Is monetary and fiscal policy conflict *that* dire? *

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Abstract

Theory predicts that inflation can become unstable when policymakers are in conflict about their post-recession recovery strategies, with the fiscal authority actively borrowing and spending to stimulate economic growth while the monetary authority raises interest rates to tame inflation. Such policy conflict can generate a debt-inflation spiral when agents are forward-looking. We show that the dire effects of policy conflict are less concerning when agents form backward-looking expectations. We then test this prediction in a learning-to-forecast experiment. Our results suggest that policy conflict does not necessarily lead to worse economic outcomes. This finding is driven by the fact that agents rely mostly on recent macroeconomic trends to formulate their expectations and do not meaningfully factor the government debt level or future regime shifts into their expectations.

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1 Introduction

In this paper, our goal is to better understand how fiscal and monetary authority interactions – be they in coordination or in conflict – at different points in the business cycle, affect macroeconomic expectations, and, as a result, macroeconomic outcomes. The link between monetary and fiscal policy is well documented. Central bank independence helps to provide the credibility necessary to allow monetary authorities to operate under discretion, and keep inflation well-anchored, despite fiscal authorities who have an incentive to increase short-term output at the expense of longer-term inflation [Barro and Gordon, 1983]. And, while true, the implication is not that coordination between the two authorities isn't warranted under certain economic condition. Indeed, as an example, when interest rates are low - like they were after the Great Financial Crisis and before the pandemic - and conventional monetary policy tools do not have the same firepower, coordination with fiscal authorities to fill in the gap and get inflation up to its target can be beneficial [Bernanke, 2017, Eggertson, 2013]. In fact, economic theory - as well as intuition - tells us that central banks and governments are more likely to achieve desired outcomes if their monetary and fiscal policies are coordinated, as opposed to in conflict.[1] In large part, this has to do with the assumption in most economic models that agents form forward-looking, rational expectations. In this paper, we use an experimental laboratory setting to formally test these assumptions and predictions.

Following the structure of Bianchi and Melosi [2019], we study an economy that begins in a low-demand, recessionary state, one in which both monetary and fiscal authorities are engaging in expansionary policy to boost demand. From there, the economy returns to a high-demand state, with four possible paths forward:

- A monetary-led coordinated scenario - with the economy in excess demand, the central bank increases its policy rate to bring inflation back to target while the government commits to stabilizing the debt-to-GDP ratio;
- A fiscal-led coordinated scenario - the government does not commit to stabilize the debt-to-GDP ratio, thus further stimulating demand, and the central bank takes a passive stance on inflation, allowing it to remain above target, which helps with the higher debt load;
- A conflict scenario with monetary-led resolution - the government pursues an expansionary fiscal policy even though the economy is in a state of excess demand, with the

[1] To some extent, because they share a common budget, they must coordinate [Sargent et al., 1981]

central bank increasing its policy rate to fight inflation. The central bank eventually wins out and the government stabilizes its debt-to-GDP ratio; and

- A conflict scenario with fiscal-led resolution - same conflict in recovery phase with excess demand, but this time the government wins out and the central bank takes a more passive stance to inflation;[2]

The intuition for the dynamics of these scenarios is developed in Bianchi and Ilut [2017] and Bianchi and Melosi [2019]. If people are sufficiently forward-looking during recessions, they will form more pessimistic expectations about output and inflation, anticipating that the conflict between the government and the central bank will lead to higher inflation, especially as the conflict ends. Instability arises because if governments continue to accumulate debt and fuel inflation while the central bank raises rates to lower inflation, the servicing cost of debt will rise. As this debt burden grows, economic recovery is dampened, more debt is accumulated, and the cycle begins again. Indeed, part of the impetus for central banks turning to inflation-targeting regimes with independent central banks is that it forced fiscal authorities to consider this likely behavior when setting their tax and spending plans [Dodge, 2002].

Under rational expectations, Bianchi and Melosi [2019] show that these outcomes are only non-explosive with the introduction of possible changes to the policy mix under Markov switching and by leveraging recent advancements in the literature on solution methods for rational expectation models with parameter instability. In coordinated scenarios, where agents are confident that authorities will work together, recessions are predicted to be less severe, as the recovery is expected to be stronger and faster. The expectation of coordinated policy keeps debt and inflation expectations well-managed both during the recession and in its aftermath.

The success of policy coordination hinges on agents' expectations. Under rational expectations, policy conflict, especially when resolved with fiscal leadership, can lead to more prolonged recessions and higher inflation. When agents are not forward-looking, we show through simulations that the consequences of policy conflict become less severe, and the benefits of coordination are diminished. Without forward-looking expectations, agents fail to appreciate how future conflicts will lead to higher debt growth, resulting in recessions of similar severity across different policy mixes.

[2]These active fiscal-passive monetary scenarios, where debt is inflated away, are related to the fiscal theory of the price level. See, for example, Cochrane [2001]

During the recovery phase, we show that policy conflict is less detrimental if agents form backward-looking expectations. While coordinated monetary leadership leads to the fastest and strongest economic recovery, policy conflict can outperform fiscal coordination. This is because the central bank's aggressive response to inflation in conflict scenarios tames backward-looking expectations, leading to a successful economic recovery. Policy conflict anchors inflation expectations better than coordinated fiscal leadership. In other words, backward-looking expectations can make policy conflict preferable to coordination.

To study how people would respond to policy conflict and coordination, we designed a lab experiment where participants acted as professional forecasters in a simulated Learning-to-Forecast Experiment (LtFE) and were incentivized to form accurate output and inflation forecasts.[3] They were informed before the start of the experiment about the transition of their economy from low to high aggregate demand states and the policy mixes that would unfold. Detailed information about the policy scenarios was provided to minimize the effects of policy uncertainty.

Policy conflict does not present the challenge that standard economic theory predicts. We find no evidence that recessions deepen under policy conflict. The average output gap troughs show no significant difference between coordination and conflict scenarios, regardless of whether recoveries are led by monetary or fiscal policy. Moreover, policy coordination does not always result in a well-managed recovery. Economic recoveries were stronger and faster under policy coordination, but only when led by the monetary authority. The central bank's aggressive response to low inflation post-recession contributed to this. The average peaks were significantly higher under both coordination scenarios, with the greatest cumulative output gap occurring under monetary-led coordination, followed by fiscal-led conflict. While longer-run inflation was higher under policy conflict, especially with fiscal leadership, the differences between coordinated and conflict scenarios were not statistically significant.

Why is policy conflict not so dire in our experiments? Our analysis of participants' individual expectations suggests three factors at play. First, historical experiences significantly influence participants' inflation expectations, while the anticipated policy mix appears to be irrelevant during recessions. Second, in contrast to the RE predictions, government debt has only a minor effect on expectations and is deflationary, with a 1% increase in the government's debt leading to only a 0.25% *decrease* in inflation expectations. Third, the anticipation of

[3]The LtFE framework was first developed by Marimon and Sunder [1994] and extended into macroeconomics by Adam [2007].

policy conflict actually strengthens, rather than diminishes, the central bank's credibility, particularly regarding its ability to achieve its inflation target. Contrary to predictions under rational expectations, neither the anticipation nor the experience of policy conflict followed by fiscal leadership leads to inflated inflation expectations. Instead, the anticipation of policy conflict and a hawkish central bank enhances central bank credibility and anchors inflation expectations. Only when the conflict ends, particularly with fiscal leadership, do participants' inflation expectations become unanchored.

The takeaway from our results is that people do not exhibit sufficiently forward-looking behavior for the anticipation of policy conflict to matter. Instead, they respond to the recent state of the economy rather than how fiscal and monetary authorities will react at some future moment in time. It might be tempting to conclude that expected future policy coordination is unimportant, but we would frame it differently. The most important consideration for policymakers is preventing a recession from becoming too severe or inflation expectations from becoming unanchored. In other words, avoiding a situation where households and businesses go from expecting low inflation to having very little idea of where it is headed.[4]

Related literature. Our work builds on various streams of theoretical and experimental research examining the interaction of monetary and fiscal policy. The fact that monetary and fiscal authorities face a common budget constraint obliges them to coordinate - to at least some extent - their policy actions [Sargent et al., 1981]. An extensive literature has built upon seminal work by Leeper [1991] to understand the consequences of different policy mixes and the effects of regime shifts.

Our work contributes to a large literature on the evolution of the mix of fiscal and monetary policy. Beliefs of both private agents and policy makers play a critical role in the success of the policy mix, as shown in Orphanides [2002] and Sargent et al. [2006]. It is typically assumed in models of regime shifts that agents are aware of the possibility of regime changes and take this into consideration when forming their expectations [Chung et al., 2007, Bianchi, 2012, Bianchi and Ilut, 2017, Bianchi and Melosi, 2019]. Participants in our experiment are aware of the possibility of regime shifts. In fact, they know exactly what the policy composition will be in the future, albeit they do not know the exact timing of the future policy change. Despite this knowledge, we find that they do not incorporate anticipated policy

[4]The evidence suggests that inflation-targeting regimes tend to lead to better coordination between monetary and fiscal authorities, so a central bank implementing active monetary policy is likely to eventually force the hand of government [Demid, 2018].

meaningfully into their expectations, a point that has been made by related experimental research discussed below. More closely related work by De Grauwe and Foresti [2023] studies a heterogeneous-agent New Keynesian model of fiscal and monetary policy interaction under the assumption that agents use simple models to formulate their expectations. They find that fiscal dominance results in more persistent waves of optimism and pessimism, and in turn more macroeconomic volatility, when compared to monetary dominance. Moreover, when agents are behavioral, fiscal dominance can undermine monetary policy credibility. In their framework, government spending and debt play an important role in agents' beliefs about output and inflation. By contrast, we find these two variables have relatively little impact on our participants' expectations, and consequently fiscal dominance does not lead to notably greater extrapolative beliefs and macroeconomic volatility.

Our paper provides new experimental evidence for an extensive behavioral theory literature understanding the limits of future policy regimes, most notably the forward guidance puzzle.[5] In our experiment, the forecasting task is considerably challenging, and participants may not be factoring in all relevant dimensions of the task into their expectations [Gabaix and Graeber, 2023]. Key variables assumed to be relevant in a rational agent's expectations of future inflation (namely, government debt and distant future policy), do not play a consequential role in practice, in line with Maćkowiak and Wiederholt [2015] and Campbell et al. [2019].

The muted response of our participants' expectations to the government's debt level aligns with empirical findings by Brandao-Marques et al. [2023], who examine long-run inflation expectations of advanced economies by professional forecasters. They find that in advanced economies, the effects of government debt shocks on 5-year-ahead inflation expectations are, on average, zero. However, debt shocks significantly impact forecasts for emerging economies, where central bank credibility may be lower. Similarly, Grigoli and Sandri [2023] show that surveyed household expectations in the U.S., U.K., and Brazil adjust upwards when surprised by higher government debt, but the effect size is relatively small—an increase in public debt by 10% of GDP leads to a rise in one-year-ahead inflation expectations by only 0.6%. Households with greater knowledge of the inflation target are less sensitive to government debt levels, and those with the highest confidence in the central bank do not view increased debt as inflationary. Our results likely reflect the highly credible information participants have about the central bank and fiscal authorities' actions, as well as their personal experiences with inflation management outside the lab.

[5] See for the example work by Angeletos and Lian [2018], Gabaix [2020], and Goy et al. [2022].

Muted responses of inflation expectations to government debt are also observed in the lab. Both Arifovic and Petersen [2017] and Hommes et al. [2019a] find that introducing fiscal stimulus to alleviate deflationary episodes at the zero lower bound (ZLB) can temporarily stimulate inflation expectations. However, the temporary increase in government debt observed in Hommes et al. [2019a] does not significantly unanchor inflation expectations. Our findings of inattentiveness to future policy actions have also been previously documented. Lustenhouwer and Salle [2022] study how participants' macroeconomic forecasts react to news about future government spending shocks and find that the nature of financing (tax or debt-financing) does not play an important role in shaping their forecasting behavior. The authors observe significant inattentiveness, with participants consistently under-reacting to news about government spending, though this under-reaction is less pronounced when participants are forced to forecast for longer horizons. Additionally, this under-reaction does not decline as the anticipated adjustment approaches. Likewise, Kryvtsov and Petersen [2021] find monetary policy announcements have only small effects on individual forecasts, especially if they do not clarify the timing of future policy changes. In particular, people have difficulty incorporating future monetary policy actions into their inflation and output gap expectations [Mokhtarzadeh and Petersen, 2020, Kostyshyna et al., 2024].

2 Experimental Design

A key assumption underlying the dire effects of policy conflict is that agents form forward-looking, rational expectations. To validate that assumption, we turn to the lab to generate expectations data in scenarios with policy conflict and coordination. Learning-to-forecast experiments (LtFEs), originating with Marimon and Sunder [1994], are a framework for studying group expectation formation where expectations feed back into an environment's data-generating process. In these experiments, groups of participants typically interact together in a single market or economy and form expectations about the future value of a market price or macroeconomic variables such as inflation, output gaps and nominal interest rates. Participants are financially incentivized to forecast accurately over lengthy horizons, typically of 25 to 50 periods. Aggregate expectations are computed from participants' submitted forecasts and used to influence aggregate dynamics in the experimental economy.

There are a number of advantages to studying expectation formation in a LtFE. The repeated sampling of expectations at the individual level allows for valuable insight into par-

ticipants' forecasting models, which is generally unattainable in survey data collected over a limited number of waves. The lab also provides a 'wind-tunnel' in which to experiment with the nature of policy, information sets, and parameterizations. LtFEs have been used to study a wide range of macroeconomic questions related to expectation formation and equilibrium selection [Adam, 2007, Arifovic et al., 2019, Hommes et al., 2023a], the design of monetary policy rules and targets [Pfajfar and Žakelj, 2014, 2016, Kryvtsov and Petersen, 2013, Assenza et al., 2019, Cornand and M'baye, 2018, Hommes et al., 2019b, Hommes and Makarewicz, 2021], monetary policy integration [Bertasiute et al., 2020], and central bank communication [Arifovic and Petersen, 2017, Cornand and M'baye, 2018, Mokhtarzadeh and Petersen, 2020, Ahrens et al., 2022, Rholes and Petersen, 2021, Petersen and Rholes, 2022, Arifovic et al., 2023]. The expectations elicited in New Keynesian LtFEs are consistent with many of the time series and cross-section properties of households, firms, and professional forecasters, though with a tendency to form relatively more model-consistent expectations [Cornand and Hubert, 2020, 2022].

2.1 Data-generating process

The experiment consisted of 30 rounds, analogous to quarters, where participants were tasked with making incentivized one-period-ahead forecasts of inflation and output. The economy in the experiment evolved based on exogenous demand shocks, monetary and fiscal policy rules, and participants' aggregated expectations. Participants were informed during the instructions and again during the experiment that their economy would transition between two or three phases, depending on the treatment: a recession and a recovery phase, that either involved immediate coordination or initial policy conflict followed by eventual policy coordination.

The structure of the experimental macroeconomy is derived from a linearized version of the model developed by Bianchi (2019), which builds on extensive literature concerning the interaction between fiscal and monetary policy (see Sims, 1994; Schmitt-Uribe, 2000, among others). The macroeconomy is described by the following system of equations:

$$x_t = E_{t+1}x_{t+1} - \frac{1}{\sigma}\left(i_t - E_{t+1}\right) + \zeta_t^d \tag{1}$$

$$\pi_t = \beta E_{t+1}\pi_{t+1} + \kappa\left(1 + \frac{\alpha}{1-\alpha}\right)x_t \tag{2}$$

Equation 1 describes the evolution of the economy's output gap in response to aggregate expectations of the period $t+1$ output gap, $E_t x_{t+1}$, and the real interest rate, i_t–$E_t\pi_{t+1}$, where i_t is the central bank's policy rate and $E_t\pi_{t+1}$ refers to the aggregate expectation of period $t+1$ inflation. The output gap also depends on exogenous demand shocks, ζ_t^d.

Equation 2 is the New Keynesian Phillips curve and describes how inflation is driven by aggregate expectations of inflation and the output gap. The parameter $\frac{1}{\sigma}$ is the elasticity of intertemporal substitution, β is the subjective discount factor, and κ governs the pass-through of monetary policy and other factors affecting aggregate demand to inflation.

The reaction function of the central bank is given by

$$i_t = \rho_r i_{t-1} + \psi_\pi(1-\rho_r)(\pi_t - \pi^*) + \psi_y(1-\rho_r)(x_t - x^*). \tag{3}$$

Equation 3 is the central bank's Taylor rule, where ψ_π and ψ_y govern the response to deviations of inflation and output gaps from the target values of zero, respectively. The parameter ρ_r denotes the degree of persistence in the central bank's policy rate.

On the fiscal side, the government's tax rate evolves according to the following equation:

$$\tau_t = \rho_\tau \tau_{t-1} + \delta_b(1-\rho_\tau)b_{t-1} + \delta_y(1-\rho_\tau)x_t \tag{4}$$

where b_t, the government's real debt level, is given by

$$b_t = \frac{b_{t-1}}{\beta} - \frac{b^*}{\beta}(x_t - x_{t-1}) - \frac{b^*}{\beta}\pi_t - \tau_t + \frac{b^*}{\beta}i_t \tag{5}$$

Equation 4 says that the central bank increases its taxes as the output gap and the level of past real debt, b_{t-1} grows larger. The parameter ρ_τ denotes the degree of persistence in the government's tax rate. Equation 5 describes the evolution of real government debt. Debt increases as the output gap contracts, inflation is low, the government taxes less, and as nominal interest rates rise.

The exogenous demand shock, ζ_t^d, follows a two-state Markov process. In the low state, $\zeta_t^d = -143$ bps. The probability that the economy remained in the low state in the next period was 0.94. In the high state, $\zeta_t^d = 43$ bps. The probability that the economy remains in the high state in the next period was 0.99.

We closed the model by specifying the aggregate expectations that are key to driving aggregate dynamics. Aggregate expectations were elicited by our experimental participants. Each period t, participant i formed expectations about the next period's output gap, $E_{i,t}x_{t+1}$, and inflation, $E_{i,t}\pi_{t+1}$. Each period, the median forecast of each variable were used as the aggregate forecast and fed into the economy's data generating process.

