Explicit Inflation Targets, Communication, and Central Bank Independence:

Friends or Foes?∗

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Abstract

The paper studies the relationship between two recent institutional innovations in monetary policy - central bank independence (CBI) and explicit inflation targeting (EIT) (the latter characterized by a high degree of transparency and accountability). Our reduced-form model unifies several approaches in the literature, and this comprehensiveness combined with simplicity offers three novel institutional findings, all of which we support empirically. First, instrument-CBI is a complement to EIT, whereas goal-CBI acts as a strategic substitute to EIT in ensuring policy credibility. Second, out of these two ‘commitment technologies’, EIT is shown to be socially superior to goal-CBI. Third and controversially, countries that first implement goal-CBI are then less likely to adopt EIT. Our analysis therefore implies that countries should follow the example of e.g. New Zealand, Canada, and the UK and legislate EIT together with instrument-CBI, but stay well clear of goal-CBI. Unfortunately, many countries have followed the opposite route, which seems to have had adverse consequences through several channels.

Keywords: explicit inflation targeting, central bank independence, transparency, accountability, credibility, monitoring, reputation; JEL classification: E52, E61, C72

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1 Introduction

The past three decades have seen a clear trend towards independent monetary policymaking
from increasingly transparent and accountable central banks. However, there have been
significant variations across countries. Most obviously, some countries have explicitly
committed to numerical inflation targets whereas others have not.

This paper’s motivation is to (i) understand the reasons for this trend and its differences;
(ii) draw some conclusions about the desirability of central bank independence (CBI), explicit
inflation targeting (EIT), accountability (AC) and transparency (TR); and (iii) based on
those results, to identify the most effective institutional setting. It will become apparent that
the analysis offers, inter alia, an explanation of why the Fed and the ECB have not fully
adopted EIT.

In doing so our interest lies in long-run (steady-state) institutional and macroeconomic
outcomes rather than in short-run deviations and stabilization issues. This is reflected in the
fact that the inflation target in our analysis - as well as in most industrial countries - is
specified as a long-run objective that only needs to be achieved on average (over the business
cycle), not at every point in time, and therefore leaves room for stabilization of shocks.

While the long-run effects of CBI and EIT have been examined in detail,1 the
relationship between them has received little attention.2 Our analysis will show, however, that
the CBI-EIT relationship contains valuable information that may be crucial in determining
their desirability as institutional arrangements. Specifically, it challenges the conventional
belief that CBI is unreservedly beneficial - pointing to an important distinction between
instrument and goal CBI first elaborated by Debelle and Fischer (1994).

Our agenda: in order to examine the CBI-EIT relationship, we proxy the ‘explicitness’ of
EIT by the degree of the regime’s key features – goal-TR and AC. These two institutional
features are highly positively correlated since goal-TR enables us to implement AC, and both
are essential to EIT (see e.g. Bernanke, et al. (1999)). We survey the existing literature and
data on the CBI-TR and CBI-AC relationships in Section 4 from which two conflicting

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1 On CBI see McCallum (1995), Posen (1998), Forder (1998a), Jordan (1999), Lippi (1999), and Hayo and Hefeker
McCallum (2003), Goodfriend (2003), Kohn (2003), Friedman (2004), Mishkin (2004), and the papers in Bernanke and
Woodford (2005). On the empirics of EIT see the references in section 4.

2 This is perhaps unsurprising – countries are commonly viewed as either inflation targeters or non-targeters, so
there is not enough variation in the EIT variable to perform empirical testing. The papers that have attempted to test
the effects of EIT using a dummy for EIT, e.g. Ball and Sheridan (2003), have been criticized precisely on this point:
Gertler (2003). This is because many countries pursue an inflation target \textit{implicitly} - including the U.S., see Goodfriend
(2003), or the Bundesbank and the Swiss National Bank in the 1980s, see Bernanke, et al. (1999)).
streams of literature emerge. Specifically, one stream predicts a positive and the other a negative CBI-EIT relationship.

