C, and Adi Sunderam. 2018. "The fed, the bond market, and gradualism in monetary policy." *The Journal of Finance*, 73(3): 1015–1060.

Woodford, Michael. 2003. *Interest and prices*. Princeton University Press.

Woodford, Michael. 2011. "Simple analytics of the government expenditure multiplier." *American Economic Journal: Macroeconomics*, 3(1): 1–35.

Appendices for:
Fiscal inaction as monetary support

This Appendix contains further material for the article "Fiscal inaction as monetary support". We provide: (i) supplementary details for our theoretical analysis in Sections 2 - 5; (ii) a complete model description, the empirical exercise, and additional analysis for our quantitative investigations in Section 6; and (iii) all proofs.

Any references to equations, figures, tables, assumptions, propositions, lemmas, or sections that are not preceded by "A."—"C." refer to the main article.

A Supplementary details for the theoretical details

[UNDER CONSTRUCTION]

A.1 Model environment

A.2 Equilibrium characterization

A.3 Illustrative calibrations

A.4 Two-period policy problems

B Details for the quantitative analysis

[UNDER CONSTRUCTION]

B.1 Quantitative model

B.2 Getting the sufficient statistics

B.3 Impulse responses

C Proofs

[UNDER CONSTRUCTION]

C.1 Proof of Lemma 1

C.2 Proof of Proposition 1

C.3 Proof of Proposition 2

C.4 Proof of Corollary 1

C.5 Proof of Proposition 3

C.6 Proof of Proposition 4

C.7 Proof of Proposition 5

C.8 Proof of Proposition 6

C.9 Proof of Proposition 7

C.10 Proof of Corollary 2

C.11 Proof of Proposition 8

C.12 Proof of Proposition 9

C.13 Proof of Proposition 10