Abstract

Very diverse responses of monetary and fiscal policies have been observed around the world in the post global financial crisis period of 2010-2014. Our paper explores (i) whether the strategic interaction between the central bank and government can explain this diversity, and (ii) what lessons about the institutional design of the two policies can be learnt from it. Particular attention is paid to the effect of explicit and/or strict inflation targeting and its possible effect on both monetary and fiscal outcomes.

Keywords: Monetary-fiscal interactions; Game of Chicken; Dynamic Commitment; Leadership; Global Financial Crisis; Conservative Central Banker; Inflation Targeting; JEL classification: E63
1. INTRODUCTION

The aftermath of the global financial crisis has seen a variety of monetary and fiscal policy mixes across the globe. Ranging from fiscal stimulus to austerity measures to quantitative easing, policymakers in governments and central banks have tried a number of different economic recipes. In attempt to understand this plurality and provide novel insights and policy recommendations, this paper examines monetary-fiscal interactions following a major adverse shock.

Our focus is on the strategic aspect of the monetary/fiscal responses to the shock. This is because the literature is scarce on this point with most papers assuming that the two policies are able and willing to perfectly coordinate their actions. The 2010-2014 period has however showed us that this is not necessarily the case. For example, while central banks have attempted to lower long-term yield via quantitative easing, governments have tended to issue long-term rather than short-term bonds, and thus sabotage the central banks’ stimulatory efforts.

To keep the analysis as transparent as possible, we incorporate fiscal policy into the familiar Clarida, Gali and Gertler (1999) New Keynesian model. In order to highlight the strategic considerations this reduced-form model is then mapped into a 2 × 2 game theoretic representation, and analyzed via novel game theoretic methods. Specifically, we develop two frameworks in which the timing of the moves is more general, and hence the Stackelberg leadership concept is transformed form static to dynamic.

Monetary and fiscal policies are postulated as partial substitute demand side stabilization tools - both of them can stimulate the economy following an adverse shock. It is therefore uncontroversial that the two policies may face a coordination problem in terms of which policy should respond to each particular economic disturbance. Our analysis however shows that the policies are likely to face an outright conflict in the form of the Game of Chicken. Surprisingly, this can happen even in the most favourable scenario in which: (i) the government and the central bank share the same targets for inflation and output; (ii) the shared output target is at the potential level [i.e. there is no time-inconsistency problem ala Kydland and Prescott (1977) or Barro and Gordon (1983)]; (iii) there are only demand side shocks, no supply side shocks; and (iv) there exists no uncertainty about the structure of the economy nor the shocks (that can be perfectly observed by both policymakers and private agents in real time).

What then drives the policy conflict if none of the standard culprits apply? For a monetary-fiscal policy conflict regarding shock stabilization to occur it suffices that (1) the policies are not fully credible (i.e. expectations are not perfectly anchored), and (2) the central bank places a different weight on inflation vs output stabilization than the government. This is because in such case each institution prefers to stabilize the shocks itself to apply its own weights between inflation and output volatility.

\[^2\text{For instance, Economist (2011) reported that between mid-November 2010 and end-March 2011 'America’s Treasury has issued some $589 billion in extra long-term debt, of which the Fed has bought $514 billion'. From early 2009 through to March 2010 Britain’s Treasury issued £247 billion ($396 billion) of extra long-term gilts, of which the Bank of England bought £199 billion. The Economist concluded: 'In effect, QE [quantitative easing] in both countries has been undermined by debt-management policy'.}\]
As a consequence, we may observe three distinct types of short-term policy conflict/mis-coordination.

First, each institution may be responding strongly to the shock in attempt to discourage the other institution from responding. Such strategic tug-of-war may lead to the joint response being excessive. It may over-heat the economy and possibly plant seeds for future imbalances or bubbles - as many argue was the case in the United States during 2001-2005. As a second type of post-shock conflict, each institution may be delaying a response to the shock in anticipation that the other institution will respond and provide the required stimulus. This dead-lock sends the economy into a deep contraction and possibly a deflationary spiral. In a third type of short-term conflict the economy may fall into a mixed Nash equilibrium with switching between policy regimes, for example between fiscal stimulus and austerity. Such regime switching results in a high volatility of both inflation and output.

All three conflict/mis-coordination scenarios are costly for society and both policymakers. They are Pareto inferior to the two pure Nash equilibria in which only the policies coordinate their actions, and only one of them responds to the adverse shock to stabilize the economy.

Our analysis has several policy implications. First, it shows the positive role of policy credibility. It ensures expectations of private agents are well anchored, which in turn improves the policy stabilization trade-off. The analysis thus warns of a vicious circle associated with lack of credibility: the more likely private agents find inferior macro outcomes due to policy conflict, the less likely expectations are anchored, and this in turn increases the likelihood of inferior outcomes and so on. One way to alleviate the problem under some circumstances may be an legislating and explicit (but not necessarily strict) inflation target. As it tends to anchor expectations, see e.g. Gürkaynak et al. (2010), it may be useful in building monetary policy credibility, and hence avoiding such vicious circle.

Second, the analysis highlights the importance of coordination between the central bank and the government, and their joint communication with the public. The challenge in improving these is however that policy coordination is often interpreted by the markets as compromising central bank independence [for a discussion see Libich, Savage, and Walsh (2011)]. Explicit inflation targeting may again be useful here, and play a positive role in this communication. The transparency and accountability associated with the regime helps the public understand the short-term policy actions and how they fit with the long-term goals of both policies.

Third and most notably, the paper develops two novel game theoretic frameworks to formally explore channels that can alleviate the above conflict and coordination problems. The frameworks allow a more general timing of moves in the game than the standard simultaneous move and Stackelberg leadership setups. Specifically, they postulate deterministic and stochastic revisions of the players’ actions. Deterministic revisions can

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3Let us stress that the paper examines the short-term perspective of policy interactions. A possible long-term conflict between monetary and fiscal policies related to fiscal sustainability and the unpleasant monetary arithmetic is explored in Libich and Stehlík (2012).

be interpreted as the policies’ implementation lags, whereas stochastic revisions express the degree of the policies’ leadership (pre-commitment).

The aim of our extended timing is to identify circumstances under which conflict between monetary and fiscal policies can be avoided. We show two channels, one in each timing setup, that act as implicit coordination devices and ensure a unique Pareto efficient equilibrium. This is either a Monetary-dominance region or a Fiscal-dominance region with the dominant player’s preferred outcome obtaining in equilibrium.