Importantly, some of the assumptions required for log-linear approximation may not always hold in the experiment. Expectational errors may not be small and unbiased. However, the assumption of rationality simplifies the data-generating process and the complexity of the forecasting problem for our subjects, and is standard in the experimental literature.[6]

It is important to note that fiscal policy and government debt do not directly affect the structural equations of the model, namely the Phillips curve and the Euler equation. However, fiscal policy can influence the economy through expectations. In response to a negative demand shock, the government begins to accumulate debt. The impact of this debt on the economy hinges on agents' expectations of future policy actions. If agents anticipate that this debt will be stabilized via inflation, inflationary pressures will emerge. The central bank's subsequent response will then induce further nominal and real effects. For instance, if the central bank aggressively raises its policy rate to counteract inflation, the economy might face a spiraling recession, compounded by additional debt accumulation, increased debt financing costs, and further inflation.

2.2 Treatments

Our experiment consisted of two or three phases, depending on the treatment. In Phase 1, the economy was in a low-demand, recessionary state, where both the government and central bank engaged in expansionary fiscal and monetary policies to boost demand. In the remaining phases, the economy would transition back to a high-demand state, with the monetary and fiscal authorities either coordinating their policy decisions or being in conflict, depending on the treatment. The probability of remaining in the low state was high, but we pre-selected a sequence of shocks such that the economy would transition into the high

[6]See Mauersberger [2021] and Kryvtsov and Petersen [2021] for experimental implementations of New Keynesian models that relax the assumption of rational expectations based on the model by Woodford [2013]. Mauersberger demonstrates the instability associated with the less restrictive boundedly-rational DGP and shows that monetary policy must be significantly more aggressive to maintain the same stability when agents, i.e. participants, form non-rational expectations.

state in Period 11.

During the remaining periods, the economy transitioned into one of four scenarios as the economy returned to a high-demand state: a monetary-led coordinated recovery (ML), a fiscally-led coordinated recovery (FL), a conflict recovery with a monetary-led solution (CML), or a conflict recovery with a fiscally-led solution (CFL). These scenarios occurred in Phase 2 (rounds 11-30 in coordination or 11-20 in conflict) and Phase 3 (rounds 21-30 in conflict).

In the monetary-led coordinated (ML) scenario, the central bank actively worked to bring inflation back to target by raising the interest rate, while the government committed to stabilizing the debt to GDP ratio.

In the fiscally-led coordinated (FL) scenario, the government continued to further stimulate economic growth and not stabilize the debt to GDP ratio, while the central bank took a passive stance on inflation, resulting in inflation remaining above target.

In the conflict with monetary-led resolution (Conflict+ML) scenario and the conflict with fiscally-led resolution (Conflict+FL) scenario, the government initially pursued an expansionary fiscal policy in the economic recovery while the central bank would pursue a more aggressive contractionary monetary policy. After some number of periods, one party would eventually 'win' and take leadership. In Conflict+ML, the central bank would continue to take an aggressive (albeit slightly weaker) stance on inflation while the government would be forced to stabilize its debt-to-GDP ratio (as in the ML scenario). In Conflict+FL, the government would continue to stimulate economic growth and not stabilize the debt to GDP ratio while the central bank would take a passive stance to inflation (as in the FL scenario).

During the instruction phase of the experiment, participants were provided with comprehensive information about the economy's structure, including a detailed quantitative model that illustrated the significance of different variables in driving inflation and the output gap, as well as the government debt levels, tax rates, and the central bank's interest rate. Participants had complete knowledge about the economy's structure, policy rules governing the monetary and fiscal authorities, and that the economy would go through two or three phases. They were fully informed whether the monetary and fiscal authorities would cooperate following the recession, and how the conflict (if any) would resolve. However, consistent with the theoretical framework, participants were not informed of the exact timing of the economy transitioning from a low to a high state or when the conflict would resolve itself.

A complete set of instructions can be found in Appendix A.

Table 1 presents the selected parameters for each treatment and phase of the experiment. Most parameter values are directly taken from Bianchi and Melosi (2019), with minor adjustments to better align with the reaction function of the Bank of Canada, particularly considering its single mandate to target inflation. We maintained a consistent weight on the output gap deviation parameter across scenarios, focusing on adjustments to the weight on inflation deviations. Specifically, and relative to Bianchi and Melosi, we increased the inflation deviation parameter under the coordination monetary-led scenario to ensure compliance with the Taylor principle, and lowered the output gap deviation parameter in this scenario to match the fiscal-led coordination scenario. These minor adjustments do not qualitatively alter the results of the Bianchi and Melosi model.[7]

Insert Table 1

We note that, following Bianchi and Melosi (2019), the persistence parameter for the central bank, ρ_r, is different under coordination and conflict. The underlying intuition is that the impact of inflation on real debt depends on how aggressively the central bank reacts to inflation above target. The more aggressive the reaction, the more likely it is that real debt will increase. To generate a double-dip recession under conflict in this model, debt servicing costs for the government must rise. This necessitates a secondary increase in interest rates due to the higher inflation the government requires to manage its increased debt load, creating a higher debt/higher inflation/higher interest rate spiral.

Achieving these higher interest rates requires the central bank to respond aggressively to inflation above target, which we simulate by removing any persistence in the Taylor rule. Conversely, during coordination, the persistence parameter must be positive, affecting the parameters required in the Taylor Rule equation. The adjustments we make ensure a greater than one-for-one reaction of interest rates to inflation under active monetary policy.

2.3 Experimental Implementation

We conducted the experiment at Simon Fraser University's Experimental Economics Laboratory from October 2021 to April 2022. Each treatment consisted of six independent

[7] We also tested the Bianchi and Melosi model without an interest rate persistence parameter and found that it hinders recovery under both fiscal and monetary-led scenarios due to the rapid adjustment of interest rates during Phase 2.

sessions involving seven participants each, for a total of 168 participants. Participants were inexperienced undergraduate students from a wide range of disciplines.

The sessions were conducted remotely over Zoom due to COVID-19 restrictions. At the start of each session, participants received a link to the web-hosted instructions. The experimenter read these instructions aloud while participants followed along. Subsequently, the experimenter guided participants through a demo of the interface and allowed them to practice making forecasts for four practice periods, which lasted approximately 10 minutes. Participants were encouraged to ask questions throughout both the instruction phase and the practice session.

The experiment consisted of 30-40 minutes of instructions and four periods of practice with the experimental interface, followed by 35-40 minutes of incentivized decision-making. There was a soft time limit of 75 seconds in the first 10 rounds and 60 seconds in the remaining 20 rounds. A warning would appear on participants' screen when time had run out.

A screenshot of the experimental interface is presented in Figure 1. On the left side of the screen, participants could see their individual subject number, the period, the time remaining, and their total points. Below this, they input their one-period-ahead output gap and inflation forecasts. On the right side of the screen, participants could view all past and current variables. Their private forecasts were displayed in blue in the bottom two panels, while realized output and inflation were shown in red. We spent considerable time explaining the timing of the data as it appeared on their screen to ensure that subjects understood how their forecast accuracy, and consequently their payoffs, would be determined.

Insert Figure 1

Each participant received \$7 for arriving at the experiment on time and earned additional compensation throughout the experiment based on their forecast accuracy. The points earned by subject i in period t were calculated based on the absolute distance between their forecasts made in period $t-1$ and realized inflation and output in period t:

$$Points_{i,t} = 0.3\left(2^{-.5|\mathbb{E}_{i,t-1}\{\pi_t\}-\pi_t|} + 2^{-.5|\mathbb{E}_{i,t-1}\{x_t\}-x_t|}\right) \tag{6}$$

Insert Figure 2

Figure 2 shows how participants' per-period scores over both forecasts steeply increase as

they become more accurate. Participants' total points over all the forecasting periods were converted to Canadian dollars at an exchange rate of $1.25 per point. The maximum earnings for the 90 minute experiment was $28.75. The average payoffs were $24.50.

3 Theoretical Predictions

In this section, we examine how the dire effects of policy conflict, as predicted by rational expectations theory, depend on the formation of aggregate expectations. By contrasting rational expectations theory with other behavioral models of expectations, we can lay out our testable hypotheses to be examined in our lab setting.

Our evaluation of the policy mixes focuses on four key metrics: the depth of initial recessions, the speed and size of the economic recovery, and the inflation-output gap trade-off. We compute these metrics for each treatment under three different assumptions about aggregate expectations. Following Bianchi and Melosi [2019], our baseline assumption is that participants form ex-ante rational expectations of the output gap and inflation. Additionally, we consider behavioral models of expectations where agents rely on recent historical experiences to formulate their expectations, $E_t\pi_{t+1} = \pi_{t-1} + \tau_\pi(\pi_{t-1} - \pi_{t-2})$ and $E_t x_{t+1} = x_{t-1} + \tau_x(x_{t-1} - x_{t-2})$, where agents are either assumed to form naïve expectations ($\tau_x = \tau_\pi = 0$) or extrapolate recent trends ($\tau_x = \tau_\pi = 0.5$). Table 2 summarizes the four metrics under each model of expectations while Figure 3 presents the predicted dynamics. For conciseness, we focus our discussion of the behavioural predictions on the trend-extrapolative model. Further details about the welfare implications of the different policy mixes can be found in Section B.2 in the Online Appendix.

Insert Table 2 and Figure 3

If participants form rational expectations, the anticipation of policy conflict after a recession is predicted to generate deeper and more severe downturns. When the government is expected to accumulate more debt, fueling inflation, and the central bank raises rates to control this inflation, the servicing cost of debt increases. This expected debt burden, coupled with the anticipation of a more aggressive monetary policy response during the conflict, will dampen the economic recovery and has the potential to cause a double-dip recession, particularly noticeable in fiscal-led resolutions from conflict.

If participants are sufficiently forward-looking during the recession, they will form more pessimistic expectations about inflation and output as they anticipate the consequences of policy conflict. During the economic recovery, participants aware of the policy conflict and its implications for the debt level would expect even higher inflation, leading to actual higher inflation when resolution occurs, again more notably in fiscal-led resolutions. The conflict economies experience stagflation even though fundamentals improve. The economic recovery is anticipated to be slower and incomplete due to the more restrictive monetary policy set by the relatively aggressive, hawkish central bank.

In the coordinated scenarios, because rational participants anticipate that the monetary and fiscal authorities will work together, the initial recession is predicted to be less severe, with a quicker, stronger recovery. The fiscally-led coordinated scenario yields the strongest output recovery, as participants expect a relatively muted central bank response in the aftermath of the recession. Both monetary and fiscal-led economies fully recover immediately as they transition from a low to a high state. In these coordination scenarios, the economic recoveries lead to a positive trade-off of higher inflation with higher economic output.

The remaining panels of Table 2 and Figure 3 present predictions under the alternative behavioral models. The dynamics of the economy under naïve and trend-extrapolative expectations differ notably from those predicted by rational expectations. Importantly, the backward-looking expectations do not account for the anticipated persistence of the low state, future policy mix, or the size of the government's debt. However, both output gap and inflation expectations become increasingly pessimistic as the economy languishes in recession, irrespective of coordination versus conflict. Recessions and disinflation are markedly worse when participants are assumed to extrapolate recent macroeconomic trends.

As the economy shifts into the high state in Period 11, the policy mix results in notably different recoveries. Monetary leadership leads to the fastest and most pronounced rebound in output, which returns to the steady state within two periods under trend-extrapolative expectations.[8] Under fiscal leadership, it takes the economy four periods to return to its steady state following the improvement in economic fundamentals. This slower recovery is due to expectations being unresponsive to fundamentals and a lack of stimulative monetary policy response to kick-start the economy. The impact of fiscal leadership on the economy hinges on expectations, which are assumed to be relying on past inflation and output gap

[8]The recovery is slower than observed under rational expectations because agents are not responding to the change in fundamentals, but rather to recent economic conditions.

expectations and not on government debt or fiscal policy.

Policy conflict is not as dire when agents form extrapolative expectations. Conflict accelerates economic recovery relative to fiscal leadership, as the central bank aggressively aims to bring inflation back to target. In fact, policy conflict leads to a stronger economic recovery in Phase 2 than coordinated fiscal leadership. Economic recovery takes only three periods under trend-extrapolation, and the size of the recovery is approximately 35% larger. If participants extrapolate recent trends, this can result in an overshooting of the steady state and a more significant reversal of monetary policy, driving the economies into a second recession, which serves to tame inflation.

As observed under rational expectations (RE), fiscal leadership under extrapolative expectations leads to higher inflation during the economic recovery compared to monetary leadership (Phases 2 and 3 of ML vs. FL, Phase 3 of Conflict+ML vs. Conflict+FL). However, unlike under RE, policy conflict does not necessarily imply higher inflation when agents form extrapolative expectations. In Phase 3, mean inflation is highest under fiscal leadership (FL), averaging 214 basis points (bps) per period. Conflict+FL experiences roughly half the inflation, at 109 bps. While Conflict+ML does produce more inflation than ML (56 bps vs. 17 bps), the differences are relatively small.

Based on these theoretical results, we now formulate our testable hypotheses as discussed above. Given the prevalence of extrapolative expectations in learning-to-forecast experiments, we use this behavioral model as the basis of our alternative hypotheses, comparing them against those derived from rational expectations theory.

H1: Initial recessions are deeper when policy conflict is expected.
H1a: Initial recessions are not significantly different across treatments.

H2: Recovery is stronger and occurs at a faster pace when monetary and fiscal policy are coordinated.
H2a: This is also the case under trend-extrapolative expectations for monetary leadership, but not the case for fiscal leadership. Under (eventual) fiscal leadership, conflict leads to larger and faster recoveries.

H3: Past policy conflict leads to higher inflation in Phase 3.
H3a: This is also the case under trend-extrapolative expectations for eventual monetary leadership, but not the case for eventual fiscal leadership.

Hypothesis 1 is evaluated by examining the minimum level of output during the recession in Phase 1. Hypothesis 2 is evaluated according to two metrics: the session-level maximum output gap during the initial recovery in Phase 2 and the number of periods before the output gap returns to the steady state following the transition to Phase 2. Finally, Hypothesis 3 is evaluated with session-level mean inflation in Phase 3.

4 Results

Result 1: Recessions are not deeper when policy conflict is expected.

Under rational expectations (RE), our first testable hypothesis is that initial recessions are deeper in conflict scenarios compared to coordination, both in fiscal-led and monetary-led settings. Under trend-extrapolation, we hypothesized no significant differences across treatments. Our findings support this latter hypothesis. Specifically, the median results during the recession (Phase 1) show that coordination and conflict scenarios in both monetary-led and fiscal-led settings are almost indistinguishable (Figure 4 and Figure 5).

Insert Figure 4 and Figure 5

The anticipated policy mix makes little difference during the recession phase. In the monetary policy scenarios, the average output gap trough is -945 basis points with coordination and -934 basis points with conflict (Figure 6). Similarly, in the fiscal policy scenarios, the average output gaps are -903 basis points under coordination and -933 basis points under conflict. Comparing these scenarios, we find that coordination and conflict result in comparable troughs during the recession phase of the experiment. A two-sided Wilcoxon rank sum test of $N = 6$ independent groups for each treatment yields a p-value of 1.00, indicating that we cannot reject the null hypothesis of no difference.

Insert Figure 6

Result 2: Recovery is stronger under monetary-led coordination, and mixed in terms of speed.

Under rational expectations (RE), the second testable hypothesis was that the output gap rebound when the economy returned to normal would be stronger and faster with policy

coordination, regardless of whether it was fiscal or monetary-led. In contrast, the hypothesis under trend-extrapolation predicted this would be true only under monetary leadership.

Our experiments provide mixed support for the RE predictions and tend to favor the trend-extrapolation predictions. On the one hand, the peak of the recovery is stronger in coordination scenarios. Figure 7 panel (a) shows the distribution of the peaks of the output gaps in Phase 2.[9]

The average peak recovery in Phase 2 is significantly higher in coordination scenarios (1871 basis points in monetary-led and 693 basis points in fiscally-led) compared to conflict scenarios (432 basis points in monetary-led and 574 basis points in fiscally-led), with a p-value of 0.0742. In both coordination and conflict scenarios, the differences between monetary and fiscal policy-led recoveries are marginally significant, with p-values of 0.1003.coordination and 0.0679 in conflict).

Insert Figure 7

However, the results are inconclusive when using an alternative measure of the size of the recovery—the total output gap—in Phase 2. Figure 7 panel (b) shows the distribution of the total output gaps across sessions for each treatment. On this metric, while the average total output gap is largest in the coordinated monetary-led scenario (7392 basis points), it is followed not by the fiscally-led coordinated scenario but by the fiscally-led conflict scenario (2347 basis points).[10] The differences between the coordination and conflict scenarios overall are not statistically significant, with a p-value of 0.172.

In terms of the speed of recovery, Figure 7 panel (c) presents the number of periods before the economy in a particular session returns to the steady state. On average, sessions in the monetary-led coordination and both conflict scenarios take two periods to return to their pre-recession state. However, the coordinated fiscally-led scenario is more sluggish, taking an average of 3.75 periods. Taken together, these results suggest that recovery is not universally faster in coordinated scenarios, with a p-value of 0.069.

[9]The peaks in each session do not occur at the same time. Consequently, the time series peaks in Figures 4 and 5 do not necessarily match those found in Figure 7.

[10]The next largest output gaps are in the fiscally-led coordinated scenario (2071 basis points) and the monetary-led conflict scenario (1724 basis points).

Result 3: Past policy conflict leads to higher inflation in Phase 3, but the differences are not statistically significant.

The last testable hypothesis under RE is that Phase 3 inflation is higher in conflict scenarios than under coordination. This hypothesis also holds under trend-extrapolative expectations.

Insert Figure 8

Our experiments provide some qualitative support for Hypothesis 3. Figure 8 presents the distribution of session-level mean inflation in Phase 3 by treatment. Past policy conflict does produce higher inflation in Phase 3 (when the conflict is over), irrespective of who prevails. Session-level mean inflation is 71.28 basis points (bps) in ML and 90.07 bps in Conflict+ML ($p = 0.262$ N=5 vs. N=6). Similarly, session-level mean inflation is 538.96 bps in FL and 883.84 bps in Conflict+FL($p = 0.754$, N=5 in both treatments). The ordering of the treatments in terms of inflation is also consistent with the RE (and trend-extrapolative expectations) predictions. However, the differences across treatments are not statistically significant.