It is the conventional view that TR and AC should go hand in hand with CBI to be consistent with democracy (for a widely cited example see King (1998)), and avoid a ‘democratic deficit’. A contribution by Geraats (2001) presents additional ‘political economy’ arguments for a positive CBI-TR relationship motivated by empirical findings of Chortareas, et al. (2002) and Fry, et al. (2000). Also, historical evidence shows that EIT was often adopted as a way of enhancing CBI, see e.g. Singleton, et al. (2007).

By contrast, the seminal work of Cukierman and Meltzer (1986) postulated a weakly negative CBI-TR relationship based on ‘constructive ambiguity’. In line with this Briault, et al. (1997) observe that ‘… transparency has been pursued most actively by central banks with little independence…’ (emphasis added). Their paper, and those of de Haan, et al. (1999) and Sousa (2002), present evidence that CBI and AC may be negatively related in practice (see Figure 1 for an example).3

![Accountability vs. Independence](image)

**Figure 1:** Source: Sousa (2002), see Appendices D to H for details on the criteria, countries, and scores. The correlation coefficient, at -0.78 (t=-6.94), is negative and significant.

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3 Out of the three papers we depict the latter due to the largest sample. This finding can be viewed as robust as it has been found in variety of studies using differently constructed indices for different countries and different periods.
As is apparent, most of the inflation targeting countries in Figure 1 are located in the top left hand corner and feature relatively low CBI. The existence of these two conflicting streams of results implies that the link between CBI on one hand and EIT, TR, AC on the other is not straightforward. One of this paper’s goals is to reconcile them, both theoretically and empirically.

On the empirical front we perform a formal analysis of the available indices in Section 4. It shows that \textit{instrument-CBI} is positively related to TR (economic-TR in particular) - which is consistent with the first group of results cited above. Nevertheless, it also shows that \textit{goal-CBI} is negatively related to \textit{goal-TR} and AC as the second stream predicts. This reconciles the two conflicting sets of results.

On the theoretical front, our model implies that this is because \textit{instrument-CBI} complements EIT (it is one of the regime’s prerequisites; a ‘friend’), whereas \textit{goal-CBI} acts as a \textit{strategic substitute} (‘foe’) to EIT. This ‘equal but opposite’ distinction between instrument and goal CBI due to Debelle and Fischer (1994) turns out to be crucial.\(^4\) Since the complementarity of CBI and EIT is less controversial and has received more attention in the literature, our paper focuses on modelling the substitutability of the two (consistent with Figure 1) and its policy implications.

\textbf{Framework.} The strength of our model lies in its comprehensiveness combined with simplicity and familiarity. We can incorporate a number of widely used concepts, for example \textit{goal-CBI}, \textit{goal-TR}, AC, EIT, regime overriding, reputation, credibility, and monitoring. Due to such large scope, we choose to use the simplest setting in which the insights regarding the institutional relationships can be shown analytically. This we can do in a reduced-form New Keynesian model, rather than in a more complicated general equilibrium model. While this may raise questions about robustness, it will be clear that our main conclusions actually do not depend on the fine specifications of the model, and would therefore be unaltered in a richer macroeconomic environment. Moreover, the way all our institutional variables are incorporated into the model is in line with the existing literature.

Unlike the government who has an over-ambitious output target, the central banker is optimally conservative in the Rogoff (1985) sense. Goal-CBI then determines which of these two policymakers, and to what extent, is in charge of setting monetary policy. We assume both policymakers dislike AC - possibly because of punishments implied by a optimal linear incentive contract as in Walsh (1995) and Svensson (1997b); and, to a lesser extent, due to

\(^4\) To document this claim from a different angle, the correlation between instrument and goal CBI among the 22 transition countries in Fry, et al. (2000) is \(-0.34\).
their accountability aversion in the spirit of Milton Friedman. As implied by e.g. Bernanke, et al. (1999) or Mishkin (2004), the contract can only be implemented if policy goals are transparent in the sense of Geraats (2002).