One such channel is shown to come into force if the degrees of monetary and fiscal policy leadership differ sufficiently across the two policies. This is because one policy then has sufficient leverage over the other policy, and can better induce compliance and cooperation. By increasing the degree of central bank leadership, explicit inflation targets may be useful in this respect. Intuitively, the fact that they are legislated gives the central bank ammunition in the Game of Chicken against the government. They may thus contribute to an improvement of not only monetary outcomes (which has been the focus of the existing literature), but also of fiscal policy outcomes. Empirical evidence for the latter claim is reported in Franta, Libich, and Stehlík (2012) and discussed below.

Another conflict-avoiding channel identified by our game theoretic analysis relates to the length of monetary and fiscal policy implementation lags. These must be neither sufficiently similar nor too different. Intuitively, this guarantees - for both the central bank and government - that the cost of potential conflict is offset by a sufficiently long-lasting gain from subsequent policy coordination.

We also assess the Rogoff (1985) recommendation of appointing a conservative central banker - a strict(er) inflation targeter. Our modelling as well as real world experience make it apparent that strict and explicit inflation targeting are two distinct features of monetary policy regimes.

We show that in the standard simultaneous move framework the appointment of a strict(er) central banker lacks traction and does not by itself achieve policy coordination. In fact, it makes things worse by deepening the policy differences and conflict. Nevertheless, we then show that in combination with one of the above cooperation channels this appointment may still be desirable by increasing the size of the Monetary-dominance equilibrium region in which policy conflict is avoided. Put differently, while not a pre-requisite, strict(er) inflation targeting may under some circumstances enhance the effectiveness of explicit inflation targeting.

More broadly, our analysis offers a possible explanation for the diverse monetary-fiscal policy actions observed during 2010-2014 around the globe. It shows that the outcomes of strategic policy interactions depend on a number of institutional and policy parameters - that are likely to differ across countries.

Let us acknowledge that due to our interest in strategic policy interactions we focus on the dynamics at the game theoretic level, and suppress the dynamics at the macro-economic level considered in existing models. Nevertheless, we believe that stripping the macroeconomic environment to the bare bones is justified since novel insights emerge.

5As demonstrated in Libich (2011), real world explicit inflation targets do not imply strict monetary policy (inflation ‘nutters’) because they are postulated as long-term objectives that need to be achieved on average over the business cycle. Similarly, strict monetary policy may be pursued without explicit numerical inflation targets.
that cannot be obtained from conventional setups. Furthermore, the micro-foundations of the Clarida, Galí and Gertler (1999) model are well known, see for example Woodford (2003).

2. Model

2.1. Economy. We postulate the simplest possible (yet familiar) setup from which some lessons about policy interactions in the aftermath of the global financial crisis can be drawn. The Clarida, Galí and Gertler (1999) model features an IS curve and a Phillips curve, whereby we incorporate fiscal policy in the former:

\[ x_t = -\varphi [i_t - E_t \pi_{t+1}] + E_t x_{t+1} + \gamma e_t + g_t, \]

\[ \pi_t = \lambda x_t + E_t \pi_{t+1} + u_t, \]

where the parameters \( \varphi, \gamma, \) and \( \lambda \) are positive, \( x \) is the output gap, \( \pi \) is the inflation rate, \( i \) is the nominal interest rate set by the central bank, and \( e \) denotes government expenditure net of taxes. Specifically, \( e > 0, e = 0, \) and \( e < 0 \) represent a budget deficit, balanced budget, and budget surplus respectively. The terms \( g_t \) and \( u_t \) are demand and cost-push shocks respectively that are i.i.d. random variables with zero means for simplicity. For the same reason we consider the case of no discounting (both private agents and the two policymakers).\(^6\)

2.2. Preferences. The period objectives of the monetary (\( M \)) and fiscal (\( F \)) policymakers are also standard:

\[ U_i = - (\pi_t - \pi^T)^2 - \alpha_i (x_t - x^T)^2, \]

where \( i \in \{ M, F \}, x^T \) and \( \pi^T \) are the output gap target and the inflation target respectively, and \( \alpha \) is the weight on output relative to inflation stabilization (the inverse of central bank conservatism).

Let us reiterate that our analysis will solely focus on strategic policy interactions regarding short-term stabilization problems - long-term interactions featuring fiscal sustainability and the unpleasant monetary arithmetic are examined in Libich and Stehlík (2012). Therefore, let us consider the case assumed in Clarida, Galí and Gertler (1999), namely

\[ x^T_F = x^T_M = 0. \]

This is to highlight the fact that any conflict between the policies is neither due to their disagreement over the inflation or output target levels, nor due to the time-inconsistency problem of Kydland and Prescott (1977). We will throughout focus on the relevant case

\[ \alpha_F \geq \alpha_M \geq 0, \]

in which the central banker may (or may not) be conservative in the Rogoff (1985) sense (\( \alpha_F > \alpha_M \)) and he may (or may not) be strict on inflation (\( \alpha_M = 0 \)).

\(^6\)This is not going to play a role as we are interested in short-term outcomes rather than long-term outcomes.
2.3. Steady-State Outcomes. Using (2)-(4) we get the conventional optimality condition for both policymakers under discretion

\[ x_t = -\frac{\lambda}{\alpha_i} (\pi_t - \pi^T). \]

There is consensus between the policymakers about the steady-state levels (denoted by ‘bar’) - both inflation and output are preferred to be on target

\[ \bar{\pi} = \pi^T \quad \text{and} \quad \bar{x} = 0. \]

Therefore, expectations by the public regarding these variables - that we assume throughout to be formed rationally - are also on target

\[ \hat{E}_t \pi_{t+1} = \pi^T \quad \text{and} \quad \hat{E}_t x_{t+1} = 0. \]

In the absence of a shock the setting of both policies is therefore, using (7)-(8) with (1)-(2), at the neutral levels

\[ \bar{i} = \pi^T \quad \text{and} \quad \bar{e} = 0. \]

2.4. Demand Shock. Consider an adverse demand shock of the size \( \varepsilon \) at the start of period \( t + 1 \), namely

\[ g_{t+1} = -\varepsilon. \]

Equations (1)-(2) imply that if

\[ \varepsilon > \frac{\pi^T}{\lambda} \]

the shock is large enough to lead to deflation. This is in the case of no response in policy/expectations - i.e. assuming (8)-(9) hold. We will assume such a sizeable shock, i.e. (10) to hold, but it is purely for terminology purposes; none of our qualitative results hinges on this assumption.