Comparing coordinated vs. conflict scenarios, the differences are not statistically significant ($p = 0.622$, N=10 vs. N=11).[11] Thus we find weak evidence in support of H3 or H3a.

5 Why is policy conflict not that dire?

Our aggregate findings suggest that the consequences of policy conflict are not as dire as predicted. In contrast to Bianchi and Melosi, we find that recessions are not deeper when policy conflict is expected, and aggregate instability is not worse following a policy conflict. To understand why policy conflict has such minimal and inconsistent impact on the economy, we next examine participants' individual expectations and their responses to different policy mixes and debt levels.

5.1 Is policy conflict more confusing?

One possibility is that the conflict scenarios demand significantly more cognitive processing, leading participants to rely on simpler heuristics and disregard future policy conflict in their

[11] When we include outlier sessions, the calculated p-value decreases slightly to 0.262, 0.423, and 0.484, respectively, but our conclusions of insignificant differences remain unchanged.

forecasts, resulting in larger forecast errors. To evaluate this hypothesis, we compare participants' average forecast errors across phases and treatments. The results are reported in Table 3 by treatment and phase.

If policy conflict scenarios were more cognitively challenging, we would expect participants to make larger forecast errors in the conflict treatments. However, we find no evidence of this. During the initial recession, forecast errors are not significantly different across conflict and coordination scenarios. During Phase 2, participants facing policy conflict make significantly smaller forecast errors than those in coordination scenarios, and the same trend holds when the conflict is over. Overall, we find no evidence that policy conflict produces greater errors and confusion.

We can also compare participants' expectations and forecast accuracy to those of real-world households. We find that subjects' inflation forecast errors are relatively low and in line with Canadian household forecast errors. Across treatments, the median one-period-ahead inflation forecast errors in our experiment range between 20 and 25 basis points (bps) in Phase 1, which is an annualized rate of $(1 + 0.0025)^4 = 1$ percentage point, and become as high as 37 bps in Phase 2 of ML (or 1.01 percentage points annually). When we conducted our experiment in 2021Q4, the median household's one-year inflation expectation in the Canadian Survey of Consumer Expectations was 4.89%, while realized inflation in 2022Q4 was 6.5%, a difference of 1.61 percentage points. Participants' forecast errors are lower because of the relative simplicity of our experimental economy and the relatively high level of information participants have about the data-generating process and aggregate outcomes.

5.2 Are there differences in central bank credibility across policy regimes?

Another explanation for the lack of dire effects from policy conflict is that participants may have not perceived the central bank's ability to manage inflation as credible during conflict recoveries.

We define central bank credibility as the negative of the absolute deviation of participants' expectations from the output gap and inflation target. We first estimate the mean difference in credibility across treatments:

$$Credibility_{i,t}^{x^*} = \alpha + \beta Treatment_i + \phi Credibility_{i,t-1}^{x^*} + \mu_i + \epsilon_t \quad (7)$$

where $Treatment_i$ is a vector of treatment indicator variables (FL, Conflict+ML, and Conflict+FL), $Credibility_{i,t-1}^{x^*}$ is a one-period lag of participant i's deviations from target, and μ_i is a subject-specific random effect. We then evaluate the effects of fiscal leadership, policy conflict, and their mix on central bank credibility in the following specification:

$$Credibility_{i,t}^{x^*} = \alpha + \beta Fiscal_i + \gamma Conflict_i + \zeta Fiscal_i \times Conflict_i + \phi Credibility_{i,t-1}^{x^*} + \mu_i + \epsilon_t \quad (8)$$

Fiscal is an indicator variable that takes the value of 1 for fiscal policy treatments (FL and Conflict+FL) and 0 otherwise, and Conflict is an indicator variable that takes the value of 1 for the conflict treatments (Conflict+ML and Conflict+FL). For both specifications, we exclude extreme outlier observations from ML Session 5, FL Session 5, and CFL Session 2. The estimation results are reported below for the three phases of the experiment in Table 4 for output gap and inflation targets. Odd columns present estimates of Equation 7 and even columns present estimates of Equation 8.

Insert Table 4

During the recession in Phase 1 under monetary leadership, the average deviations of output and inflation forecasts from target are 359 and 54 basis points (bps), respectively. While we observe no significant differences in output target credibility, there are notable differences in the credibility of the inflation target. The anticipation of policy conflict—irrespective of which policy maker prevails—has a small (10 to 14 bps) but significant anchoring effect on inflation expectations in the direction of the target.

During the economic recovery in Phase 2, participants' credibility in the central bank's targets is lowest under monetary leadership (ML). Both fiscal leadership and policy conflict significantly strengthen central bank credibility in the output gap target. However, the anticipation of future fiscal leadership mutes some of the anchoring benefits of the policy conflict. Inflation expectations are also much more anchored when policy makers are in conflict (11 to 21 basis points), with this effect being more muted when fiscal leadership is expected in Phase 3. Overall, we find that coordinated fiscal leadership does not influence the credibility of the central bank's inflation target. This increased credibility under policy conflict is likely due to participants observing a highly active and more effective central bank.

In Phase 3, credibility in the central bank's targets is heavily entrenched. The estimated coefficient on $Credibility_{i,t-1}^{x,\pi}$ is very high (0.94 and 1.09, respectively). Output gap expectations continue to be most unanchored under monetary leadership (ML), while coordinated fiscal leadership (FL) significantly anchors output gap expectations. A resolution of policy conflict with monetary leadership also significantly better manages expectations.[12] By contrast, conflict that ends in fiscal leadership does not consistently anchor output gap expectations. In fact, inflation expectations become significantly unanchored without the aggressive stance of monetary policy to rein in inflation.

Overall, our results suggest that the dire effects of policy conflict are not anticipated during recessions. If anything, the anticipation of a more hawkish central bank serves to initially strengthen central bank credibility, even if fiscal leadership is eventually expected.

5.3 Do expectations incorporate debt?

As discussed in Section 3, the consequences of the policy mix become dire under rational expectations when agents perceive unstable debt levels as generating stagflation. In Conflict+FL, the debt level is expected to grow significantly as central banks raise interest rates while the government fails to rein in its spending during the economic recovery. To understand how important government debt levels are in shaping participants' expectations, we estimate the following regressions for each treatment and phase:

$$E_{i,t}x_{t+1} = \alpha + \beta x_{t-1} \times Treatment_i + \phi b_{t-1} \times Treatment_i + \epsilon_t \tag{9}$$

$$E_{i,t}\pi_{t+1} = \alpha + \beta \pi_{t-1} \times Treatment_i + \phi b_{t-1} \times Treatment_i + \epsilon_t \tag{10}$$

where b_{t-1} is a one-period lag of government debt, x_{t-1} and π_{t-1} are the most recent output gap and inflation rates, and ϵ_i is a subject random effect. These specifications show how the reliance on lagged output (inflation) and lagged government debt influence output (inflation) expectations relative to the baseline treatment ML. The results are presented in Table 5. Odd columns present the restricted model of lagged output and inflation only, while even columns present the full model. We also provide complementary results for the RE predictions in Panels A of Table B1 and Table B2 in Appendix B.

[12] ML and Conflict+ML are identically parameterized in Phase 3 and should exhibit comparable credibility. We attribute the relatively stronger anchoring effects to the fact that Conflict+ML participants have experienced a more hawkish central bank.

Insert Table 5

We find that participants use a mix of recently observed output gaps, inflation, and debt levels to form their expectations. Broadly speaking, participants do incorporate debt into their forecasts, but mostly in a negative manner. Our estimation results of the rational expectations (RE) model show that including recent debt can significantly improve the fit of the predicted data. However, we find relatively limited improvements in the fit of our laboratory-generated data, evidenced by very small reductions in the RMSEs when debt is included in the model.

During the recession, both output and inflation expectations are highly positively correlated and adjust in step with realized output and inflation, while adjusting negatively with the debt level. The anticipated policy mix does not influence how participants respond to either realized outcomes or debt.

In the economic recovery, we observe more heterogeneity in reliance on recent outcomes and debt levels when forming expectations. Higher debt levels lead to more pessimistic output gap and inflation expectations, with minimal differences across treatments. Only in coordinated fiscal leadership (FL) do participants exhibit slightly less pessimistic output gap expectations in response to rising debt levels. By Phase 3, we see that the government's debt levels play a much smaller and negative role in output gap and inflation expectations, especially in the conflict treatments. Neither the anticipation nor the experience of policy conflict followed by fiscal leadership produces heightened inflation expectations, as the rational model would predict.

Fiscal leadership and policy conflict notably influence how participants rely on historical macroeconomic experiences when forming their expectations. In the economic recovery, participants in conflict scenarios exhibit relatively more contrarian output gap expectations, as monetary policy is far more aggressive than under monetary leadership (ML). However, fiscal leadership, or the prospect of fiscal leadership following conflict, leads to significantly more extrapolative expectations. Columns (3) and (4) in Panel B show a significantly larger extrapolation of the most recently observed inflation in inflation expectations in FL and Conflict+FL treatments. In the final phase of the experiment, we find even more pronounced inflation extrapolation in the conflict treatments (Columns (5) and (6)). We explore this further in the next section.

5.4 Do mental models depend on the policy mix?

Our evidence so far has shown that the anticipation of policy conflict does not lead to significantly different aggregate outcomes, consistent with predictions assuming agents are not forward-looking. We now turn to participants' individual expectations to gain insight into their mental models of the economy and understand how beliefs are revised throughout the experiment. We consider several types of forecasting models and assign a type to each participant that best fits their forecasting behavior.

Table 6 summarizes the set of models we consider. The simplest deviation from rational expectations we examine is cognitive discounting [Gabaix, 2020], where agents discount variables far into the future to a larger degree than expected. We also consider a model in which participants' forecasts are based on a steady state or target. Additionally, we consider backward-looking models where the formation of expectations is history-driven, such as constant-gain learning [Evans and Honkapohja, 2001, Milani, 2012]. Lastly, we examine two trend-chasing expectations based on experimental evidence from earlier work [Pfajfar and Žakelj, 2014, Cornand and M'baye, 2018, Petersen, 2014, Assenza et al., 2019]. First, we consider the possibility that expectations of next period's output/inflation is based on last period's output/inflation, though with the addition of a trend-chasing parameter that gives weight to how last period's output/inflation evolved from output/inflation the period before that. Our second model of extrapolation instead assumes agents extrapolate inflation based on the trends in government debt as opposed to inflation or output.

Insert Table 6

We determine the forecasting model that best fits each participant's forecasting behavior during each phase of the experiment. To do this, we compute the mean absolute error (MAE) of each participant's expectations for each of the models presented in Table 6.[13] We assign each participant the model and its parameter value (if applicable) that produces the lowest MAE. Figure 9 presents the share of participants in each treatment classified into a given model. For conciseness, we present the assigned models over the entire experiment, as the distribution of general models does not change meaningfully across phases.

Insert Table 6

[13] We choose to assign forecasting types based on MAE rather than mean squared errors (MSE) to minimize sensitivity to outliers. MSE squares errors before averaging, which gives a disproportionately large weight to large errors and can skew the overall error metric. MAE treats all deviations from the hypothetical heuristic forecasts equally, providing a more robust measure.

Insert Figure 9

We find that economic fundamentals and the government's debt do not significantly influence participants' forecasts. Instead, participants rely on some form of historical information to formulate their expectations. A large majority of participants use historical inflation and output gap trends to forecast inflation and the output gap.

Following Kostyshyna et al. [2024], we plot the cumulative distribution of the trend-extrapolation parameter, τ_x and τ_π, for participants classified as trend chasing to understand how expectations respond to recent trends across treatments and phases. Summary statistics are reported in Table 7 and the cumulative distributions by treatment are presented in Figure 10. While the general models participants employ to forecast are very similar across treatments, there are notable differences in the way they extrapolate trends.

Insert Table 7

Insert Figure 10

In Phase 1, the fiscal and monetary authorities use identical rules to determine their respective policies. Moreover, participants have yet to experience the economic recovery and differing policy approaches. Thus, any differences in treatments during this phase should stem from expectations about future policy responses. While the anticipation of future conflict increases output gap extrapolation from $\tau_x = 0.58$ in the Coordination treatments to $\tau_x = 0.84$ in the Conflict treatments, the differences are not significant ($p = 0.114$). Likewise, the degree of trend-extrapolation in inflation expectations does not differ notably, ranging from $\tau_\pi = 0.70$ to $\tau_\pi = 0.83$ ($p > 0.19$ for all pairwise comparisons). Overall, we see little difference in the anticipation of policy coordination or conflict on trend-extrapolation, suggesting participants do not significantly factor policy coordination and conflict into their expectations.

In Phase 2, the mean τ_x ranges from 0.65 to 0.74, with no statistically significant differences ($p > 0.52$). The mean τ_π ranges from 0.67 in Conflict+ML to 0.88 in FL. Conflict, overall, does not significantly alter how much participants extrapolate ($p > 0.48$). This lack of difference between conflict and coordination scenarios also provides further evidence to reject Hypothesis 2, which posits that recovery is stronger and faster when policy is coordinated.

Moreover, when monetary policy leads or is expected to lead after conflict, specifically with respect to inflation, expectations are significantly and notably less extrapolative ($p = 0.008$). This finding is consistent with ample experimental evidence demonstrating that inflation expectations are better managed when monetary policy is active. Pfajfar and Žakelj [2014], Assenza et al. [2019], and Mauersberger [2021] show that a more aggressive monetary policy response can tame extrapolative inflation expectations.

With these earlier findings in mind, we anticipated in phase 2 that the passive monetary policy response in FL would generate more extrapolative expectations than the extra-aggressive monetary policy in Conflict+FL. However, we find minimal support for this hypothesis. The differences in τ_x and τ_π across FL and Conflict+FL are minimal and not statistically significant ($p > 0.75$).

However, the fact that inflation expectations become more extrapolative in phase 2 in Conflict+FL compared to Conflict+ML, despite identical current policies and both having highly active monetary policy, is striking. The anticipation of an eventual fiscally-led resolution results in significantly greater trend-extrapolation ($p = 0.036$).

Finally, in Phase 3, all conflict has been resolved, and either the fiscal or monetary authority leads with active policy. In other words, the policy rules are identical in the ML and Conflict+ML treatments, as well as in the FL and Conflict+FL treatments. Therefore, it would be reasonable to expect that the distribution of models would be comparable within the policy-leader treatments.

The mean τ_x ranges between 0.74 and 0.83, with no significant differences across treatments ($p > 0.382$). The mean τ_π is notably lower when policy was previously coordinated ($p = 0.024$). This result stems mainly from the fiscal policy treatments, where the difference between FL and Conflict+FL is significant at the 10% level ($p = 0.06$).

One potential explanation for the large difference between the FL and Conflict+FL $\tau_\pi$values is experience. Participants in the FL treatment have had time to learn how to forecast in an environment with passive monetary policy. In contrast, Conflict+FL participants who experienced policy conflict in Phase 2 were previously interacting in a more stable environment with better inflation management. The shift in policy away from inflation management may have been confusing, leading participants to rely more heavily on recent trends to formulate their forecasts.

6 Discussion

This paper highlights how individuals respond to policy conflict and government debt when forming macroeconomic expectations. Our findings reveal that people do not adequately consider future policy conflicts and coordination, indicating a limited appreciation for their potential economic consequences. Participants' expectations are primarily influenced by the recent state of the economy rather than the level of debt, suggesting debt may not play as significant a role in shaping inflation expectations as previously thought. Our results suggest that myopia and selective attention, rather than cognitive load or central bank credibility, play a significant role in driving participants' expectations. Similar inattentiveness to future monetary policy has been observed in other studies [Kryvtsov and Petersen, 2021, Coibion et al., 2023].

Personal experiences likely influenced participants' attitudes towards debt and inflation. For our undergraduate participants, experiences of low and stable inflation, disconnected from government debt levels, may have led to muted responses to policy conflict and, especially, government debt. This aligns with Brandao-Marques et al. [2023] and Grigoli and Sandri [2023] who find more muted effects of government debt on inflation expectations of those in advanced economies and for those who are more informed. Future research could compare expectation formation across generations to see if past experiences with high debt and inflation lead to different responses. Likewise, Hommes et al. [2023b] find that most households surveyed in the Netherlands, France and Italy between November 2021 and March 2022 did not consider inflation to be a pressing concern when asked to think about government debt. Coibion et al. [2021] also find that information about current fiscal debt or deficits has little impact on household inflation expectations, though projections of rising future debt do. In our study, participants were well informed about the central bank's target and that the policy makers were committed to their policy rules. We did not provide participants with projections of the government debt, but we suspect doing so would have made them more responsive to that information.

Another explanation for the minimal impact of policy conflict is the presence of strong strategic complementarities. If participants do not believe aggregate expectations will respond to future policy mixes, they are less likely to incorporate it into their own beliefs. While our experimental design does not allow us to conclusively address strategic complementarities, related work by Mirdamadi and Petersen [2018] shows that introducing such complementarities into the experimental framework can encourage more ex-ante rational forecasting

behavior, as outlier forecasters learn from the aggregate outcomes.

The observed prevalence of backward-looking expectations also has important implications for less conventional monetary policy frameworks. Make-up strategies, such as those considered by the Bank of Canada, and introduced by the Federal Reserve in the form of average inflation targeting (AIT), rely on forward-looking expectations to anchor public expectations effectively. In the case of AIT, the public must be sufficiently forward-looking to understand that the period of overshooting inflation they are living in, for example, will be met with a period of undershooting to hit the target over a specific period of time. Our results suggest that such strategies may not work as intended if the public is primarily backward-looking. There are already signs that AIT is struggling in practice, with work by Bocola et al. [2024] showing that the change in Fed stance accounted for half of the post-2020 inflation experienced in the US.