There are two types of government following Backus and Driffill (1985). The weak (impatient) type has a temptation to ‘override’ the institutional regime by setting the policy itself. To add realism this overriding takes the form of a temporary suppression of the existing goal-CBI and/or EIT arrangements, rather than firing the central banker as in Lohmann (1992). Overriding may lead to an output gain through surprise inflation, but it deteriorates the government’s reputation and hence future monetary policy outcomes. For that reason a strong (patient) government is not tempted to override the central bank. The problem is that an ‘economically rational public’ (in the spirit of Feige and Pearce (1976)) cannot observe the government’s type in real time unless it ‘monitors’ – that is, unless it pays a fee for a signal that reveals the government’s type and intentions.

Findings and Policy Implications. It is shown that if the monitoring cost is sufficiently low and the government’s reputation is imperfect, the public will find it optimal to monitor, which will discourage the weak government type from interfering with the institutional setting. Optimally low inflation then becomes time-consistent and credible. If however the monitoring cost is too high then agents do not monitor. This leads to monetary policy lacking credibility (whereby credibility is an increasing function of the government’s reputation), and the economy’s output being below-potential. These short-run themes are examined in detail in our companion paper Hughes Hallett and Libich (2007).

Our main focus in this paper is institutional design and the long-run (steady-state) outcomes. We show that both goal-CBI and EIT are ‘commitment devices’ that improve long-run monetary policy performance. While each works through a different channel (the Rogoff and the Walsh channels respectively), they both eliminate the inflation bias, and hence increase steady-state output by improving the policy’s credibility. This is the standard part of our results.

Our main result is that EIT is found to be superior to goal-CBI.5 First, it eliminates the possible democratic deficit in Figure 1 through enhancing AC. Second, it is robust to the degree of goal-CBI, i.e. it delivers credibility even under a non-conservative policymaker. Put differently, credibility is ‘institutionalized’ by EIT - tied up with the institutional regime, not

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5 To demonstrate, the survey by Blinder (2000) shows that CBI (without the goal vs instrument distinction) is still perceived by central bankers and academics as the most important institutional feature of monetary policy in terms of achieving credibility.
with an individual, and is therefore not at stake if a particular Governor departs. Third, EIT reduces the monitoring cost of the public by enhancing goal-TR. This is because under an EIT regime the government’s weakness/overriding are easily detectable (the deviations from the legislated target are visible), which results in cheaper monitoring. Fourth, because of that, EIT makes it more likely that the public monitors, and hence reduces the probability of a regime being overridden through government pressure. This in turn increases monetary policy’s credibility and increases steady-state output.\(^6\)

The implication of these results is that one advantage of EIT is an improvement of the central bank’s *communication* with the public and financial markets. This is not so much by explaining in detail what the bank is doing; but in clarifying what it is trying to do (reaffirming its objectives) and hence what the private sector might reasonably expect from policy in the future. This is in line with the plea of Cecchetti (2003) quoted in the introduction, and is consistent with the arguments in Bernoth, et al. (2008) who show formally that communication in this sense is necessary if policy makers are to shift or anchor expectations. But it differs from the existing ideas on communication which have focussed on cheap talk, publishing private information about shocks and forecasts, and issues of unanimity (or otherwise) in the monetary policy committee.

Arguably a more controversial part of our results is the model’s prediction that if the government grants full goal-CBI, then the appointed central banker is *less likely* to adopt EIT. First, he will *not need* to do use the Walsh channel as credibility of low inflation is delivered through the substitute Rogoff channel. Second, he may *not want* to do so if he is averse to the possibility of punishment/criticism attached to an EIT that might be missed. The fact that AC can only be enhanced by goal-TR implies, in accordance with the findings of the second stream of literature and Figure 1, that both goal-TR and AC will be *negatively* related to goal-CBI.