To focus on strategic interactions between the central bank and the government, we will abstract from uncertainty and incomplete information. In particular, we will assume that both policymakers and private agents can perfectly anticipate the shock at the end of period \( t \).

3. Game Theoretic Representation

Each policy chooses from two options: stimulus (denoted \( S \)) and no-stimulus (denoted \( N \)). In line with these two policy options, we depict two possibilities in terms of expectations. In the Anchored expectations scenario, denoted \( A \), macroeconomic stabilization policy is credible, and agents expect a coordinated policy stimulus, i.e. \((i^S, e^S)\) or \((i^N, e^N)\). As such stimulus leads to the shock being perfectly stabilized, inflation and output remain on target, and expectations thus do not respond to the shock. They remain anchored at the steady state levels of inflation and output.

In the alternative Unanchored expectations scenario \( U \), agents expect the no-stimulus outcome \((i^N, e^N)\) and hence anticipate reductions in inflation and output. This change
in expectations effectively acts as a positive supply shock that alters the policymakers’ stabilization tradeoff (lowers the relevant short-term Phillips curve).\footnote{We have also analyzed the case in which agents expect a double-stimulus \((i^S, e^S)\), but as it does not provide additional insights it is not reported here.}

3.1. Payoff Matrices. Obviously, the public’s expectations will impact the effectiveness of the policy actions, and hence the policymakers’ payoffs. The game can therefore be summarized as follows:

\[
\begin{array}{c|cc|c|cc|c|cc}
& F^N & e^N & i^N & a', w' & b', x' & i^S & c', y' & d', z' \\
M & & & & & & & & \\
i^S & & & & & & & & & \end{array}
\quad
\begin{array}{c|cc|c|cc|c|cc}
& F^N & e^N & i^N & a, w & b, x & i^S & c, y & d, z \\
M & & & & & & & & & \end{array}
\]

Anchored expectations \(A\)       Unanchored expectations \(U\)

The \(\{a, ..., z'\}\) letters denote the policymakers’ payoffs from the eight different policy and expectations regimes. It must be acknowledged that such game representation does not deal with the dynamic part of the policy interactions. It is effectively a snapshot of the policy interaction at some point in time. While such approach cannot fully capture the richness of the policy interactions, we argue that it can still generate valuable insights regarding the strategic aspect of policy interactions which cannot be examined in standard DSGE models.

3.2. Policy Actions. The way we truncate the model into a \(2 \times 2\) game theoretic representation is driven by our interest in situations such as the 2010-2014 period. On one hand, following a major downturn it is often feared that without a continued policy stimulus the economy can fall into a deeper recession accompanied by deflation. On the other hand, a danger exists that a continued stimulus of both policies \((i^S, e^S)\) may be excessive, over-heat the economy, and plant seeds for future imbalances.\footnote{As an example, it is now a widely-held view that the joint policy response to the NASDAQ bust in the U.S. during 2001-2005 was ‘too much for too long’, and that this partly fueled the subsequent housing/stock market bubble. For more see Taylor and Ryan (2010). Obviously, there are real world situations with little ambiguity about the need for large joint stimuli of both policies (the 2008-2009 period for example). But there is no short-term policy conflict in such a scenario to be examined.}

In selecting the \(S\) and \(N\) policy options we follow the natural approach of Backus and Driffill (1985). The no-stimulus policy levels \(i^N\) and \(e^N\) are set at the long-run values \(\bar{i}\) and \(\bar{e}\) in (9) for both expectations scenarios. In selecting the stimulus levels \(i^S\) and \(e^S\) we choose values that are the solutions of each policymaker’s optimization problem: (i) assuming no response from the other policy, and (ii) taking private expectations as given. Formally, we define

\[
\begin{align*}
i^S &= \arg\max\{U_M|e^N, E_t x_{t+1}, E_t \pi_{t+1}\} \\
e^S &= \arg\max\{U_F|i^N, E_t x_{t+1}, E_t \pi_{t+1}\}
\end{align*}
\]

Using (2) and (6) yield the optimal combinations of inflation and output chosen by the policymakers

\[
\begin{align*}
\pi^S_i &= \frac{\lambda^2 \pi^T + \alpha_i E_t \pi_{t+1}}{\alpha_i + \lambda^2} \\
x^S_i &= -\frac{\lambda (E_t \pi_{t+1} - \pi^T)}{\alpha_i + \lambda^2}
\end{align*}
\]

We will now examine the outcomes under each expectations scenario.
4. Outcomes Under Anchored Expectations

Let us derive the output and inflation outcomes in the four policy regimes assuming that expectations are anchored at the long-term level in (9). Put differently, agents believe the shock will be perfectly stabilized and thus do not alter their expectations. In the monetary stimulus case the interest rate is lowered, \(i_{SA}^S\), to close the output gap assuming the government does not respond, \(e_{NA}^N = 0\). Analogously, in the fiscal stimulus case the government runs a budget deficit, \(e_{SA}^F\), to close the output gap assuming the central bank does not react to the shock, \(i_{NA}^N = \pi^T\). Using this information in (1) and (13) yields the exact levels of the two policy instruments:

\[
i_{SA}^S = \pi^T - \frac{\varepsilon}{\varphi} \quad \text{and} \quad e_{SA}^S = \frac{\varepsilon}{\gamma}.
\]

By combining (1)-(2) with (8) and the policy levels \(i_{NA}^N, i_{SA}^S, e_{NA}^N, e_{SA}^F\) from (9) and (14), we obtain the following output and inflation outcomes:

\[
\begin{array}{|c|c|c|}
\hline
&M&\text{\textit{Output Level}}&\text{\textit{Inflation Target}}\\
\hline
\text{\textit{Contraction/Deflation}}&\text{\textit{Optimal recovery}}&\text{\textit{Optimal recovery}}&\text{\textit{Over-heating}}\\
\hline
\text{\textit{iN}}&x = -\varepsilon, \pi = \pi^T - \lambda \varepsilon & x = 0, \pi = \pi^T & x = \varepsilon, \pi = \pi^T + \lambda \varepsilon \\
\text{\textit{iS}}&x = 0, \pi = \pi^T & & \\
\hline
\end{array}
\]