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7 Tables and figures

Table 1: Parameter values for experimental treatments

	Low demand state	**High demand state**			
Parameter	**All treatments**	**ML**	**FL**	**CML**	**CFL**
ζ_t^d	-143	43	43	43	43
κ	0.007232228	0.007232228	0.00723223	0.00723223	0.00723223
α	0.33	0.33	0.33	0.33	0.33
β	0.9985	0.9985	0.9985	0.9985	0.9985
ρ_{tr}	0.462027055	0.462027055	0.46202706	0.46202706	0.46202706
ϕ_y	0	0	0	0	0
b^*	1.118045487	1.118045487	1.11804549	1.11804549	1.11804549
δ_y	0.281411571	0.281411571	0.28141157	0.28141157	0.28141157
ρ_τ	0.650109862	0.966628833	0.65010986	0.65010986	0.65010986
δ_b	0	0.077837151	0	0	0
ψ_y	0.265458534	0.265458534	0.26545853	0.26545853	0.26545853
ρ_r	0.657556532	0.657556532	0.65755653	0	0
ψ_π	0.690266852	3.5	0.69026685	2	2
ψ_y	0.265458534	0.265458534	0.26545853	0.26545853	0.26545853

Note: ML = Coordinated monetary-led scenario, FL = Coordinated fiscally-led scenario, CML = Conflict monetary-led scenario, and CFL = Conflict fiscally-led scenario

Table 2: Summary of predictions under different models of expectations

	H1:Recession	H2: Recovery		H3: Fiscal leadership	
	Depth	Peak	No. Periods	Mean output gap	Mean inflation
				Phase 2, Phase 3	Phase 2, Phase 3
Ex-ante rational					
ML	-342.28	76.02	1	-4.72, 16.02	17.43, 9.96
FL	-205.61	127.22	1	62.54, 43.36	175.06, 167.79
Conflict+ML	-374.70	-15.04	n/a	-15.18, -27.22	12.14, 16.24
Conflict+FL	-278.11	-98.95	11	-103.94, 51.54	169.72, 208.33
Naïve					
ML	-548.26	516.75	3	237.70, 309.85	-37.38, 3.99
FL	-548.26	122.36	6	-45.63, 126.13	-50.49, -39.53
Conflict+ML	-548.26	238.91	4	37.85, 345.41	-46.24, -18.22
Conflict+FL	-548.26	238.91	4	37.85, 187.66	-46.24, -26.10
Trend-extrapolation ($\tau = 0.5$)					
ML	-860.72	1056.72	2	-282.33, -129.50	-23.24, 17.42
FL	-860.72	333.50	4	-60.08, 495.43	2.61, 214.06
Conflict+ML	-860.72	457.82	3	-149.51, -485.10	-9.17, 56.31
Conflict+FL	-860.72	457.82	3	-149.51, 187.05	-9.17, 109.37

Note: Recession depth is measured as the minimum output gap (bps) in Phase 1. Recovery refers to Phase 2, and Peak is measured as the maximum level of output (bps) while No. Periods refers to the number of periods before output returns to the steady state.

Table 3: Mean absolute forecast errors, by treatment and phase

	Output gap expectations			Inflation expectations		
Phase	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3
ML	287.49	785.78	727.59	38.35	74.23	91.85
	(447.08)	(587.40)	(882.90)	(44.88)	(96.48)	(98.54)
FL	228.84	190.92	155.95	36.20	47.76	42.25
	(531.30)	(187.13)	(183.43)	(53.50)	(61.86)	(61.34)
Conflict+ML	257.19	180.44	209.19	30.21	31.20	27.62
	(210.65)	(151.11)	(246.03)	(60.48)	(35.32)	(36.64)
Conflict+FL	244.80	240.13	214.52	33.55	37.33	73.45
	(234.83)	(203.40)	(458.41)	(57.93)	(32.56)	(191.16)
p-value of pairwise t-test						
Ml vs. FL	0.186	0.000	0.000	0.754	0.073	0.000
Conflict+ML vs. Conflict +FL	0.574	0.000	0.937	0.570	0.134	0.044
ML vs. Conflict ML	0.340	0.000	0.000	0.210	0.002	0.000
FL vs. ConflictFL	0.674	0.019	0.379	0.674	0.148	0.167
Coordination vs. Conflict	0.779	0.000	0.000	0.208	0.001	0.083
Monetary vs. Fiscal	0.158	0.000	0.000	0.826	0.269	0.914

Note: This table reports the mean absolute forecast error by treatment and phase. Pairwise t-tests evaluate the hypothesis that the comparison groups are identical. For hypothesis tests, we evaluate mean absolute forecast errors at the subject-level.

Table 4: Effects of policy mix on central bank credibility

Panel A						
$Credibility^{x^*}_{i,t}$	Phase 1		Phase 2		Phase 3	
	(1)	(2)	(3)	(4)	(5)	(6)
FL	-25.987		249.229***		196.488***	
	(40.56)		(84.27)		(63.33)	
Conflict+ML	37.098		288.759***		121.490*	
	(26.59)		(84.92)		(65.24)	
Conflict+FL	-9.122	-20.233	224.179***	-313.809***	68.844	-249.135***
	(22.47)	(48.40)	(68.90)	(101.53)	(83.64)	(69.86)
Fiscal		-25.987		249.229***		196.488***
		(40.56)		(84.27)		(63.33)
Conflict		37.098		288.759***		121.490*
		(26.59)		(84.92)		(65.24)
$Credibility^{x^*}_{i,t-1}$	0.563***	0.563***	0.589***	0.589***	0.941***	0.941***
	(0.14)	(0.14)	(0.12)	(0.12)	(0.05)	(0.05)
Constant	-358.868***	-358.868***	-379.092***	-379.092***	-207.257***	-207.257***
	(100.17)	(100.17)	(118.58)	(118.58)	(75.84)	(75.84)
N	1305	1305	1450	1450	1415	1415
χ^2	30.17	30.17	514.0	514.0	1881.7	1881.7

Panel B						
$Credibility^{\pi^*}_{i,t}$	Phase 1		Phase 2		Phase 3	
	(1)	(2)	(3)	(4)	(5)	(6)
FL	8.313		2.061		2.377	
	(5.53)		(4.56)		(5.37)	
Conflict+ML	13.684**		21.594***		0.043	
	(5.55)		(3.65)		(5.88)	
Conflict+FL	10.820*	-11.176	11.207***	-12.447**	-32.215**	-34.636**
	(5.68)	(7.81)	(4.04)	(4.85)	(13.99)	(15.85)
$Credibility^{\pi^*}_{i,t-1}$	0.630***	0.630***	0.792***	0.792***	1.092***	1.092***
	(0.12)	(0.12)	(0.03)	(0.03)	(0.10)	(0.10)
Fiscal		8.313		2.061		2.377
		(5.53)		(4.56)		(5.37)
Conflict		13.684**		21.594***		0.043
		(5.55)		(3.65)		(5.88)
Constant	-53.993***	-53.993***	-26.572***	-26.572***	1.682	1.682
	(12.06)	(12.06)	(4.67)	(4.67)	(11.52)	(11.52)
N	1305	1305	1450	1450	1415	1415
χ^2	46.11	46.11	2403.4	2403.4	855.3	855.3

Note: This table reports random effect panel regressions evaluating the effects of policy mixes on central bank credibility. The dependent variable is the absolute deviation of individual expectations from the central bank's output gap and inflation targets. Outlier sessions are excluded. $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 5: Effects of government debt and policy mix on expectations

Panel A	Phase 1		Phase 2		Phase 3	
Dep. var: $E_{i,t}x_{t+1}$	(1)	(2)	(3)	(4)	(5)	(6)
x_{t-1}	1.017***	0.806***	1.002***	0.717***	1.075***	1.129***
	(0.05)	(0.09)	(0.03)	(0.06)	(0.04)	(0.07)
$x_{t-1}\times$ FL	0.071	0.179	0.011	0.115***	-0.267***	-0.246***
	(0.06)	(0.17)	(0.04)	(0.04)	(0.06)	(0.06)
$x_{t-1}\times$ Conflict+ML	-0.028	0.037	-0.112***	-0.044	0.038	-0.005
	(0.04)	(0.09)	(0.04)	(0.04)	(0.05)	(0.05)
$x_{t-1}\times$ Conflict+FL	0.023	-0.078	-0.070*	-0.116**	0.137**	0.136**
	(0.04)	(0.09)	(0.04)	(0.05)	(0.06)	(0.06)
b_{t-1}		-0.249***		-0.223***		0.039
		(0.08)		(0.06)		(0.03)
$b_{t-1}\times$ FL		0.010		0.028***		-0.018***
		(0.01)		(0.01)		(0.00)
$b_{t-1}\times$ Conflict+ML		0.005		0.003		-0.019***
		(0.01)		(0.01)		(0.00)
$b_{t-1}\times$ Conflict+FL		-0.012		0.006		-0.019***
		(0.01)		(0.01)		(0.00)
Constant	35.414	1830.540***	57.305***	1542.397***	48.246***	-132.482
	(27.76)	(625.86)	(10.39)	(397.03)	(13.05)	(202.39)
N	1305	1305	1450	1450	1415	1415
$Adj.R^2$	0.293	0.303	0.780	0.800	0.890	0.893
RMSE	384.3	381.7	316.1	301.4	425.5	420.3

Panel B:	Phase 1		Phase 2		Phase 3	
Dep. var: $E_{i,t}\pi_{t+1}$	(1)	(2)	(3)	(4)	(5)	(6)
π_{t-1}	1.086***	1.037***	0.821***	0.820***	0.951***	0.850***
	(0.03)	(0.05)	(0.05)	(0.05)	(0.07)	(0.06)
$\pi_{t-1}\times$ FL	-0.025	-0.066	0.188***	0.125**	0.096	0.081
	(0.03)	(0.07)	(0.05)	(0.06)	(0.08)	(0.07)
$\pi_{t-1}\times$ Conflict+ML	-0.027	-0.014	0.025	-0.014	0.167**	0.515***
	(0.04)	(0.05)	(0.06)	(0.06)	(0.08)	(0.07)
$\pi_{t-1}\times$ Conflict+FL	-0.023	-0.093	0.175***	0.214***	0.427***	0.413***
	(0.04)	(0.06)	(0.05)	(0.06)	(0.11)	(0.11)
b_{t-1}		-0.025***		-0.026***		-0.024***
		(0.01)		(0.00)		(0.00)
$b_{t-1}\times$ FL		-0.001		0.002		-0.001
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+ML		0.000		-0.001		-0.005***
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+FL		-0.001		0.001		-0.007***
		(0.00)		(0.00)		(0.00)
Constant	-4.635*	184.994***	26.328***	190.810***	-4.833*	193.384***
	(2.71)	(57.15)	(2.32)	(25.99)	(2.53)	(15.08)
N	1305	1305	1450	1450	1415	1415
$Adj.R^2$	0.536	0.537	0.728	0.752	0.871	0.884
$RMSE$	61.12	61.00	73.66	70.28	115.3	109.3

Note: This table reports random effect panel regressions evaluating the effects of government debt and policy mix on individual expectations. The dependent variable is the absolute deviation of individual expectations from the central bank's output gap and inflation targets. Outlier sessions are excluded. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Forecasting models

Model	Description	Expectations
M1	Ex-ante rational	$E_{i,t}\pi_{t+1} = f\left(r^n_{t-1}, \epsilon_t\right)$
		$E_{i,t}x_{t+1} = f\left(r^n_{t-1}, \epsilon_t\right)$
M2	Cognitive discounting	$E_{i,t}\pi_{t+1} = \alpha f\left(r^n_{t-1}, \epsilon_t\right)$
		$E_{i,t}x_{t+1} = \alpha f\left(r^n_{t-1}, \epsilon_t\right)$
M3	Constant Gain	$E_{i,t}\pi_{t+1} = E_{i,t-2}\pi_{t-1} - \gamma(E_{i,t-2}\pi_{t-1} - \pi_{t-1})$
		$E_{i,t}x_{t+1} = E_{i,t-2}x_{t-1} - \gamma(E_{i,t-2}x_{t-1} - x_{t-1})$
M4	Steady State/Target	$\mathrm{E}_{i,t}\pi_{t+1} = 0$
		$\mathrm{E}_{i,t}x_{t+1} = 0$
M5	Trend Chasing	$E_{i,t}\pi_{t+1} = \pi_{t-1} + \tau(\pi_{t-1} - \pi_{t-2})$
		$E_{i,t}x_{t+1} = x_{t-1} + \tau(x_{t-1} - x_{t-2})$
M6	Debt Trend Chasing	$E_{i,t}\pi_{t+1} = \pi_{t-1} + \delta(b_{t-1} - b_{t-2})$
		$E_{i,t}x_{t+1} = x_{t-1} + \delta(b_{t-1} - b_{t-2})$

Note: We evaluate γ, τ, and $\delta \in [0.1, 1.5]$, and $\alpha \in [0.1, 0.9]$ in increments of 0.1.

Table 7: Degree of trend-extrapolation across treatments and phases

	Output gap expectations		
	Phase 1	Phase 2	Phase 3
Mean τ_x			
ML	0.572	0.655	0.830
FL	0.593	0.681	0.811
Conflict+ML	0.854	0.742	0.767
Conflict+FL	0.831	0.697	0.738
p-value			
ML vs. FL	0.904	0.862	0.878
Conflict+ML vs Conflict+FL	0.916	0.743	0.822
ML vs. Conflict+ML	0.107	0.521	0.382
FL vs. Conflict+FL	0.324	0.919	0.657
Coordination vs. Conflict	0.114	0.618	0.415
Monetary vs. Fiscal	0.750	0.935	0.633

	Inflation expectations		
	Phase 1	Phase 2	Phase 3
Mean τ_π			
ML	0.707	0.718	0.718
FL	0.781	0.881	0.796
Conflict+ML	0.700	0.671	0.847
Conflict+FL	0.831	0.850	1.034
p-value			
ML vs. FL	0.433	0.114	0.469
Conflict+ML vs. Conflict+FL	0.364	0.036	0.265
ML vs. Conflict+ML	0.941	0.484	0.423
FL vs. Conflict+FL	0.713	0.752	0.060
Coordination vs. Conflict	0.694	0.872	0.024
Monetary vs. Fiscal	0.195	0.008	0.084

Note: This table presents the mean degree of trend-extrapolation for participants best classified as trend-chasing. p-values are calculated from pairwise t-tests, with standard errors clustered at the session-level.