These results have strong implications for the optimal institutional design. They argue for EIT (which includes goal-TR, AC, and instrument-CBI), but against the simpler goal-CBI regime. The rest of the paper is structured as follows. Section 2 describes the model and Section 3 presents the results for all three versions of the game (that reflect various timing scenarios). Section 4 discusses empirical evidence. Section 5 summarizes and concludes.

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\(^6\) There is another potential reason (that we do not model explicitly) related to the current financial crisis. It has been argued that EIT is well suited reduce the danger of *deflation*, see e.g. Svensson (2001).
2 The Model

To make the analysis more instructive, while also incorporating a number of institutional variables at the same time, we build on a simple reduced-form New Keynesian framework. Nevertheless, since (i) the main features of the model are consistent with a fully micro-founded general equilibrium model (see e.g. Clarida, et al. (1999)), and (ii) all our institutional assumptions are in line with the existing literature, it will become apparent that our insights would hold more generally in a richer model.

Our policy framework features three players - the public, \( p \), the government, \( g \), and the central bank, \( b \). They are rational, have common information, and know their opponents to be rational. The economy is summarized by a New Keynesian Phillips curve

\[
\pi_t = \omega x_t + \pi^e_t + \varepsilon_t
\]

where \( \pi \) is inflation, \( \pi^e \) is expected inflation, \( x \) is the output gap (difference between current and potential output), \( \varepsilon \) denotes a supply shock (with zero mean), and \( t \) denotes discrete time. The model also includes an IS curve, but since our attention will be on steady-state outcomes, we will not use it here. The players’ single period utility functions are the following\(^7\)

\[
u^i_t = -\beta x^2_t + \lambda^i x_t - (\pi_t - \bar{\pi})^2 - a_i AC_t\]

\[
u^g_t = -(\pi_t - \bar{\pi})^2 - c(\pi_t - \bar{\pi})^2 - m_i M_i\]

where \( i = \{g,b\} \), \( \bar{\pi} \) is the socially optimal inflation target (which may be implicit or explicit), \( AC \geq 0 \) denotes accountability, \( M \in \{0,1\} \) denotes the degree of the public’s monitoring, \( \beta, \lambda \) are non-negative weights, and \( a \geq 0 \), \( m \geq 0 \) and \( c \geq 0 \) refer to the accountability, monitoring, and inflation costs respectively. Equation (2) makes clear that the government’s and central banker’s preferences only differ in one aspect which is the level of the output gap target, as in Faust and Svensson (2001) for example. As they do, we assume that the central banker is ‘responsible’, \( \lambda^b = 0 \), but that the government is ‘ambitious’ (for political economy reasons), \( \lambda^g > 0 \).

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\(^7\) We will not formally model discounting of the central bank and the public for parsimony. In terms of the government, its discount factor is \( \delta_g \), where \( \delta_g = 1 \) will be called patient, and \( \delta_g < 1 \) impatient.
The intuition behind the players’ preferences is standard; but there are two innovations. First, we allow for the possibility that the policymakers are averse to accountability. Second, the public’s utility function expresses ‘economically rational expectations’ (Feige and Pearce (1976)), in which information updating is the result of a cost/benefit analysis performed by the agents. But, in order to keep the intuition comparable to standard rational expectations we will follow Backus and Driffill (1985) and disregard the public’s inflation cost by setting $c = 0$.

**Long-run perspective.** Since our interest lies in the effect of institutional design on monetary policy we will focus on long-run (steady-state) outcomes of the game. Since the shock has a zero mean, it does not affect steady-state outcomes, and we can therefore abstract from it by setting $\tilde{\varepsilon}_t = 0, \forall t$ throughout. It then follows that we can, without loss of generality, set $\beta = 0$. It is also implied we can treat inflation directly as the instrument of monetary policy.