Combining (15) with the policy objectives in (3)-(4) yields the following payoff matrix (16)

\[
\begin{array}{|c|c|c|}
\hline
&M&\text{\textit{Output Level}}&\text{\textit{Inflation Target}}\\
\hline
\text{\textit{Optimal recovery}}&\text{\textit{Over-heating}}& & \\
\hline
\text{\textit{iN}}&a' = -\varepsilon^2 (\lambda^2 + \alpha_M), w' = -\varepsilon^2 (\lambda^2 + \alpha_F) & b' = 0, x' = 0 & \\
\text{\textit{iS}}&c' = 0, y' = 0 & d' = -\varepsilon^2 (\lambda^2 + \alpha_M), z' = -\varepsilon^2 (\lambda^2 + \alpha_F) & \\
\hline
\end{array}
\]

The left panel of Figure 1 summarizes the outcomes using the Carlin and Soskice (2005) graphical framework. The monetary and fiscal rules are the optimal targeting type rules derived from the policies’ objective functions. The different slopes depicted in the figure are for the Rogoff (1985) conservative central banker case \(\alpha_M < \alpha_F\).

The policymakers are indifferent between the two pure Nash equilibria \((i_{SA}^S, e_{NA}^N)\) and \((i_{NA}^N, e_{SA}^F)\) as both regimes lead to the optimal outcomes. In both the shock is perfectly stabilized - by monetary and fiscal policy respectively. The remaining regimes are however inferior. In the \((i_{SA}^S, e_{NA}^N)\) regime we have a (perfectly avoidable) contraction accompanied by deflation since neither policy provides the required stimulus. In contrast, in the \((i_{NA}^N, e_{SA}^F)\) regime we observe a positive output gap and inflation above the target due to an excessive uncoordinated stimulus of both policies. The payoffs in (16) satisfy the following

\[
b' = c' > a' = d' \quad \text{and} \quad x' = y' > w' = z',
\]

and hence the game has the structure of a coordination game Choosing Sides. There are two efficient pure strategy Nash equilibria, neither of which Pareto-dominates the other. Conventional game theoretic methods cannot select between these two equilibria due to the symmetry. Therefore, the inefficient mixed strategy Nash equilibrium, in which the
policies randomize between the regimes, is a possibility. And a reason for concern among the policymakers.

Figure 1. The four policy regimes for the $\alpha_M < \alpha_F$ case under Anchored expectations (left panel) and Unanchored expectations (right panel).

5. Outcomes Under Unanchored Expectations

In the $U$ expectations case the public expects neither policy to respond to the shock - in anticipation of the other policy’s response. Agents therefore believe the setting of both policies will remain at the neutral levels and rationally predict the macroeconomic outcomes in (15) associated with the $(i^N, e^N)$ policy regime. Specifically, agents expect a contraction accompanied by deflation:

\[ E^U x = -\varepsilon \quad \text{and} \quad E^U \pi = \pi^T - \lambda \varepsilon. \]

Using (1), (13) and (17) yields the stimulatory levels of the interest rate and government spending

\[ i^S_U = -\frac{1}{\varphi} \left[ 2\varepsilon + \varphi (\lambda \varepsilon - \pi^T) + \lambda^2 \frac{\varepsilon}{\alpha_M + \lambda^2} \right] \quad \text{and} \quad e^S_U = \frac{1}{\gamma} \left( 2\varepsilon + \lambda \varphi \varepsilon + \lambda^2 \frac{\varepsilon}{\alpha_F + \lambda^2} \right). \]

9Alternatively, the fact that private agents expect the policymakers not to respond in the real world may be due to (unmodelled) future considerations. For example, the government may be reluctant to increase spending for concerns over fiscal sustainability, whereas the central bank may be reluctant to carry out quantitative easing for lack of exit strategy and fear of inflationary consequences in the longer term.
Using these we can derive the output and inflation outcomes in the four policy regimes:

\[ e^N = \begin{array}{c}
\text{Contraction/Deflation} \\
\text{Sub-optimal recovery}
\end{array} \]
\[ e^S = \begin{array}{c}
\text{Over-heating}
\end{array} \]

<table>
<thead>
<tr>
<th>( M )</th>
<th>( i^N )</th>
<th>( F )</th>
<th>( e^N )</th>
<th>( e^S )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( i^N )</td>
<td>( x = -\varphi\lambda + \lambda x = -2\lambda ), ( \pi = \lambda T - \varphi\lambda x = -3\lambda )</td>
<td>( x = \frac{\lambda^2}{\alpha F + \lambda^2} ), ( \pi = \pi^T - \frac{\lambda\alpha F}{\alpha F + \lambda^2} )</td>
<td>( x = \varepsilon \left[ 2 + \varphi\lambda + \lambda^2 \left( \frac{1}{\alpha M + \lambda^2} + \frac{1}{\alpha F + \lambda^2} \right) \right] ), ( \pi = \pi^T + \lambda\varepsilon \left[ 1 + \varphi\lambda + \lambda^2 \left( \frac{1}{\alpha M + \lambda^2} + \frac{1}{\alpha F + \lambda^2} \right) \right] )</td>
<td></td>
</tr>
<tr>
<td>( i^S )</td>
<td>( x = \frac{\lambda^2}{\alpha M + \lambda^2} ), ( \pi = \pi^T - \frac{\lambda\alpha M}{\alpha M + \lambda^2} )</td>
<td>( x = \varepsilon \left[ 2 + \varphi\lambda + \lambda^2 \left( \frac{1}{\alpha M + \lambda^2} + \frac{1}{\alpha F + \lambda^2} \right) \right] ), ( \pi = \pi^T + \lambda\varepsilon \left[ 1 + \varphi\lambda + \lambda^2 \left( \frac{1}{\alpha M + \lambda^2} + \frac{1}{\alpha F + \lambda^2} \right) \right] )</td>
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</table>

Note that compared to (15), the single policy stimulus cases \((i^S, e^N)\) and \((i^N, e^S)\) no longer provide optimal recovery, since inflation and output are below and above their target levels respectively. Applying (19) together with (3)-(4) yields

\[ (20) \]

The right panel of Figure 1 graphically summarizes the outcomes, showing the following result.

**Remark 1.** In the Unanchored expectations case, the demand shock cannot be perfectly stabilized even if it is perfectly anticipated by both policymakers and the public.