Figure 1: Experimental interface

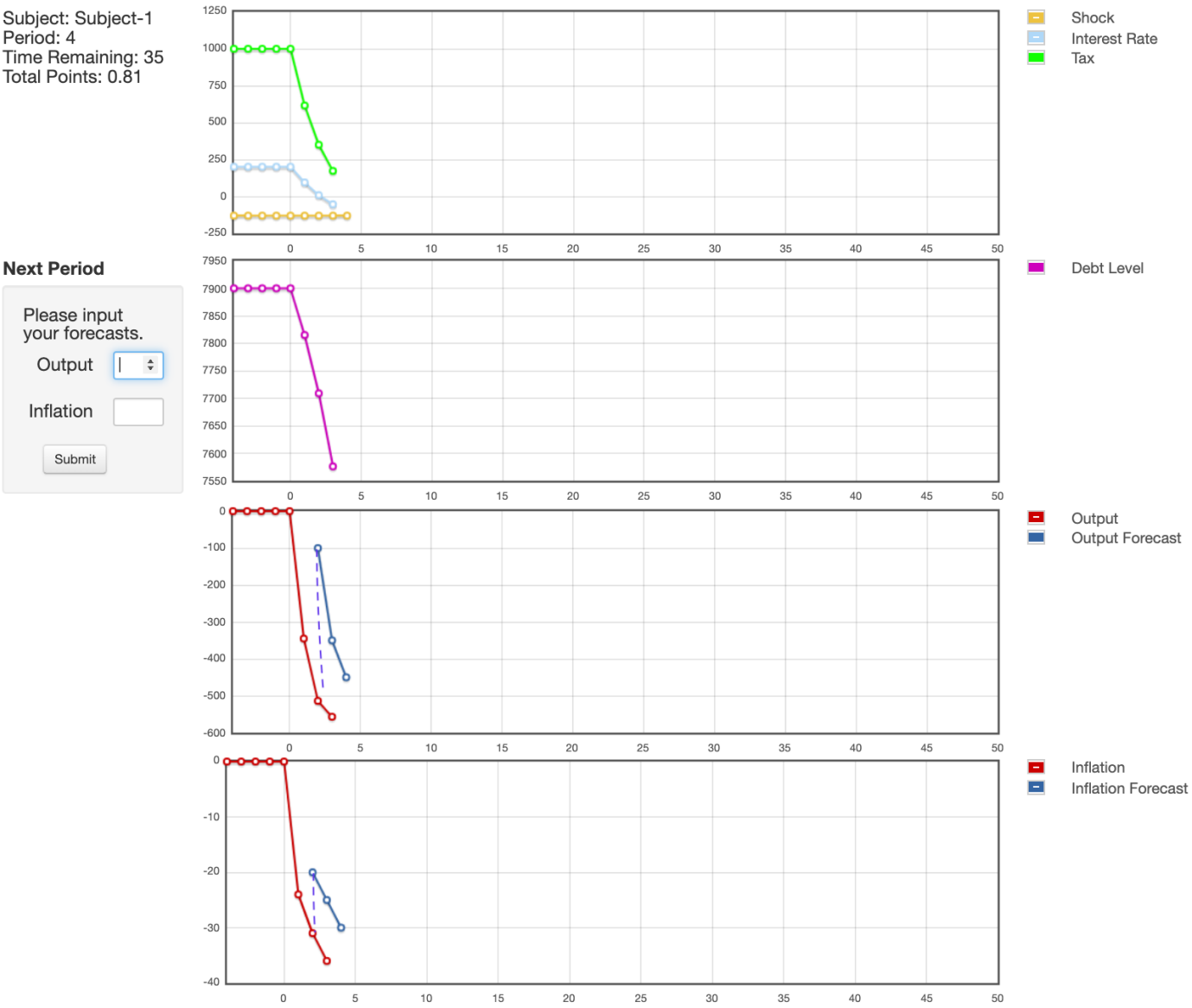


Figure 2: Scoring rule

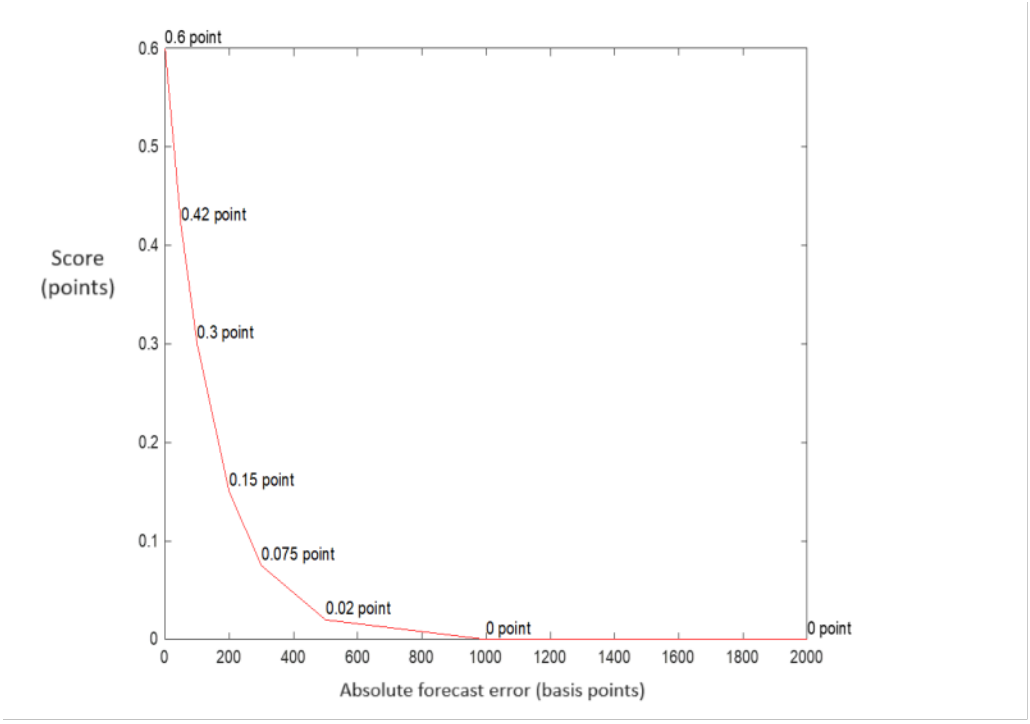
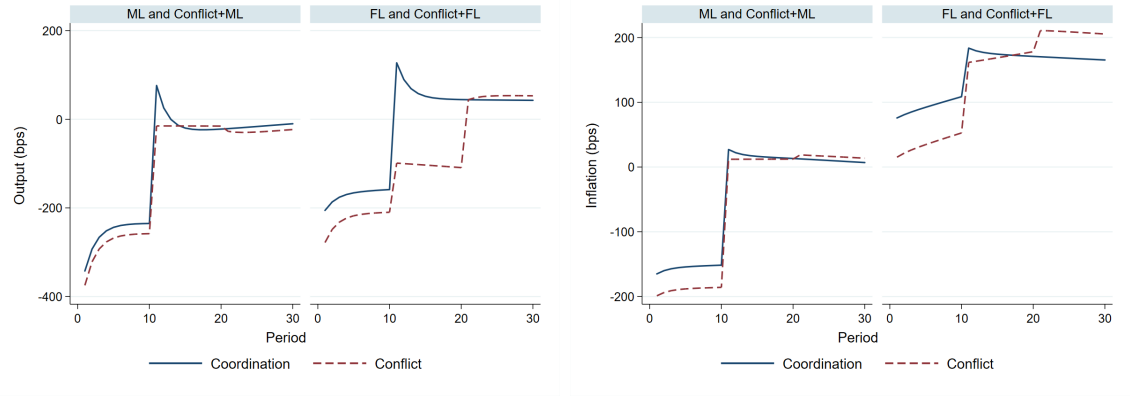
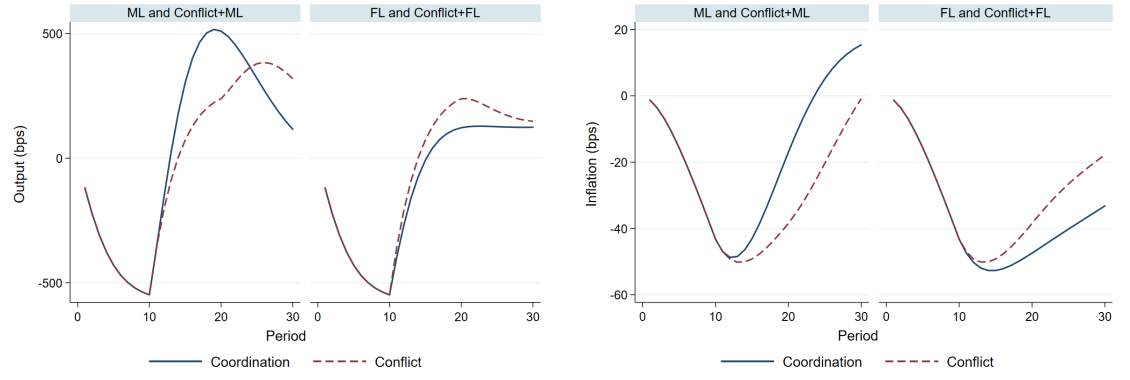


Figure 3: Predictions under alternative expectations

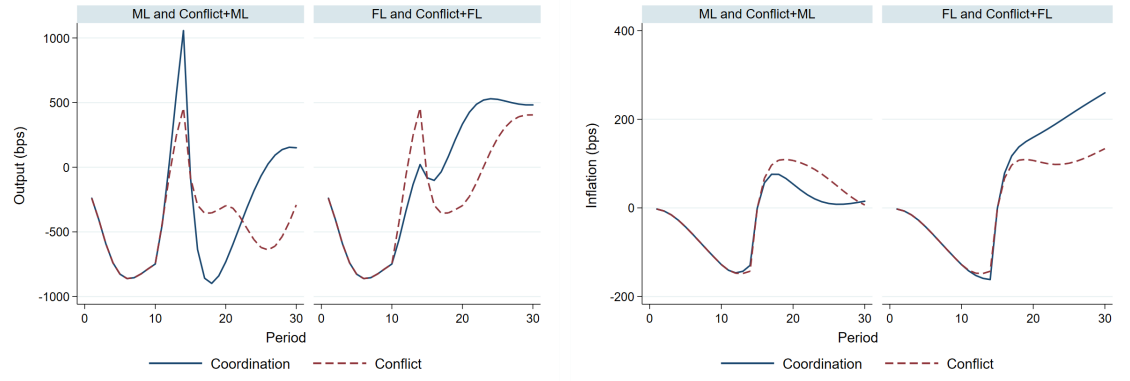
(a) RE



(b) Naïve

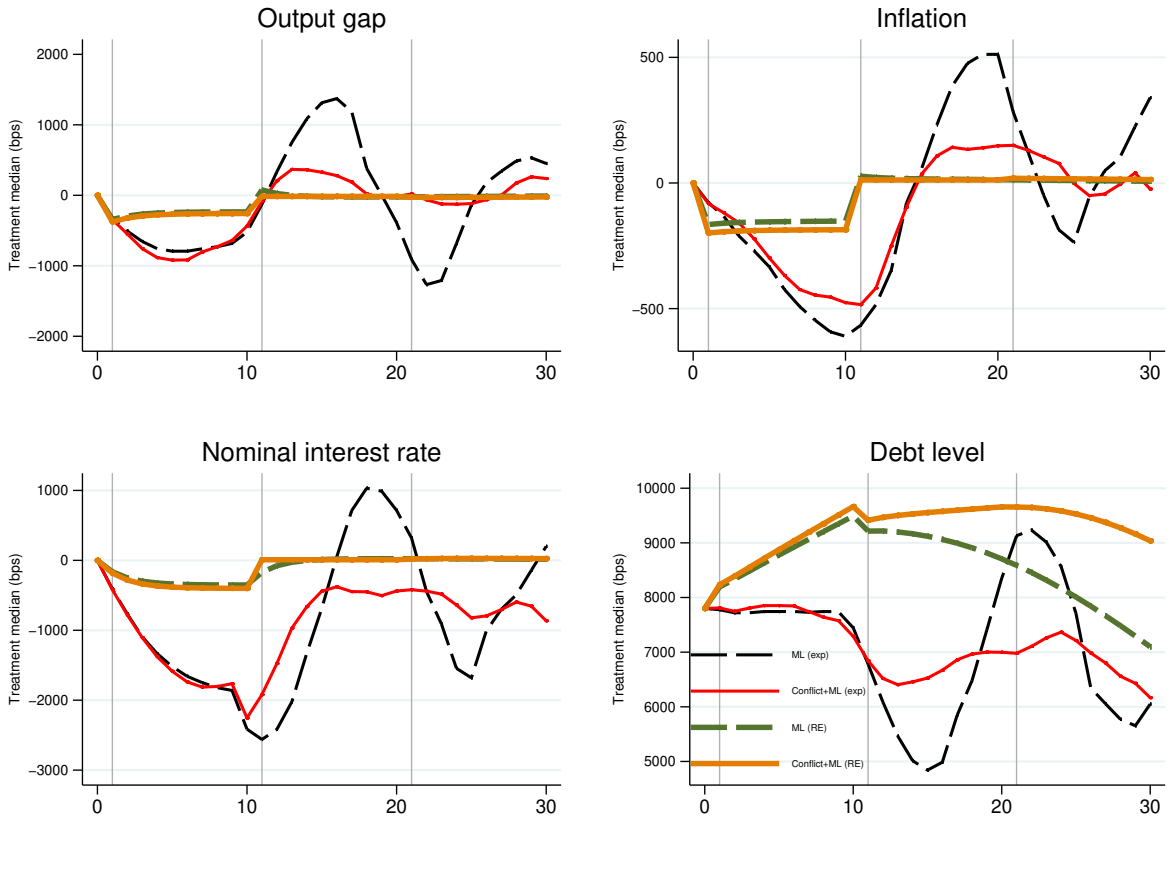


(c) Extrapolative ($\tau = 0.5$)



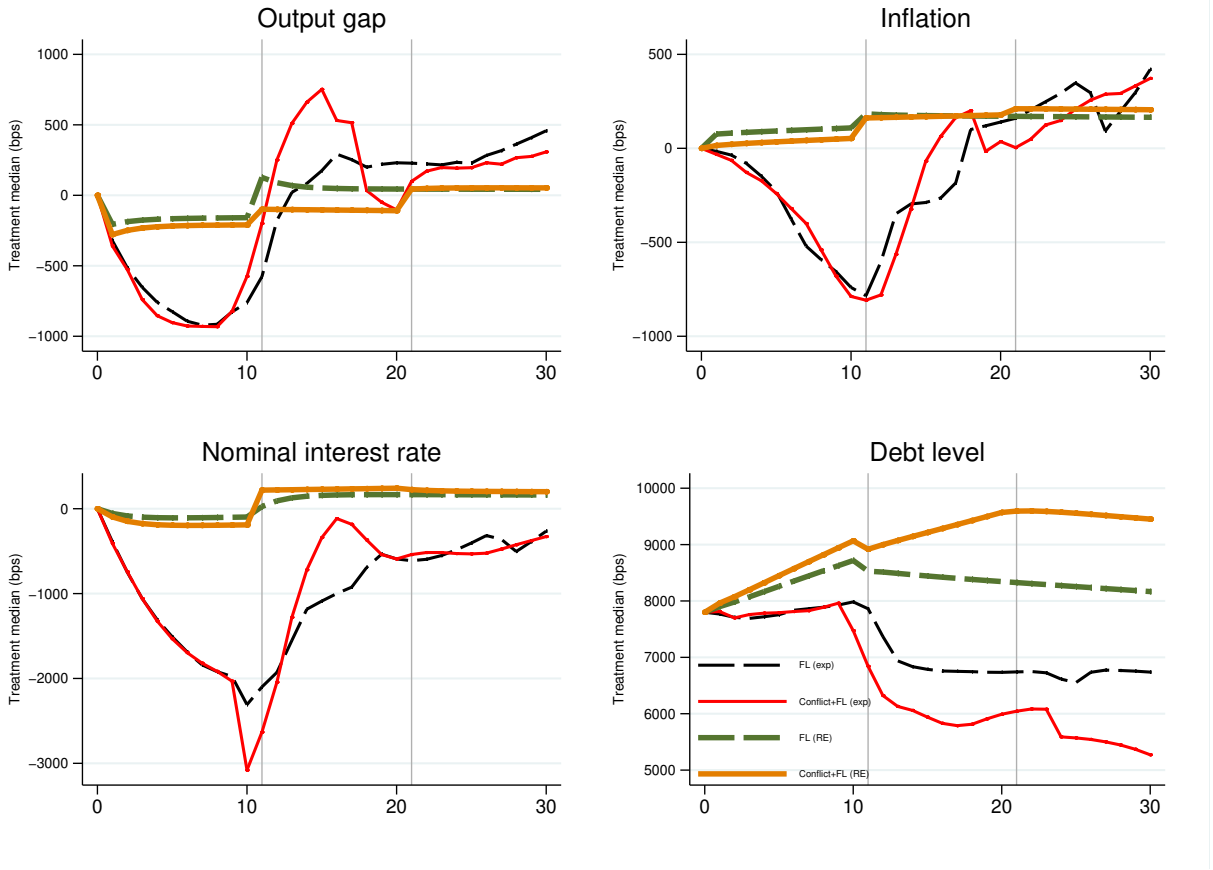
Note: Solid lines represent coordination scenarios (ML and FL) and dashed lines conflict scenarios (CML and CFL). Output gap and inflation are set to represent basis point deviations from steady state and so are initialized at zero.

Figure 4: Monetary-led scenarios, in basis points



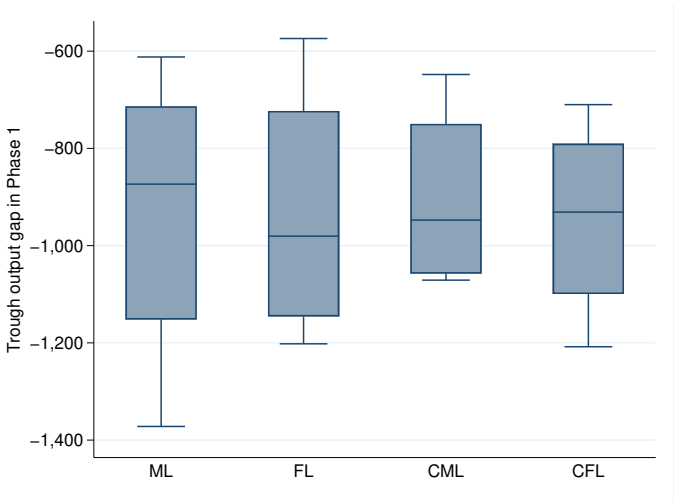
Note: Dashed lines represent coordination scenarios and solid lines conflict scenarios. The black-dashed line ("ML (exp)") is the median value across sessions at each point in time in the monetary-led coordinated scenario in the experiments, while the grey-dashed line ("ML (RE)") is the result from Bianchi and Melosi's Rational Expectations model. Similarly, the red line ("Conflict+ML (exp)") is the median value across sessions at each point in time in the monetary-led coordination scenario in the experiments, while the gold line ("Conflict+ML (RE)") is the conflict followed by monetary-led coordination from the Rational Expectations model. Output gap, inflation, and interest rate are set to represent basis point deviations from steady state and so are initialized at zero. Debt level (debt to GDP ratio), borrowing from Bianchi and Melosi (2019), is set at an initial level of 77 percent (or 7700 basis points).

Figure 5: Fiscal-led scenarios, in basis points



Note: Dashed lines represent coordination scenarios and solid lines conflict scenarios. The black-dashed line ("FL (exp)") is the median value across sessions at each point in time in the fiscally-led coordinated scenario in the experiments, while the grey-dashed line ("FL (RE)") is the result from Bianchi and Melosi's Rational Expectations model. Similarly, the red line ("Conflict+FL (exp)") is the median value across sessions at each point in time in the fiscally-led conflict scenario in the experiments , while the gold line ("Conflict+FL (RE)") is the conflict followed by fiscally-led coordination from the Rational Expectations model. Output gap, inflation, and interest rate are set to represent basis point deviations from steady state and so are initialized at zero. Debt level (debt to GDP ratio), borrowing from Bianchi and Melosi (2019), is set at an initial level of 77 percent (or 7700 basis points).

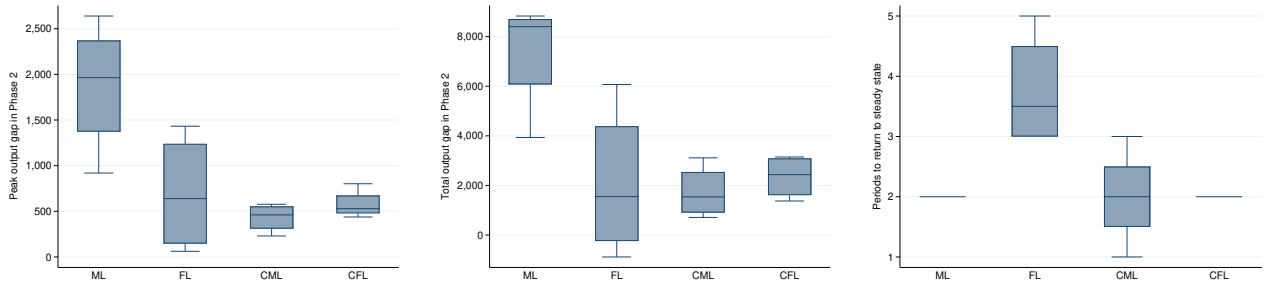
Figure 6: Distribution of recession output gap troughs



Note: This figure presents session-level statistics for the output gap in Phase 1. Horizontal line within each box are the median values. The box indicates the values associated with the 25th and 75th percentiles, and the bars denote the minimum and maximum values.