### 2.1 Institutional Features

In this section and the next, we introduce and define the various concepts used in our framework and in the literature.

**Definition 1:** Central bank goal-independence, $CBI \in [0,1]$, refers to the capacity of the central bank to pursue its own objectives (targets).

Following Hughes Hallett and Weymark (2005) it is assumed to be an index. In order to better express who actually sets monetary policy in practice, we merge the two players into one called ‘monetary policymaker’, denoted $m$. His preferences are assumed to be an average of the two players’ objectives weighted by CBI, $u^m_t = CB\tilde{u}^b_t + (1 - CB)\tilde{u}^f_t$, from which it follows

$$u^m_t = -(\pi_t - \bar{\pi})^2 + \lambda(1 - CB)x_t - a_t AC_t \tag{4}$$

**Definition 2:** Goal-transparency, $TR \geq 0$, refers to the degree of explicitness with which long-run monetary policy objectives (targets) are stated in the central bank statutes (or related legislation).

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8 It has been shown that aversion to output and inflation volatility can be, under reasonable assumptions, derived from micro-foundations (see e.g. Woodford (2003)).

9 This is in the spirit of the models of ‘rational inattention’ (Sims (2003) and Reis (2006)).
This second definition is in line with Geraats (2002) and Eijffinger and Geraats (2006), and it will become apparent that this aspect of ‘legality’ makes goal-TR substantially different from a policy announcement – because of its effect on AC and monitoring.¹⁰

**Definition 3: Accountability**, \( AC \geq 0 \), refers to the monetary policymaker’s punishability (by the public) for deviating from the long-run monetary policy objectives.

In most settings the central banker is accountable to the government, and the government is subject to periodic re-election by the public and to scrutiny by parliament or the press. Our definition therefore combines the two.¹¹

Aversion to AC is determined by the following punishment scheme of Walsh (1995), in which the contract is linear for modelling purposes (as in Svensson (1997a)).

\[
a_t = \gamma (\pi_t - \bar{\pi}) + \kappa
\]

The ‘punishment aversion’, \( \gamma \), is defined as \( \gamma > 0 \) for \( \pi_t \geq 0 \); but \( \gamma = 0 \) otherwise.¹² The constant term, \( \kappa \geq 0 \), is included to enable us to consider the policymaker’s ‘punishability aversion’ as such - the threat of punishment itself, as opposed to the size of punishment for deviating from the long-run target.¹³

With regards to achievability of AC, the literature argues that it can only be secured through goal-TR: e.g. Debelle (1997), Svensson (1999), Eijffinger, et al. (2000), Geraats (2002). This is because the optimal incentive contract can only be put in place if the policymaker’s targets are clearly specified. Hence in general terms we have \( \frac{\partial AC}{\partial TR} > 0 \), \( \forall TR \geq 0 \). For the purposes of illustration, we use a specific functional form

\[
AC_t = \tau TR_t
\]

**Definition 4: Explicit inflation targeting**, \( EIT \), is a monetary policy regime characterized by a high degree of goal-TR and AC.

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¹⁰ In Geraats (2002) and Eijffinger and Geraats (2006) goal-transparency (referred to as ‘political’ transparency) has three elements, namely ‘formal objectives’, ‘quantitative targets’, and ‘institutional arrangements’. Note that all three are officially grounded in the legal framework of monetary policy (the Central Bank Act, the Statutes etc), i.e. Definition 3 follows this specification.

¹¹ It should be noted that our main findings would obtain even if the central banker was accountable to the government.

¹² In our shock-free environment assuming no punishment for deflation is without loss of generality.