Intuitively, when agents believe there will be no policy stimulus, output and inflation are expected to decrease. This will bring down the negotiated nominal wage and shift the Phillips curve downward (i.e. it constitutes a positive aggregate supply shock). As a consequence, the inflation rate is decreased further. In responding to the shock both policymakers thus choose a positive output gap to increase the inflation closer to its target. The outcomes can be summarized from a game theoretic perspective as follows.

**Proposition 1.** Unlike in the Anchored expectations case, in which monetary and fiscal policies only face a coordination problem regarding the stabilization of the adverse shock, in the Unanchored expectations case the policies also face conflict. Specifically, for all \( \alpha_M < \alpha_F \) their interaction has a structure of the Game of Chicken in which each policymaker prefers a different pure strategy Nash equilibrium.
Proof. It is straightforward to verify, comparing the payoffs across the four regimes in (20), that in the U case the following two scenarios can occur:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Pure Nash</th>
<th>Mixed Nash</th>
<th>Coordination Problem</th>
<th>Equilib. Policy Conflict</th>
<th>Parameter Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game of Chicken</td>
<td>(i^N, e^S)</td>
<td>(i^S, e^N)</td>
<td>yes</td>
<td>yes</td>
<td>(\alpha_M &lt; \alpha_F)</td>
</tr>
<tr>
<td>Choosing sides</td>
<td>(i^N, e^S)</td>
<td>(i^S, e^N)</td>
<td>yes</td>
<td>no</td>
<td>(\alpha_M = \alpha_F)</td>
</tr>
</tbody>
</table>

For all \(\alpha_M < \alpha_F\) the payoffs in (20) satisfy

\[
c > b > \max\{a, d\} \quad \text{and} \quad x > y > \max\{w, z\},
\]

which constitutes a variant of the Game of Chicken game.

Intuitively, in this Game of Chicken each policymaker prefers to carry out the stimulus themselves to apply their preferred stabilization weights: the central bank prefers the \((i^S, e^N)\) regime whereas the government prefers the \((i^N, e^S)\) regime.\(^{10}\) To give a numerical example, under \(\alpha_M = 0.5, \alpha_F = \lambda = \varphi = \varepsilon = 1\) the payoff matrix in (20) becomes (rounding the payoffs to one decimal place)

\[
\begin{array}{c|cc}
\hline
M & e^N & e^S \\ \hline
i^N & \text{Contraction/Deflation} & -20.5, -25 & \text{Sub-optimal recovery} & -0.4, -0.5 \\ \hline
i^S & \text{Sub-optimal recovery} & -0.3, -0.6 & \text{Over-heating} & -18.7, -27.4 \\
\hline
\end{array}
\]

Similarly to the Choosing Sides game, conventional game theoretic methods are unable to select between the two pure strategy Nash equilibria in the Game of Chicken. However, the policymakers’ disagreement about the desirable equilibrium further increases the probability of conflict and randomizing between the regimes, both of which are costly.

In the rest of the paper we explore game theoretic devices - with an institutional design interpretation - through which such inefficient outcomes can be avoided. Special attention is paid to the role of an explicit inflation target and the effect of a more conservative (stricter) central banker. One advantage of our game theoretic framework is that it allows us to distinguish explicit from strict inflation targeting, and show that separate as well as joint effect on the monetary-fiscal interaction and outcomes.

6. Solutions to the Conflict/Coordination Problems

Let us first revisit the case for appointing a conservative central banker as suggested by Rogoff (1985).

Remark 2. Under the standard simultaneous timing of policy actions, a more conservative (stricter) central banker by itself does not solve the conflict/coordination problems

\(^{10}\)The alternative scenario in which each policymaker prefers the other policy to carry out the required stimulus may also be relevant under some circumstances, see Libich, Nguyen and Stehlík (2011).
between monetary and fiscal policy. In fact it makes policy coordination harder by moving the policies from the Choosing Sides scenario to the Game of Chicken.

We will investigate ways of resolving these problems, by which we mean circumstances that deliver a unique and Pareto-efficient subgame perfect Nash equilibrium. To do so let us generalize the timing of the game by allowing for deterministic or stochastic revisions of policy actions. Such revisions will enable us to examine various institutional design features such as strength of policy leadership and length of implementation lags. It will be apparent that the recommendation of Rogoff (1985) may still be warranted if central bank conservativeness is combined with another institutional mechanism.

6.1. Timing Assumptions. Consider the following simple extension of the Stackelberg leadership concept from static to dynamic - along the lines of Calvo (1983). At the start of the game, in time \( t = 0 \), the two policies move simultaneously selecting \( i \) and \( e \). Then, at pre-determined times \( \tau_M \) and \( \tau_F \), each policy has a revision opportunity with probability \( 1 - \theta_M \) and \( 1 - \theta_F \) respectively. We will denote the players’ initial move by 1 and the revision by 2 in the subscript.

Let us assume that, at the time of revision, each player \( k \) can observe all past actions of opponent \( j \) (including \( j \)’s initial action under \( \tau_k = 0 \)).

6.2. Deterministic Revisions. We will first examine the following deterministic case

\[
\tau_M \neq \tau_F \quad \text{and} \quad \theta_M = \theta_F = 0.
\]

The player with a lower/higher \( \tau \) will be called faster/slower-reviser respectively. In this scenario the revision times \( \tau_M \) and \( \tau_F \) can be interpreted as the length of the policies’ implementation lags. We aim to derive circumstances under which the faster-reviser dominates the game and the unique subgame perfect equilibrium payoff coincides with his Stackelberg payoff.

**Proposition 2.** Under deterministic revisions, the policy conflict and multiplicity of equilibria are resolved if and only if the implementation lags of monetary and fiscal policies are (i) neither too similar (ii) nor too different. Formally, the Game of Chicken has a unique efficient outcome iff \( \tau_k \in (\bar{\tau}_k, \bar{\tau}_k) \) where \( \bar{\tau}_k \) and \( \bar{\tau}_k \) are increasing in \( \tau_j \).

**Proof.** Let us provide the proof for the realistic parameter range \( \tau_M < \tau_F \), i.e. the implementation lag of monetary policy is shorter than that of fiscal policy. The alternative case will then follow by symmetry.