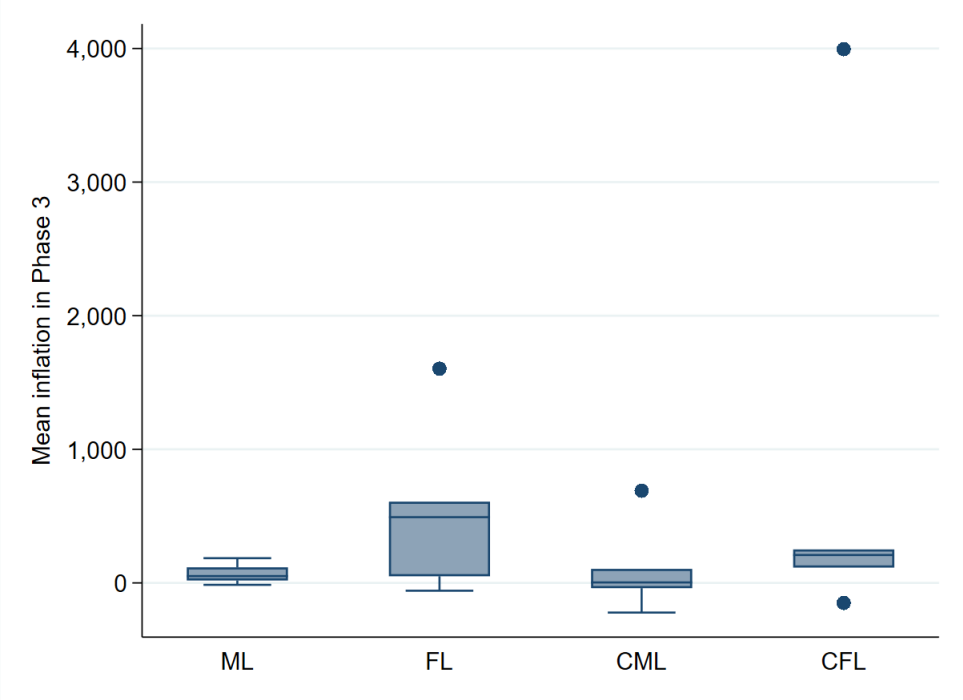
Figure 7: Distribution of output gap results in Phase 2

(a) Peak output (b) Total output (c) Recovery time



Note: This figure presents session-level statistics for the output gap in Phase 2. Horizontal line within each box are the median values. The box indicates the values associated with the 25th and 75th percentiles, and the bars denote the minimum and maximum values.

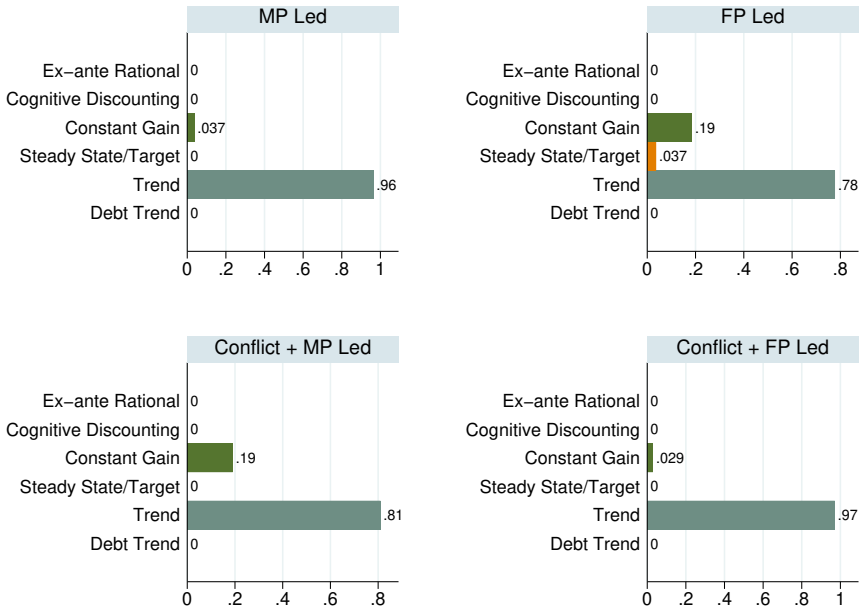
Figure 8: Distribution of session-level mean inflation in Phase 3



Note: This figure presents session-level statistics for inflation in Phase 3. Horizontal line within each box are the median values. The box indicates the values associated with the 25th and 75th percentiles, and the bars denote the minimum and maximum values.

Figure 9: Distribution of forecasting models, by treatment

(a) Output gap forecasts



(b) Inflation forecasts

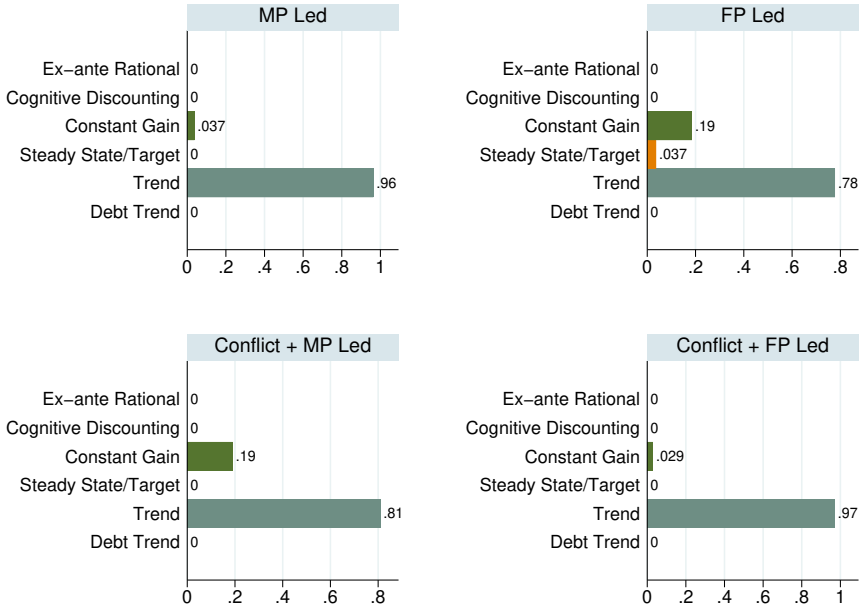
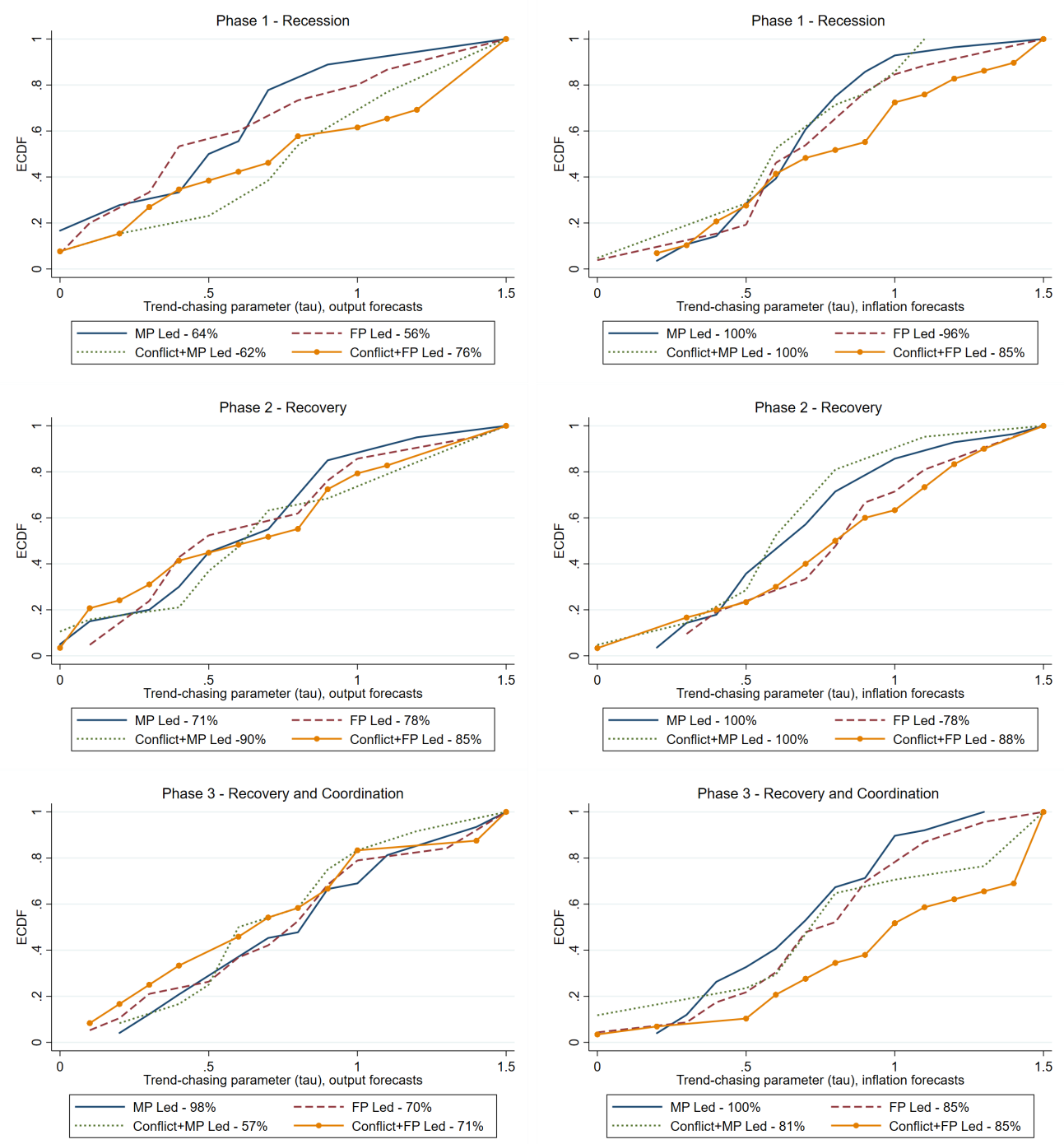


Figure 10: Distribution of trend-extrapolation, by treatment



Note: This figure presents cumulative distributions of the best-fitting measure of trend-extrapolation for participants classified into a general trend-extrapolating model. The fitted τ ranges from 0 to 1.5. The share of participants classified as extrapolating recent trends is provided in each legend.

A Instructions

This section presents consolidated instructions for Monetary Led, Fiscal Led, Conflict+Monetary Led, and Conflict+Fiscal Led treatments. Where the instructions differ across treatments is in the description of policy rules in the Scenario section (pages 6 to 8).

Experimental Instructions

Welcome! You are participating in an economics experiment at SFU Experimental Economics Lab. In this experiment you will participate in the experimental simulation of the economy. If you read these instructions carefully and make appropriate decisions, you may earn a considerable amount of money that will be immediately paid out to you in cash at the end of the experiment.

Each participant is paid CDN$7 for attending. Throughout this experiment you will also earn points based on the decisions you make. Every point you earn is worth $0.75. We reserve the right to improve this in your favour if average payoffs are lower than expected.

During the experiment you are not allowed to communicate with other participants. If you have any questions, the experimenter will be glad to answer them privately. If you do not comply with these instructions, you will be excluded from the experiment and deprived of all payments aside from the minimum payment of CDN $7 for attending.

The experiment is based on a simple simulation that approximates fluctuations in the real economy. Your task is to serve as private forecasters and provide real-time forecasts about future output and inflation in this simulated economy. The instructions will explain what output, inflation, and the interest rate are and how they move around in this economy, as well as how they depend on forecasts. We will allow you to practice making forecasts for several unpaid periods before we begin paid periods in this experiment. You will then participate in 30 paid periods.

In this simulation, households and firms (whose decisions are automated by the computer) will form forecasts identically to yours. So to some degree, outcomes that you will see in the game will depend on the way in which you form your forecasts. Your earnings in this experiment will depend on the accuracy of your individual forecasts.

On the next page we will discuss what inflation and output are, and how to predict them. All values will be given in basis points, a measurement often used in descriptions of the economy. All values can be positive, negative, or zero at any point in time.

Your task

Your task in this experiment is to forecast future output and inflation as correctly as possible, which we explain further below.

You will submit forecasts for the next period's inflation and output, measured in basis points:

- 1% = 100 basis points
- 3.25% = 325 basis points
- -0.5% = -50 basis points
- -4.8% = -480 basis points

These are just a handful of examples of how basis points work. You can submit any forecast you wish, positive or negative or zero, but please only submit integers.

How the economy evolves

We will now explain the factors that influence output and inflation and the relationships between the different variables in the economy.

The economy consists of six main variables: shocks, inflation, output, interest rate, taxes, and the debt level. Each period, you will receive the following information that will help you make forecasts.

Current Shock

A shock is a random "event" that directly affects how much people want to spend, and consequently, how much will be produced.

The shock takes one of two values.

In a Low state of the economy, the shock is equal to -130 bps. This is a relatively small negative demand shock. In terms of magnitude, it is roughly 3x smaller than the Financial Crisis. If the economy is in the Low state, it will stay Low the next period with a probability of 0.94.

In a High state of the economy, the shock is equal to 43 bps. If the economy is in the High state, it will stay High the next period with a probability of 0.99.

Each period, you and the other forecasters will be submitting your beliefs about the following period's output and inflation. The median of each of the forecasts will be employed as the aggregate forecast in the given period and play an important role in determining the current level of output and inflation. The median, rather than the average forecast, is used so that a small number of subjects cannot have a significant effect on the economy.

Output

Output refers to a measure of the quantity of goods the economy is over- or under producing in a given period. A positive output implies over production relative to an economy's potential; a negative output the opposite.

At any time period *t*, output is calculated as follows:

$$Output_t = Median\ Forecast\ of\ Output_{t+1} + Median\ Forecast\ of\ Inflation_{t+1} - Interest\ Rate_t + Shock_t$$

The value of today's output is determined by the median expectations (forecasts) of tomorrow's output and inflation, as well as today's shock and interest rate. If you, the forecasters, predict that the future economy will produce more output relative to potential, and there will be more inflation, consumers will want to spend more in the current period. Firms will then produce more to meet consumer demand.

Likewise, positive shocks to consumer demand will have a positive effect on how much will be produced.

Increases in the nominal interest rate will make it more expensive for consumers to borrow and will create more incentive for them to save. With higher interest rates, consumers will decrease their demand for goods, leading to lower production, which will indirectly reduce inflation.

Inflation

Inflation is the rate at which overall prices change between two periods.

At any time period *t*, inflation is calculated as follows:

$$Inflation_t = 0.9985(Median\ Forecast\ of\ Inflation_{t+1}) + 0.010(Output_t)$$

Inflation is determined largely by your forecast about future inflation. The idea behind this is simple: If you, the professional forecasters, communicate to the public that inflation is likely to rise in the future, firms will begin raising their prices anticipating relatively higher prices (positive inflation) in the future. This will create inflation immediately.

Current output will also have a small positive effect on current inflation. Importantly, variables that affect output will also have a small positive effect on inflation.

The economy will also be influenced by the actions of the government and the central bank. These two authorities operate independently and have different objectives.

Fiscal Policy

The main objective of the government is to keep output at its target level (i.e. at potential). Their target level of output is 0. The government sets its taxes to bring output to its target.

Debt Level

The government's debt level will also change over time. At any time period *t*, the government's debt level will be calculated as

$$Debt\ Level_t = 1.001\ Debt\ Level_{t-1} - 1.001(Output_t - Output_{t-1}) - 1.001\ Inflation_t + 1.001\ Interest\ Rate_t - Tax_t$$

The government's debt level will evolve with the economy and the decisions of the government and central bank. The debt level at any point in time will depend on its past level. The debt level will increase if the economy contracts, i.e. output is lower today than it was yesterday, and inflation is relatively low.

The debt level will also increase in response to the policy decisions made by the central bank and the government. As the interest rate increases, it becomes more expensive for the government to borrow money and their debt levels will increase. Debt levels will also rise if the government collects less tax.

Taxes

Each period, the government will collect taxes. The government adjusts how much it collects in taxes slowly. It will collect more taxes when the economy is strong and there is more output produced. In some instances the government may also collect more taxes when it has more debt. When the amount of tax collected is high, the government's debt level will decrease.

The degree to which the government will respond to its debt levels will change throughout this experiment. We will explain more about how it will respond to debt later in the instructions.

Central Bank Policy

The main objective of the central bank in this experiment is to keep inflation and output at its target levels. The target for both inflation and output is 0. The central bank sets the interest rate to bring inflation and output to its targets.

Interest Rate

The interest rate is the rate at which consumers and firms borrow and save in this experimental economy.

The interest rate responds to the distance between the current inflation rate and its target zero. The interest rate also responds to deviations of output from 0 as they are linked to deviations of inflation from its target. The response to output is much weaker than the response to inflation as output is not the principal target of the Central Bank's policy.

When inflation is high and above its target of 0 basis points, the central bank will increase interest rates. The central bank will also increase interest rate in response to positive output. When inflation or output is further above its targets, the increase in the interest rate is larger.

The increase in the interest rate has a direct negative effect on consumer demand and output, and an indirect negative effect on inflation. *When the economy is above target, a higher interest rate leads to lower inflation and output and thus helps bring the economy back towards its targets.*

When inflation is below the target of 0 basis points, the central bank will decrease interest rates with negative inflation. The central bank will also decrease the interest rate in response to negative output, though less aggressively. When inflation and output are further below their targets, the decrease in the interest rate is larger.

Lower interest rates have a direct positive effect on consumer demand and output, and an indirect positive effect on inflation. *When the economy is below target, a lower interest rate leads to higher inflation and output thus helps bring the economy back towards its targets.*

The degree to which the central bank will respond to inflation will change throughout this experiment. We will explain more about how it will respond to inflation later in the instructions.

It is also important for you to realize that, even though the government is aiming for stable output and the central bank is aiming for inflation at its target of zero, it may not be able to accomplish this every period because of the random shocks that are occurring each period and the public's (your) expectations. However, the economy will be kept relatively more stable as a consequence of the government and central bank's actions.

You will not observe the current tax rate and interest rate when you are forming your forecast about the following period's inflation and output. After you submit your forecasts, the computer will simultaneously solve for the current period's inflation, output, tax rate and interest rate taking into consideration the forecasts and the realized shock.

Scenario

The initial recession

In this experiment, the economy will begin in a recession. Consumer demand will be low for some number of periods before eventually returning to a high level. During the recession, both the government and central bank will take policy actions to help stimulate the economy. The government will ignore the level of debt and collect relatively less tax. The central bank will ignore the level and inflation and keep the interest rate low.

During the recession, the tax rate and the interest rate will be calculated as follows:

$$Tax_t = 0.65\ Tax_{t-1} + 0.098\ Output_t$$

$$Interest\ Rate_t = 0.657\ Interest\ Rate_{t-1} + 0.236(Inflation_t - 0) + 0.091(Output_t - 0)$$

The economic recovery

MP Led:

When the economy eventually recovers, output and inflation will begin to rise. The government and central bank will follow a coordinated strategy to simultaneously reduce debt and inflation. The government will reduce its spending and collect more taxes to reduce its debt level, i.e. run fiscal surpluses. The central bank will begin to raise the interest rate more than one-for-one with inflation.

During the economic recovery, the taxes and the interest rate will be calculated as follows:

$$Tax_t = 0.966\ Tax_{t-1} + 0.009\ Output_t + 0.002\ Debt\ Level_{t-1}$$

$$Interest\ Rate_t = 0.657\ Interest\ Rate_{t-1} + 1.2\ (Inflation_t - 0) + 0.09\ (Output_t - 0)$$

Increasing the amount of tax collected will reduce the government's debt level.

Raising the interest rate will make it more expensive for households and firms to borrow, thereby reducing demand and indirectly reducing inflation.

Higher interest rates also cause the government's debt level to rise. This will, in turn, lead to higher taxes as the government aims to stabilize its debt level.

FL Led:

When the economy eventually recovers, output and inflation will begin to rise. The government and central bank will continue to follow a coordinated strategy to keep the economy growing. The government will reduce its spending but will continue to ignore its debt level when deciding how much to collect in taxes. The central bank will continue to respond weakly to any changes in inflation.

During the economic recovery, the taxes and the interest rate will continue to be calculated as follows:

$$Tax_t = 0.65\ Tax_{t-1} + 0.098\ Output_t$$

$$Interest\ Rate_t = 0.657\ Interest\ Rate_{t-1} + 0.236\ (Inflation_t - 0) + 0.091\ (Output_t - 0)$$

As output and inflation improve, the government will spend less. This, together with growing inflation and relatively low interest rates, will help the government to reduce its debt level.

Conflict: MP wins out

When the economy eventually recovers, output and inflation will begin to rise. The government and central bank will face a conflict in how to approach the recovery. The government will reduce its spending but will continue to ignore its debt level when deciding how much to collect in taxes. The central bank, on the other hand, will begin to raise the interest rate more than one-for-one with inflation.

During the economic recovery, the taxes and the interest rate will be calculated as follows:

$$Tax_t = 0.65\ Tax_{t-1} + 0.098\ Output_t$$

$$Interest\ Rate_t = 2\ (Inflation_t - 0) + 0.265\ (Output - 0)$$

Raising the interest rate will make it more expensive for households and firms to borrow, thereby reducing demand and indirectly reducing inflation. Higher interest rates also cause the government's debt level to rise.

Eventually the government will begin taxing more to manage its debt level. The taxes collected by the government will be given by

$$Tax_t = 0.966\ Tax_{t-1} + 0.009\ Output_t + 0.002\ Debt\ Level_{t-1}$$

The central bank will continue to aggressively adjust its interest rate to keep inflation and output gap close to target.

$$Interest\ Rate_t = 0.657\ Interest\ Rate_{t-1} + 1.2\ (Inflation_t - 0) + 0.091\ (Output_t - 0)$$

Conflict: FP wins out

When the economy eventually recovers, output and inflation will begin to rise. The government and central bank will face a conflict in how to approach the recovery. The government will reduce its spending but will continue to ignore its debt level when deciding how much to collect in taxes. The central bank, on the other hand, will begin to raise the interest rate more than one-for-one with inflation.

During the economic recovery, the taxes and the interest rate will be calculated as follows:

$$Tax_t = 0.65\ Tax_{t-1} + 0.098\ Output_t$$

$$Interest\ Rate_t = 2\ (Inflation_t - 0) + 0.265\ (Output - 0)$$

Raising the interest rate will make it more expensive for households and firms to borrow, thereby reducing demand and indirectly reducing inflation. Higher interest rates also cause the government's debt level to rise.

Eventually the central bank will decrease how much it responds to inflation. The interest rate will then be calculated as follows:

$$Interest\ Rate_t = 0.657\ Interest\ Rate_{t-1} + 0.236\ (Inflation_t - 0) + 0.091\ (Output_t - 0)$$

Relatively lower interest rates, together with higher inflation, will help the government to reduce its debt level.

Score

Your score will depend on the accuracy of your inflation and output forecasts. The absolute difference between your forecasts and the actual values for output and inflation are your absolute forecast errors.

Absolute Forecast Error = absolute (Your Forecast – Actual Value)
Total Score = 0.30(2^-0.01(Absolute Forecast Error for Output)) + 0.30(2^-0.01 (Absolute Forecast Error for Inflation))

The maximum score you can earn each period is 0.6 points.
Your score will decrease as your forecast error increases. Suppose your forecast errors for each of output and inflation are:

0	-Your score will be 0.6	300	-Your score will be 0.075
50	-Your score will be 0.42	500	-Your score will be 0.02
100	-Your score will be 0.3	1000	-Your score will be 0
200	-Your score will be 0.15	2000	-Your score will be 0

Information about the Interface, Actions, and Payoffs

During the experiment, your main screen will display information that will help you make forecasts and earn more points.

At the top left of the screen, you will see your subject number, the current period, time remaining, and the total number of points earned. You will also see four history plots.

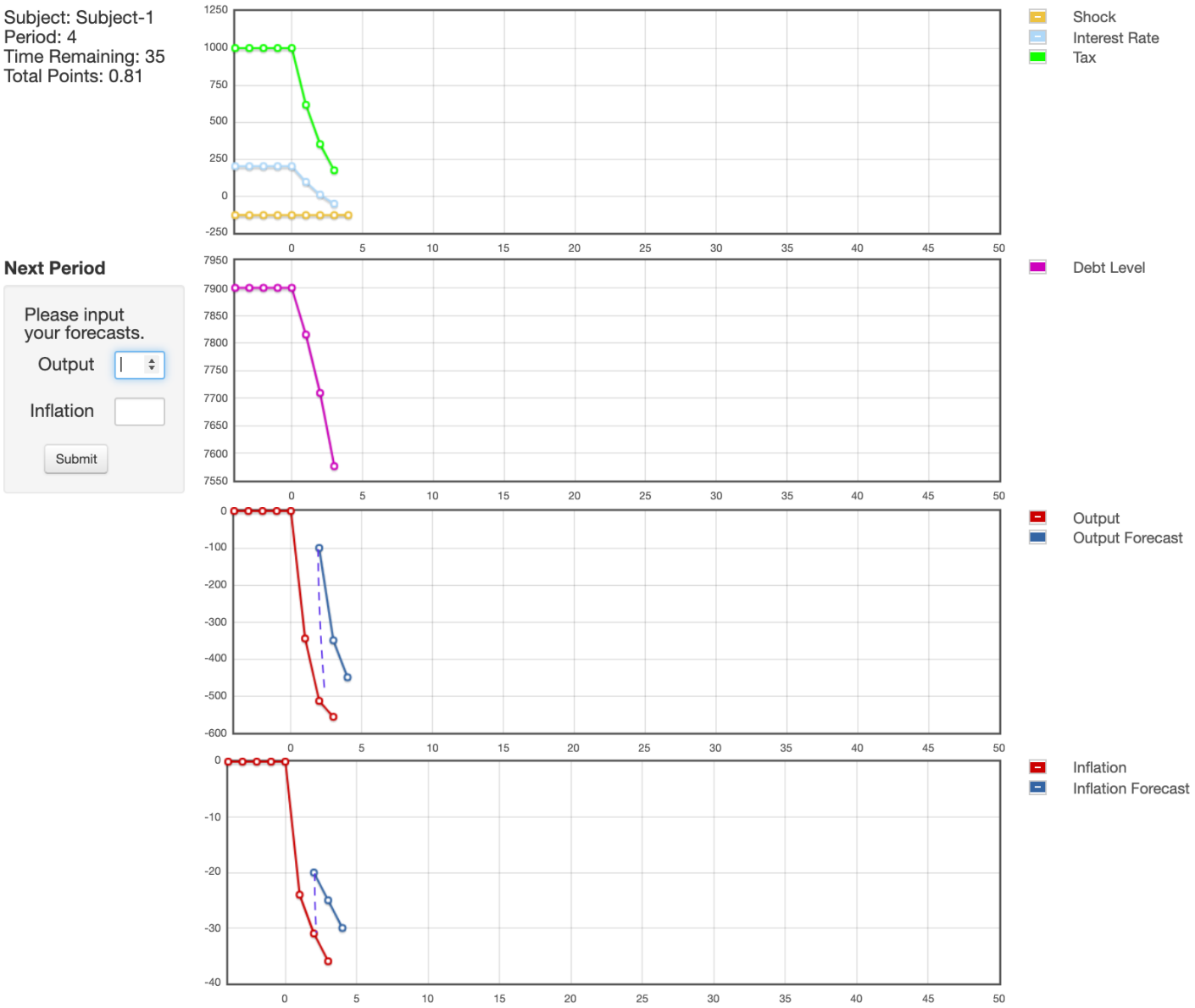
The top history plot displays past interest rates and tax rates. The plot will also display past and current shocks.

The second plot displays the government's debt level.

The third plot displays your past forecast of output and realized output levels.

The fourth plot displays your past forecasts of inflation and realized inflation levels.

Your forecasts will always be shown in blue while the realized value will be shown in red. You can see the exact value for each point on a graph by placing your mouse at that point. The difference between your forecasts and the actual realized levels constitutes your forecast errors.



You may submit positive, negative or zero forecasts. Please use whole numbers. Please review your forecasts before pressing the SUBMIT button. Once the SUBMIT button has been clicked, you will not be able to revise your forecasts until the next period. You will earn zero points if you do not submit both forecasts.

You will have 75 seconds to submit forecasts for output and inflation for each of the first 10 rounds, and 60 seconds for each of the remaining 20 periods. Your score converted into Canadian dollars ($0.75 per point) plus the show up fee will be paid to you in cash at the end of the experiment.

B Additional theoretical predictions

B.1 Comparison of behavioral models within treatment

Figure 11: Predicted output gap and inflation dynamics across treatments

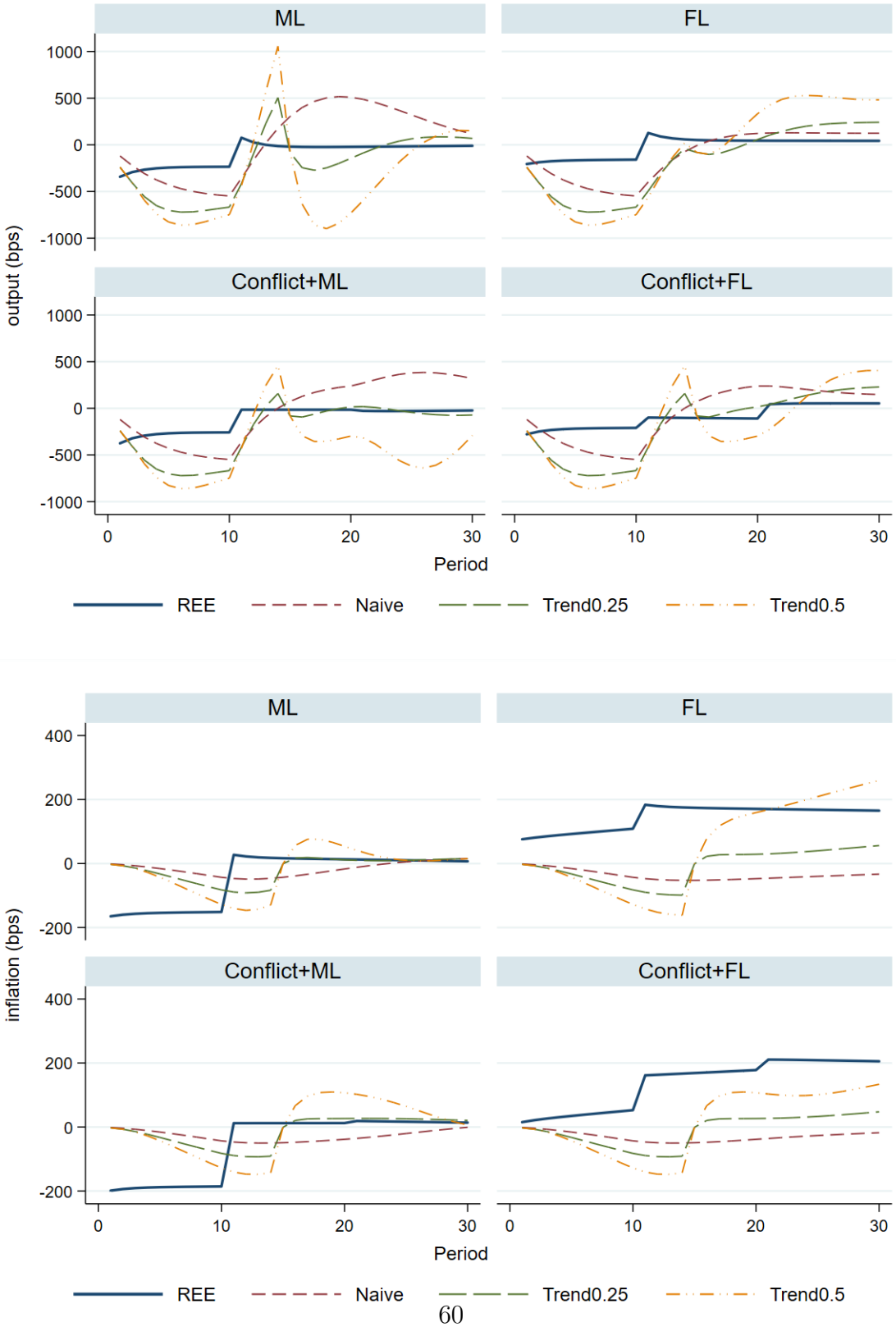
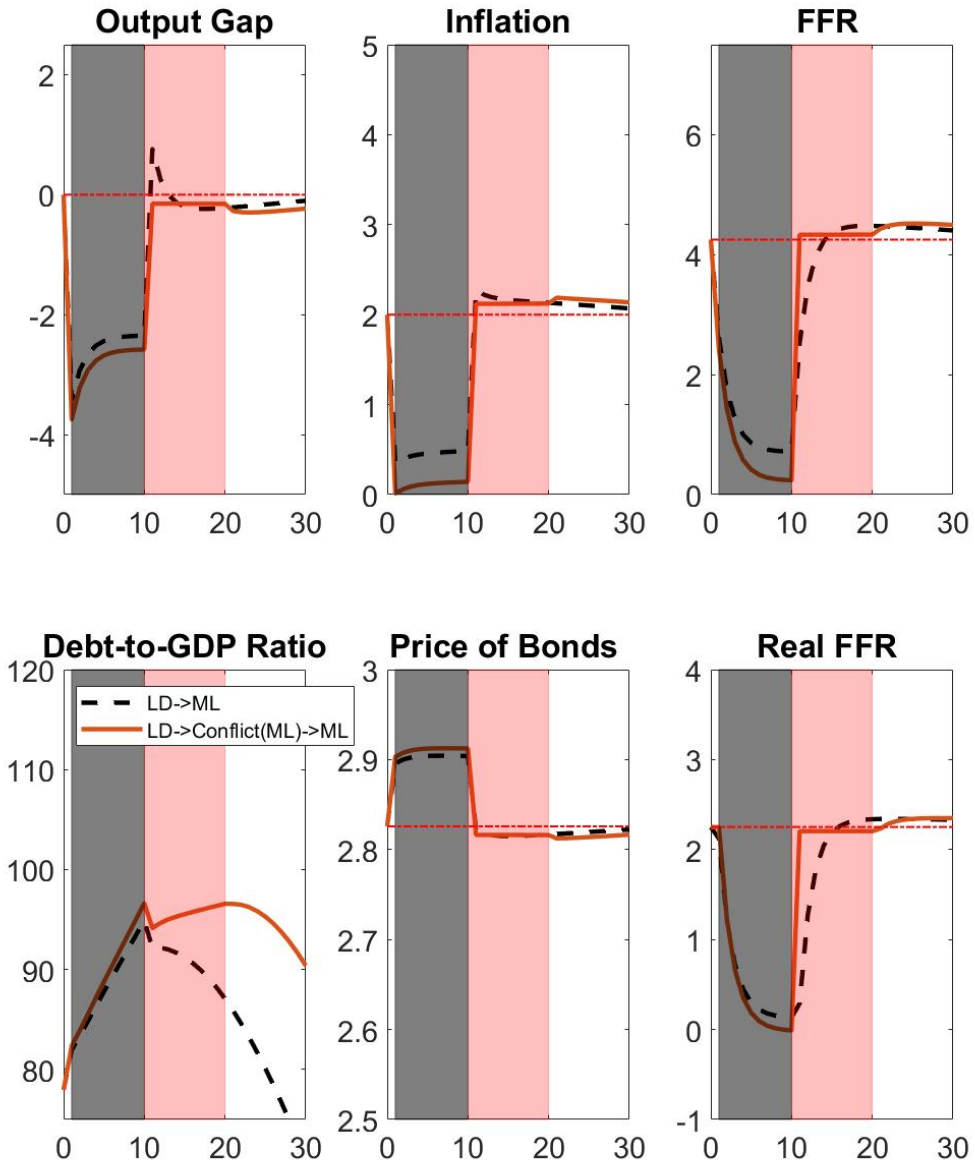
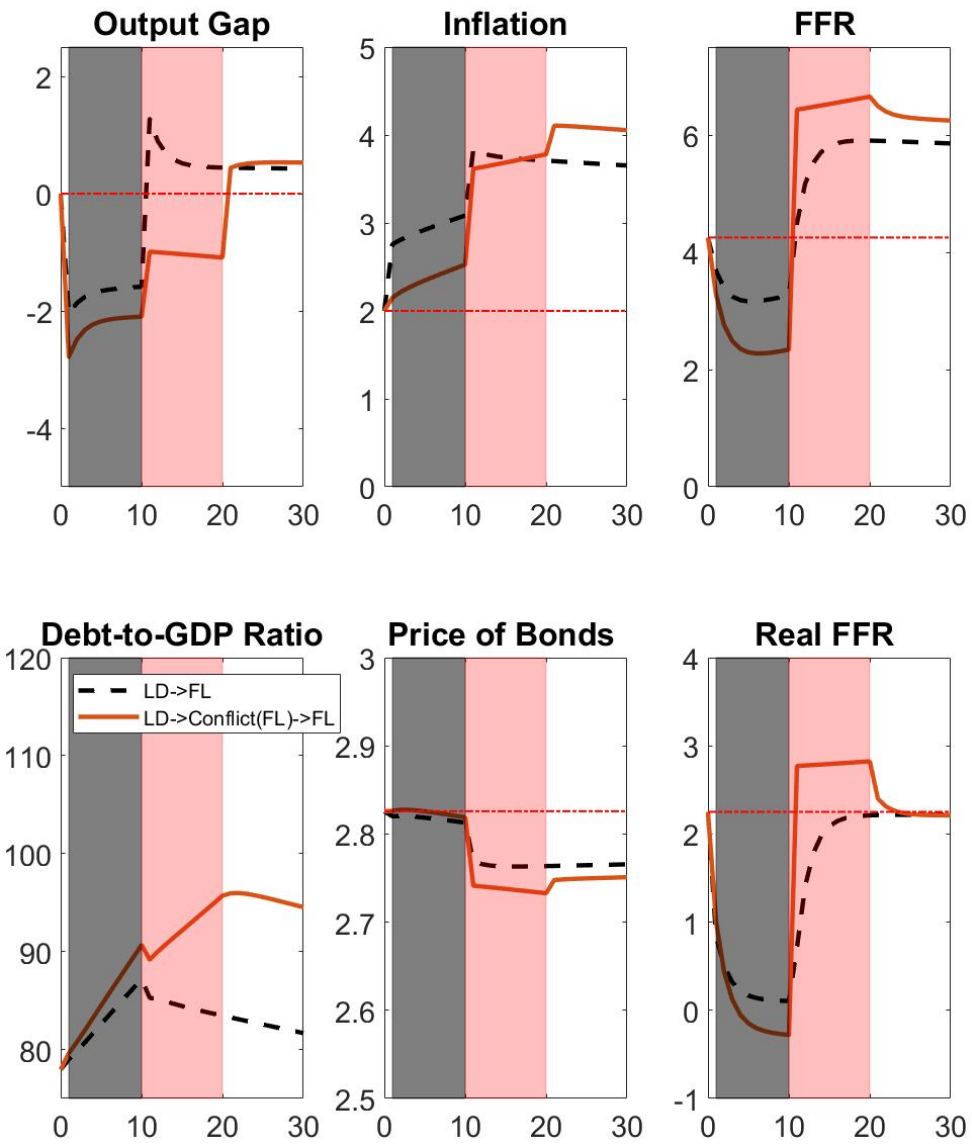