Solving by backwards induction, \( F_2 \) is the best response to \( M_2 \). Moving backwards, let us derive the condition for \( i_2^S \) to be the unique best response to \( e_1^S \). We have:

\[
d(\tau_F - \tau_M) + c(1 - \tau_F) > b(1 - \tau_M),
\]

(25)

---

\(^{11}\)For exploration of alternative timing structures and probability distributions using time scales calculus see recent research in mathematics, e.g. Stehlík and Volek (2013).
which can be rearranged into

$$\tau_M > \tau_M = \tau_F \begin{pmatrix} M's \text{ conflict cost} \\ c - d \\ b - d \end{pmatrix} - \begin{pmatrix} M's \text{ victory gain} \\ c - b \\ b - d \end{pmatrix}. \tag{26}$$

As the final step, assuming (26) holds, let us derive the condition for $e_1^N$ to be the unique best initial play for the government even if the central bank opens with $\iota_1^N$.

This can be rearranged into

$$\tau_M < \tau_M = \tau_F \begin{pmatrix} F's \text{ coordination gain} \\ y - z \\ y - z \end{pmatrix} + \begin{pmatrix} F's \text{ mis-coordination cost} \\ x - w \\ F's \text{ coordination gain} \end{pmatrix}. \tag{28}$$

Summing up, if both (26) and (28) are satisfied, i.e. $\tau_M \in (\tau_M(\tau_F), \tau_M(\tau_F))$, then player $M$ will always start with $\iota_1^N$ knowing that the opponent always starts with $e_1^N$. We therefore have the Monetary-dominance region in which $(\iota_1^N, e_1^N)$ is the unique outcome on the equilibrium path.

By symmetry, under the (less plausible) case $\tau_M > \tau_F$ the necessary and sufficient conditions for the Fiscal-dominance region are:

$$\tau_F > \tau_F = \tau_M \begin{pmatrix} F's \text{ conflict cost} \\ x - z \\ y - z \end{pmatrix} - \begin{pmatrix} F's \text{ victory gain} \\ x - y \\ y - z \end{pmatrix}, \tag{29}$$

and

$$\tau_F < \tau_F = \tau_M \begin{pmatrix} M's \text{ coordination gain} \\ c - a \\ b - d \end{pmatrix} + \begin{pmatrix} M's \text{ mis-coordination cost} \\ c - a \\ M's \text{ coordination gain} \end{pmatrix}. \tag{30}$$

which completes the proof.

The findings are summarized in Figure 2 which shows the three equilibrium regions: Monetary-dominance, Fiscal-dominance and Regime-switching. The name of the latter region featuring multiple equilibria expresses the fact that within it we may observe (i) randomizing between regimes as part of the mixed strategy Nash equilibrium, or (ii) switching between the three Nash equilibria.\footnote{Obviously, it is possible that even in this region the game may end up in one of the two efficient pure strategy Nash equilibria, but the symmetry favours the mixed Nash equilibrium.}

Note that the thresholds $\tau_M$ and $\overline{\tau_M}$ are increasing in $\tau_F$, and the thresholds $\tau_F$ and $\overline{\tau_F}$ are increasing in $\tau_M$. This implies that the policy implementation lags must
by sufficiently - but not excessively - different from each other. Intuitively, sufficiently different revision times ensure that the deflationary policy conflict before the first revision would be sufficiently short, and hence not too costly for the slower-reviser relative to her subsequent coordination gain. On the other hand, if the revision times are too different then the policy over-stimulatory conflict between revisions lasts too long and is therefore too costly for the faster-reviser - relative to his subsequent victory gain.

Note that while each player acts as the leader exactly once in the game, the second (i.e. faster-reviser’s) leadership is more effective in some sense. There exist circumstances under which the dominance region of the faster-reviser obtains, but it is never the case that the slower-reviser has a dominance region. This is because the slower reviser makes the last move of the game, which can be used by the opponent.

Let us now revisit the Rogoff (1985) suggestion of delegating monetary policy to a central bank stricter on inflation (lower $\alpha_M$), and examine its effect on the policy interaction and outcomes.

**Proposition 3.** Consider the case $\tau_M < \tau_F$. Under deterministic revisions, an appointment of a more conservative (stricter) central banker leads to an enlargement of the Monetary-dominance region and shrinking of the Regime-switching region.
Proof. Using (20) and (26)-(28) under \( \tau_M < \tau_F \) implies that

\[
\frac{\partial \tau_M}{\partial \alpha_M} < 0 \quad \text{and} \quad \frac{\partial \tau_M}{\partial \alpha_M} < 0,
\]

and completes the proof.

Proposition 3 suggests that a more conservative central banker reduces the (unconditional) probability of a policy conflict and mis-coordination. This is because (i) these undesirable outcomes cannot occur in the dominance regions, whereas they can occur in the Regime-switching region; and because (ii) a lower \( \alpha_M \) enlarges the range of parameters that lead to the former region.\(^{13}\) Let us however recall Remark 2: this effect only occurs in the environment of revisions, it does not obtain in the standard simultaneous move setting.

6.3. Stochastic Revisions. Now consider an alternative stochastic case whereby

\( \tau_M = \tau_F = 0 \quad \text{and} \quad \theta_M \neq \theta_F. \)

The distinction of the previous setup regarding slower and faster-revisers no longer applies, as both players get their revision opportunity at the same time, if at all. Instead, the player with a lower/higher \( \theta \) will be called more/less-likely-reviser respectively. Let us assume that at the time \( \tau \) their revision opportunity arrives, the players cannot observe whether the opponent has also been granted a revision opportunity.

The probabilities that players are unable to revise their actions, \( \theta \), can be interpreted as the degrees of the policies’ leadership. These are determined by various political economy and institutional factors. In terms of fiscal policy leadership, \( \theta_F \), it is arguably affected by legislation regarding government spending and taxation, the demographic trends of aging populations affecting the size of the fiscal gap (unfunded liabilities), or whether the country has an independent fiscal council.

In terms of monetary leadership, \( \theta_M \), it is arguably increased by explicit inflation targeting. The transparency of the regime’s objectives and of its other aspects combined with more active communication to (and easier scrutiny from) the public enhances the central bank’s ability to move first, and use it to its advantage. Nevertheless, as will become apparent below such explicit inflation targeting in no way implies, let alone requires, strict inflation targeting [for further examination of this distinction see Libich (2011)].

Proposition 4. Under stochastic revisions, like under deterministic ones, we may have up to three equilibrium regions: Monetary-dominance, Fiscal-dominance, and Regime-switching. The dominance regions obtain if and only if the degrees of leadership are sufficiently different across the policies.

Proof. We will derive the necessary and sufficient conditions for the dominance regions in three steps - focusing on the case \( \theta_M > \theta_F \) (the opposite case is again implied by symmetry). In step one, let us derive conditions that guarantee the more-likely-reviser \( M \) to find it optimal to respond to \( M \)’s initial move rather than to his predicted revision.

\(^{13}\)Naturally, in the considered case \( \tau_M < \tau_F \) there is no fiscal dominance region.
This will be the case if $M$’s revision probability is sufficiently low. In particular, for $e_2^N$ to be the unique best response to $i_1^S$ it must hold that

$$
\theta_M y + (1 - \theta_M) w > \theta_M z + (1 - \theta_M) x.
$$

The left hand side of this condition in (32) reports $F$’s minimum possible payoff from playing $e_2^N$ (i.e. the worst case scenario whereby $M$’s revision would lead to mis-coordination and off-diagonal payoffs). The analogous condition for $e_2^S$ to be the unique best response to $i_1^N$ is the following

$$
\theta_M x + (1 - \theta_M) z > \theta_M w + (1 - \theta_M) y.
$$

The fact that $x - w \geq y - z$ implies the condition in (32) to be at least as strong as the condition in (33) for all considered parameter values. We can manipulate (32) to obtain a more informative form of the condition

$$
\frac{F's\ mis-coordination\ cost}{\frac{x - w}{F's\ coordination\ gain} + \frac{y - z}{F's\ mis-coordination\ cost}}.
$$

If (34) holds, that is, if $M$’s revision occurs with a sufficiently low probability, then $e_2$ is the best response to $i_1$ and $M$ ignores whatever $F$ may do in $i_2$. This implies that eight outcomes remain possible on the equilibrium path, namely: (i) $(i_1^S i_2^S e_1^S e_2^N)$; (ii) $(i_1^N i_2^N e_1^N e_2^S)$; (iii) $(i_1^S i_2^S e_1^N e_2^N)$; (iv) $(i_1^S i_2^S e_1^S e_2^N)$; (v) $(i_1^S i_2^N e_1^N e_2^N)$; (vi) $(i_1^N i_2^S e_1^S e_2^S)$; (vii) $(i_1^N i_2^S e_1^N e_2^S)$; and (viii) $(i_1^N i_2^N e_1^N e_2^S)$.

In step two of the proof, we will consider the case of $i_1^S$ and identify the circumstances under which $M$ does not revise his initial play to $i_2^N$ even if he can observe that $F$’s initial move was $e_1^S$. Intuitively, it must be true that $M$’s expected payoff from $(i_1^S i_2^N e_1^S e_2^N)$ is greater than his expected payoff from $(i_1^S i_2^S e_1^S e_2^N)$. This implies the following inequality:

$$
\theta_F d + (1 - \theta_F) c > \theta_M [\theta_F d + (1 - \theta_F) c] + (1 - \theta_M) [\theta_F b + (1 - \theta_F) a],
$$

and can be rearranged into

$$
\theta_F < \frac{c - a}{b - d + c - a}.
$$

As one would expect, $F$’s revision probability has to be sufficiently high to compensate for the cost of the initial conflict.

In step three of the proof, we will assume that (34) and (36) hold, and move backwards to $M$’s starting move. The $M$’s dominance region with $(i_1^S i_2^N e_1^S e_2^N)$ uniquely on the equilibrium path requires that $(i_1^S i_2^N e_1^S e_2^N)$ generates a higher payoff to $M$ than $(i_1^N i_2^N e_1^S e_2^S)$. This is because in such case $M$ is willing to undergo a costly pre-revision conflict knowing that his $i_1^S$ induces $F$ to switch from $e_1^N$ to $e_2^S$. Such scenario will sufficiently compensate him - given $F$’s revision probability is high due to (36). It is ensured by the following

$$
\theta_F d + (1 - \theta_F) c > \frac{b}{F's\ victory}.
$$
and, after rearranging

\[ \theta_F < \bar{\theta}_F = \frac{c - b}{c - d} \]

This is a stronger condition than (36) for all considered parameter values. To summarize: for the Monetary-dominance region it is necessary and sufficient that (34) and (38) hold. Conditions for the Fiscal-dominance regions are symmetric, namely:

\[ \theta_F > \bar{\theta}_F = \frac{c - a}{b - d} \]

which completes the proof.

In a nutshell, the policies’ payoffs - and willingness to undergo conflict or cooperate - evolves with both revision probabilities \( \theta_M \) and \( \theta_F \) even for fixed normal-form payoffs \( \{a, ..., z\} \). As shown in Figure 3, the dominance regions occur if and only if the degrees of leadership are sufficiently different across the policymakers.

The fact that a stronger leadership improves a policymaker’s chances for dominance is intuitive. Equally intuitive is the fact that the opponent’s stronger leadership worsens these chances; because it is the relative strategic strength that matters.

**Proposition 5.** Under stochastic revisions, an appointment of a more conservative (stricter) central banker enlarges the Monetary-dominance region, but it has an ambiguous effect on the size of the Fiscal-dominance region. For such appointment to unambiguously shrink the Regime-switching region, the degree of monetary leadership must be sufficiently high.

**Proof.** Under stochastic revisions, using (20) with (34) and (38)-(40) implies

\[ \frac{\partial \theta_M}{\partial \alpha_M} < 0, \quad \frac{\partial \bar{\theta}_M}{\partial \alpha_M} > 0, \quad \frac{\partial \theta_F}{\partial \alpha_M} > 0, \quad \text{and} \quad \frac{\partial \theta_F}{\partial \alpha_M} \left\{ \begin{array}{l} = 0 \quad \text{if} \quad \alpha_M = \bar{\alpha}_M, \\ > 0 \quad \text{if} \quad \alpha_M > \bar{\alpha}_M, \\ < 0 \quad \text{if} \quad \alpha_M > \bar{\alpha}_M. \end{array} \right. \]

where \( \bar{\alpha}_M \) is a highly non-linear function of \( \lambda, \varphi \) and \( \alpha_F \). This implies that a lower \( \alpha_M \) increases the size of the Monetary-dominance region under all circumstances, but it may enlarge or shrink the other regions. The effect of such appointment on the probability of policy conflict thus cannot be unambiguously determined.