Figure 12: Predictions under rational expectations, ML and CML treatments



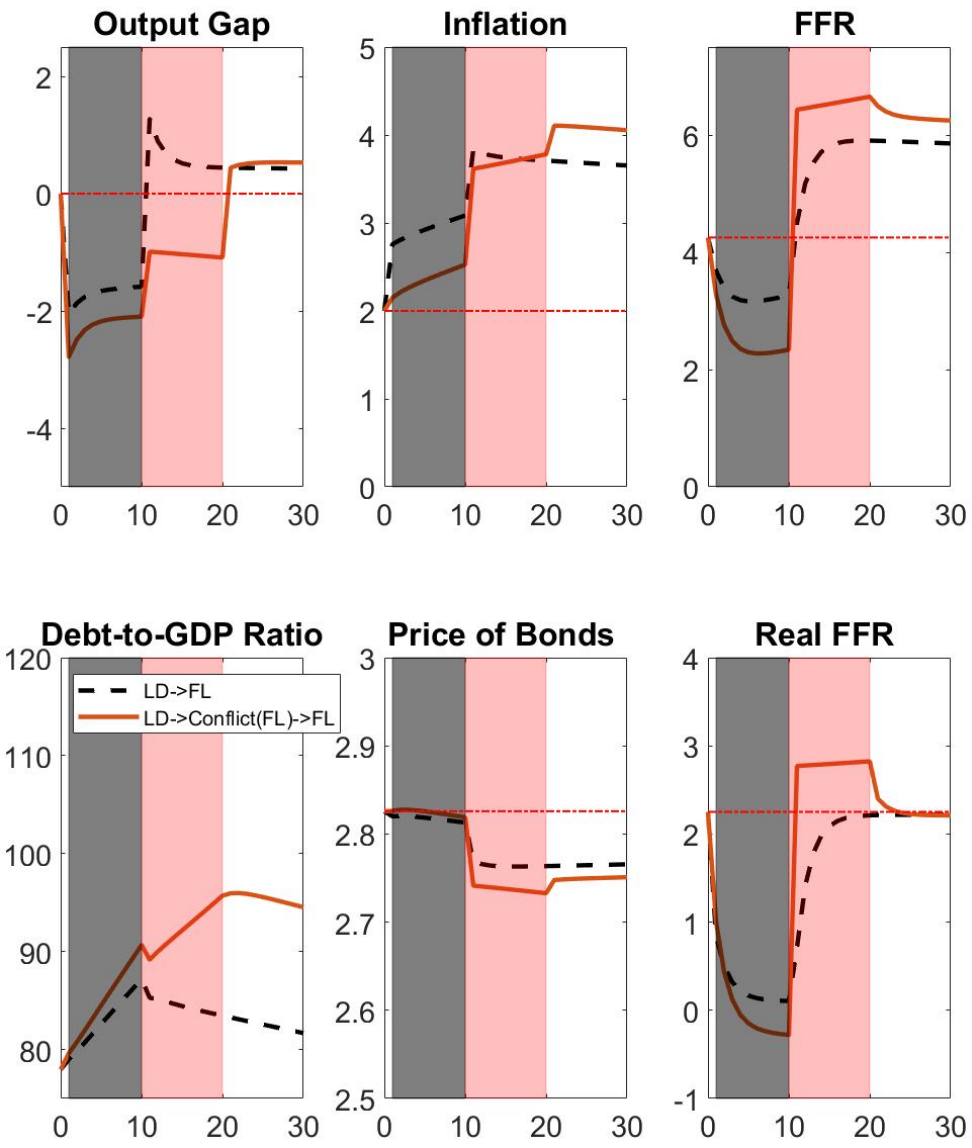
Note: Dashed lines represent coordination scenario (ML) and solid lines conflict scenario (CML). Output gap, inflation, and interest rate are set to represent basis point deviations from steady state and so are initialized at zero.

Figure 13: Predictions under rational expectations, FL and CFL treatments



Note: Dashed lines represent coordination scenario (FL) and solid lines conflict scenario (CFL). Output gap, inflation, and interest rate are set to represent basis point deviations from steady state and so are initialized at zero.

Figure 14: Predictions under rational expectations, FL and CFL treatments



Note: Dashed lines represent coordination scenario (FL) and solid lines conflict scenario (CFL). Output gap, inflation, and interest rate are set to represent basis point deviations from steady state and so are initialized at zero.

B.2 Welfare implications of policy mixes

We can also evaluate the dynamics of the economy in terms of welfare losses. We compare the predictions of our parameterized environment under the three different models of expectations. We compute the implied welfare for each model as measures of the sum of losses of squared output gap and inflation for each treatment and phase:

$$L = \sqrt{\sum_{t=i}^{i+9} (\pi_t^2 + \lambda x_t^2)} \tag{11}$$

where λ takes the value of 0.3 or 1. We provide both cases to understand how the concern for output gap stability affects the ranking of regimes. (It does not make a difference for the relative ranking.) The results are presented in the first three panels of Table 8.

Under rational expectations, welfare losses are indeed worst in the conflict scenarios, especially in the recovery phases (consistent with BM's analysis of their environment). However, under non-rational expectations, policy conflict does not produce such notably dire losses. Under naïve and extrapolative expectations, the losses are identical in Phase 1 (as the parameterization of the four environments is identical).

In Phase 2, during the economic recovery, both behavioral models produce dynamics such that ML exhibits the worst losses, followed by the two conflict scenarios, and FL with the lowest losses. The conflict scenarios produce identical losses in Phase 2 as the parameterization of the environment is the same in both treatments.

Finally, in Phase 3, the relative rankings depend on the nature of expectations. Under naïve expectations, the lowest losses are observed in FL, followed by CFL, ML, and CML. While CML produces the worst losses, it is not that notably worse than ML. Under trend-extrapolation, the lowest losses are observed in ML, followed by CFL, CML, and FL.

No real pattern emerges in any phase to suggest coordination is necessarily welfare-improving relative to conflict.

Table 8: Predicted welfare losses under different models of expectations

Ex-ante Rational									
	$\lambda = 0.3$					$\lambda = 1$			
Phase	ML	FL	CML	CFL	Phase	ML	FL	CML	CFL
1	1633.41	1028.68	**1902.87**	**1005.16**	1	2347.43	**1514.06**	**2654.65**	1780.79
2	191.43	1386.28	**113.98**	**1387.33**	2	277.92	1453.70	**150.56**	**1542.37**
3	**100.08**	1312.73	171.45	**1628.58**	3	**142.50**	1342.48	246.37	**1662.58**

Naïve									
	$\lambda = 0.3$					$\lambda = 1$			
Phase	ML	FL	CML	CFL	Phase	ML	FL	CML	CFL
1	1816.32	1816.32	1816.32	1816.32	1	3303.84	3303.84	3303.84	3303.84
2	**1635.55**	**839.76**	901.15	901.15	2	**2950.32**	**1411.83**	1550.96	1550.96
3	1356.12	**617.41**	**1482.46**	833.42	3	2473.49	**1024.46**	**2694.67**	1488.40

Trend-extrapolation ($\tau = 0.5$)									
	$\lambda = 0.3$					$\lambda = 1$			
Phase	ML	FL	CML	CFL	Phase	ML	FL	CML	CFL
1	3088.09	3088.09	3088.09	3088.09	1	5575.51	5575.51	5575.51	5575.51
2	**3048.83**	**1491.45**	1609.44	1609.44	2	**5438.50**	**2207.68**	2603.18	2603.18
3	**1181.17**	**2689.66**	2180.03	1491.98	3	**2144.21**	**4192.63**	3905.21	2392.87

C Additional results

Table B1: Effects of government debt and policy mix on output gap expectations

Panel A:	Phase 1		Phase 2		Phase 3	
RE predictions	(1)	(2)	(3)	(4)	(5)	(6)
x_{t-1}	-0.036***	-0.120***	-0.010***	-0.019***	0.003***	-0.003***
	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
$x_{t-1}\times$ FL	-0.095***	0.026	0.005	0.001	0.048***	0.008***
	(0.01)	(0.03)	(0.01)	(0.00)	(0.00)	(0.00)
$x_{t-1}\times$ Conflict+ML	0.051***	0.133***	0.001	0.013***	0.014***	-0.005***
	(0.01)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
$x_{t-1}\times$ Conflict+FL	0.003	0.089***	-0.089***	-0.018***	0.021***	0.014***
	(0.01)	(0.03)	(0.01)	(0.01)	(0.00)	(0.00)
b_{t-1}		-0.019		-0.005***		-0.003***
		(0.01)		(0.00)		(0.00)
$b_{t-1}\times$ FL		0.012***		0.009***		0.008***
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+ML		0.008***		-0.001***		-0.002***
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+FL		0.009***		-0.012***		0.009***
		(0.00)		(0.00)		(0.00)
Constant	-228.969***	-149.220	-8.895***	28.630**	6.651***	8.691***
	(6.85)	(106.34)	(1.90)	(11.15)	(1.05)	(1.32)
N	1305	1305	1450	1450	1270	1270
$Adj.R^2$	0.207	0.216	0.153	0.826	0.198	0.993
$RMSE$	80.40	79.96	50.43	22.88	31.75	3.028
Panel B:	Phase 1		Phase 2		Phase 3	
Data	(1)	(2)	(3)	(4)	(5)	(6)
x_{t-1}	1.017***	0.806***	1.002***	0.717***	1.075***	1.129***
	(0.05)	(0.09)	(0.03)	(0.06)	(0.04)	(0.07)
$x_{t-1}\times$ FL	0.071	0.179	0.011	0.115***	-0.267***	-0.246***
	(0.06)	(0.17)	(0.04)	(0.04)	(0.06)	(0.06)
$x_{t-1}\times$ Conflict+ML	-0.028	0.037	-0.112***	-0.044	0.038	-0.005
	(0.04)	(0.09)	(0.04)	(0.04)	(0.05)	(0.05)
$x_{t-1}\times$ Conflict+FL	0.023	-0.078	-0.070*	-0.116**	0.137**	0.136**
	(0.04)	(0.09)	(0.04)	(0.05)	(0.06)	(0.06)
b_{t-1}		-0.249***		-0.223***		0.039
		(0.08)		(0.06)		(0.03)
$b_{t-1}\times$ FL		0.010		0.028***		-0.018***
		(0.01)		(0.01)		(0.00)
$b_{t-1}\times$ Conflict+ML		0.005		0.003		-0.019***
		(0.01)		(0.01)		(0.00)
$b_{t-1}\times$ Conflict+FL		-0.012		0.006		-0.019***
		(0.01)		(0.01)		(0.00)
Constant	35.414	1830.540***	57.305***	1542.397***	48.246***	-132.482
	(27.76)	(625.86)	(10.39)	(397.03)	(13.05)	(202.39)
N	1305	1305	1450	1450	1415	1415
$Adj.R^2$	0.293	0.303	0.780	0.800	0.890	0.893
$RMSE$	384.3	381.7	316.1	301.4	425.5	420.3

Note: Panel A presents the predicted effects of recent output experiences and debt on output expectations under the assumption agents form rational expectations. Panel B presents results from laboratory experiments. Results are from OLS regressions with robust standard errors reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B2: Effects of government debt and policy mix on inflation expectations

Panel A:	Phase 1		Phase 2		Phase 3	
RE predictions	(1)	(2)	(3)	(4)	(5)	(6)
π_{t-1}	0.367***	-0.742***	-0.016	-0.013***	-0.012	-0.001
	(0.07)	(0.06)	(0.02)	(0.00)	(0.04)	(0.01)
$\pi_{t-1}\times$ FL	-1.779***	0.210***	-0.441***	0.080***	0.229***	0.047***
	(0.07)	(0.07)	(0.02)	(0.00)	(0.04)	(0.01)
$\pi_{t-1}\times$ Conflict+ML	0.361***	0.019	0.254***	0.024***	-0.324***	0.027***
	(0.08)	(0.09)	(0.03)	(0.00)	(0.04)	(0.01)
$\pi_{t-1}\times$ Conflict+FL	-1.421***	0.112	-0.405***	0.046***	0.165***	0.096***
	(0.07)	(0.07)	(0.04)	(0.01)	(0.04)	(0.01)
b_{t-1}		-0.113***		-0.004***		-0.003***
		(0.01)		(0.00)		(0.00)
$b_{t-1}\times$ FL		0.034***		0.024***		0.021***
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+ML		-0.003***		-0.000*		-0.000
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+FL		0.027***		0.025***		0.028***
		(0.00)		(0.00)		(0.00)
Constant	136.159***	879.796***	270.118***	243.001***	290.088***	240.072***
	(4.97)	(57.37)	(2.70)	(3.16)	(2.73)	(2.97)
N	1305	1305	1450	1450	1270	1270
$Adj.R^2$	0.550	0.904	0.306	0.984	0.163	0.980
$RMSE$	85.52	39.49	66.73	10.22	80.91	12.43

Panel B:	Phase 1		Phase 2		Phase 3	
Data	(1)	(2)	(3)	(4)	(5)	(6)
π_{t-1}	1.086***	1.037***	0.821***	0.820***	0.951***	0.850***
	(0.03)	(0.05)	(0.05)	(0.05)	(0.07)	(0.06)
$\pi_{t-1}\times$ FL	-0.025	-0.066	0.188***	0.125**	0.096	0.081
	(0.03)	(0.07)	(0.05)	(0.06)	(0.08)	(0.07)
$\pi_{t-1}\times$ Conflict+ML	-0.027	-0.014	0.025	-0.014	0.167**	0.515***
	(0.04)	(0.05)	(0.06)	(0.06)	(0.08)	(0.07)
$\pi_{t-1}\times$ Conflict+FL	-0.023	-0.093	0.175***	0.214***	0.427***	0.413***
	(0.04)	(0.06)	(0.05)	(0.06)	(0.11)	(0.11)
b_{t-1}		-0.025***		-0.026***		-0.024***
		(0.01)		(0.00)		(0.00)
$b_{t-1}\times$ FL		-0.001		0.002		-0.001
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+ML		0.000		-0.001		-0.005***
		(0.00)		(0.00)		(0.00)
$b_{t-1}\times$ Conflict+FL		-0.001		0.001		-0.007***
		(0.00)		(0.00)		(0.00)
Constant	-4.635*	184.994***	26.328***	190.810***	-4.833*	193.384***
	(2.71)	(57.15)	(2.32)	(25.99)	(2.53)	(15.08)
N	1305	1305	1450	1450	1415	1415
$Adj.R^2$	0.536	0.537	0.728	0.752	0.871	0.884
$RMSE$	61.12	61.00	73.66	70.28	115.3	109.3

Note: Panel A presents the predicted effects of recent output experiences and debt on output expectations under the assumption agents form rational expectations. Panel B presents results from laboratory experiments. Results are from OLS regressions with robust standard errors reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.