While deriving the necessary and sufficient condition is not possible due to the non-linearity of \( \bar{\alpha}_M \), we can identify a sufficient condition. If the value of \( \theta_M \) is sufficiently high, namely greater than the threshold \( \bar{\theta}_M \), then there is no Fiscal-dominance region.
Therefore, the appointment of a more conservative central banker will surely lead to a reduction of the Regime-switching region under such circumstances, and an improvement in the coordination prospects.

The threshold $\bar{\theta}_M$ is a decreasing function of the appointed conservative central banker’s $\alpha_M$, which implies an interesting insight. The more conservative the central banker to be appointed, the higher the degree of monetary leadership required to ensure that this appointment does not turn out to be counter-productive, and does not increase rather than decrease the probability of policy conflict.\footnote{Let us add that the probability of regime switching and excessive joint stimulus may not only differ across the three equilibrium regions, but also within the regime switching region. Consider for example the case of $\theta_M > \bar{\theta}_M$. If $\theta_F \in (\overline{\theta}_F, \theta_F)$ the central bank knows that if it initially plays $S$ it will surely achieve its preferred coordinated regime $\left(i_2^n, e_2^n\right)$ after time $\tau$ - provided $F$ gets a revision opportunity. If however $\theta_F > \theta_F$ this is no longer the case.}

In summary, the policy implication is that an appointment of a conservative (stricter) central banker must be carefully considered, taking into account the existing institutional framework and the strategic policy interaction effects. Our analysis showed that implementation lags of monetary and fiscal policies, the degrees of their leadership, as well as other policy and structural parameters all play a role.\footnote{For important contributions on this front see also Blake and Kirsanova (2011) and Adam and Billi (2008).}
Proposition 6. Under both deterministic and stochastic revisions, changes in the slopes of the Phillips curve and IS curve have an ambiguous effect on the size of the two dominance regions (and thus the probability of policy conflict and mis-coordination).

Proof. It can be readily checked, using (20), that

\[
\begin{align*}
\frac{\partial (c - d)}{\partial \lambda} &> 0, \\
\frac{\partial (b - d)}{\partial \lambda} &> 0, \\
\frac{\partial (c - a)}{\partial \lambda} &> 0, \text{ and} \\
\frac{\partial (c - b)}{\partial \lambda} &\begin{cases} < 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F < 0, \\ > 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F > 0, \\ = 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F = 0,
\end{cases}
\end{align*}
\]

and analogously for \( F \)'s payoffs. In words, a higher \( \lambda \) increases both players' coordination gains, mis-coordination costs, and conflict costs. Combining this with (34) and (38)-(40) implies that a change in \( \lambda \) in a certain direction may alter the eight relevant thresholds \( \tau \) and \( \theta \) in the same or opposite directions, and therefore the effect on the size of the dominance region cannot be determined in general.

Similarly, in relation to the slope of the IS curve it can be shown, using (20), that

\[
\begin{align*}
\frac{\partial (c - d)}{\partial \varphi} &> 0, \\
\frac{\partial (b - d)}{\partial \varphi} &> 0, \\
\frac{\partial (c - a)}{\partial \varphi} &> 0, \\
\frac{\partial (c - b)}{\partial \varphi} &\begin{cases} < 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F < 0, \\ > 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F > 0, \\ = 0 & \text{if } -\lambda^2 + \alpha_F \lambda^2 + 2\alpha_M \alpha_F = 0,
\end{cases}
\end{align*}
\]

While in this case the \( \theta_F \) and \( \theta_M \) thresholds are unambiguously decreasing in \( \varphi \), the sign of the effect of this IS slope parameter on the size of the dominance region is again ambiguous due to the remaining thresholds.

Intuitively, changes in \( \lambda \) and \( \varphi \) change the players’ incentives to coordinate/fight through several different channels, and the sign of the overall effect depends on the relative magnitude of these channels. It is interesting to note that even if \( M \) policy becomes more potent \( (\varphi \text{ and } \lambda \text{ both increase simultaneously}) \) this will not help the central bank gain an upper hand in the Game of Chicken. Conversely, a higher potency of \( F \) policy does not affect the size of the dominance regions (none of the eight thresholds), and hence cannot help the government in pressuring the central bank either. This suggests that what matters in the policy interaction is the leverage one policy has over the other policy, not so much the leverage it has over economic outcomes.

7. SUMMARY AND CONCLUSIONS

The paper attempts to add strategic considerations into an investigation of monetary-fiscal policy interactions. Events in the aftermath of the global financial crisis have shown that strategic effects, missing in standard models of policy interactions, may play an important role. Our aim has been to consider the effect of various institutional factors such as the inflation targeting regime.

To do so in the most transparent fashion the paper maps a simple reduced-form New Keynesian model of Clarida, Gali, and Gertler (1999) into a 2 \( \times \) 2 game theoretic representation. It then examines monetary and fiscal policy responses to an adverse shock to output.
The analysis demonstrates that there may be a coordination problem or even a conflict in terms of which policy should stabilize the shock. In the mis-coordinated scenario both policies delay the required stimulus in anticipation that the other policy will carry it out. In the conflict scenario it is the opposite: each policy engages in a strong stimulus in order to discourage the other policy from doing so. Each policy attempts to apply its preferred weights between inflation and output variability leading to a policy tug-of-war in the form of a Game of Chicken. This however results in an excessive overall stimulation of the economy and likely future imbalances. Alternatively, mis-coordination or conflict may manifest as costly regime switching that increases the variability of both nominal and real variables.

What may be surprising about our result is that such policy conflict may occur even in the most favourable case, in which: (i) there is no disagreement between the central bank and the government about the optimal targets for inflation and output (which is at the potential level); and (ii) the shock comes from the demand side of the economy (where it is perfectly observed by both policymakers and private agents). What is less surprising is that the behaviour of inflation expectations - whether or not they are anchored - affects the likelihood of such a policy conflict.

To provide some policy recommendations we examine the outcomes of the policy interaction in two novel game theoretic frameworks with deterministic and stochastic revisions of policy actions. The analysis shows under what circumstances the policy conflict can be avoided, and efficient outcomes secured in equilibrium. Our modelling approach formally distinguishes between explicit and strict inflation targeting, and suggests that these may affect the outcomes of both monetary and fiscal policies through several channels.

8. References