¹³ This is in the spirit of Milton Friedman who argued that: ‘By far and away the two most important variables in the central banker’s loss function are avoiding accountability on the one hand and achieving public prestige on the other’ (quoted in Fischer (1990)). In other words, punishability may be a constraint on the policymaker, effectively limiting his or her policy choices (similarly to the intuition of Faust and Svensson (2001), (2002)).
The specification in (6) and Definition 4 imply that AC, goal-TR, and EIT are a single object in our analysis.\textsuperscript{14}

2.2 Government Types, Reputation, Regime Overriding and Monitoring

In this section we elaborate on the uncertainty present in the game.

\textbf{Definition 5}: \textit{Overriding}, \(R = 1\), refers to the government’s temporary (one period) suppression of the institutional regime (which describes a setting in which some institutional features exist, i.e. \(CBI_t > 0\) and/or \(AC_i(TR)_t > 0\)).

We find it realistic to model overriding as a temporary interference with the existing institutional arrangements rather than as a dismissal of the central banker or abandoning the EIT, neither of which have been observed in practice. Overriding \(R_t = 1\) therefore leads to \(CBI_t = 0 = AC_i(TR)_t\), and the government setting inflation itself in \(t\).

Following the seminal work on reputation by Backus and Driffill (1985), we assume that there are two types of government, strong and weak, \(T \in \{S,W\}\). Unlike in their paper, our government types differ in their discounting of the future.

\textbf{Definition 6}: The strong type of the government, \(g^S\), is patient, whereas the weak type, \(g^W\), is impatient.

This implies \(\delta^S_g = 1\), and for simplicity we will set \(\delta^W_g = 0\). We denote the probability of \(g^S\) by \(\theta \in [0,1]\), which is fixed throughout. While we assume that the public knows the incentives of each government type, the public can only directly observe the type with a one-period lag, i.e. \(g^T_{t-1}\) at \(t\). Therefore, in every period the public makes an assessment of \(g^T_t\) before setting inflation expectations.

\textbf{Definition 7}: The government’s reputation, \(\theta^R_t \in [0,1]\), refers to the probability perceived by the public that the government is strong (patient) in period \(t\), \(g^T_t = g^S\).

The cases of \(\theta^R_t = 1\) and \(\theta^R_t < 1\) will be called perfect and imperfect reputation respectively. Past realizations of \(g^T\) according to which the public updates \(\theta^R_t\) are assumed to be costlessly available. If the public updates according to Bayes rule, or has a punishment scheme such as in Barro and Gordon (1983), each overriding decision leads to a ‘punishment’ by the public: a

\textsuperscript{14} The literature has often treated AC and goal-TR as synonymous, as they go hand in hand in the real world (Svensson (1999), Mishkin (2004)). While this is justified for modelling purposes it may have undesirable consequences: indices of these institutional features include criteria that refer to the other variable. Therefore, we prefer to postulate them separately giving a definition for each of them. Further, it should be noted that real world EIT has a number of additional features other than AC and goal-TR. Nevertheless, as these two pivotal features most affect the incentives of the policymakers and hence steady-state outcomes, we focus on them.
reduction in reputation, \( \theta^e_{i+1} \), increasing expectations \( \pi^e_{i+1} \), and consequently decreasing output \( x_{i+1} \) (and commonly in later periods as well). Due to the space constraint, we will keep the focus on the institutional relationships and leave the evolution of \( \theta^e_i \) unmodeled here (its evolution and impact is examined in Hughes Hallett and Libich (2007)). Instead, we will simply assume a grim trigger strategy scenario, under which overriding leads to the loss of the government’s reputation forever. Such a strong punishment mechanism implies that patient governments are never tempted to override: \( R^e_i(g^S) = 0 \), \( \forall i, M \).

Importantly, we assume that the public is not constrained to the past realizations, but has the option of monitoring in each period.

**Definition 8:** **Monitoring.** \( M = 1 \), refers to the public’s acquiring real-time information about the government’s type.

Specifically, \( M_i = 1 \) will denote the purchase of a 100\% informative signal of \( g^T_i \) before the actions in period \( t \) are made (whereas in the case of no-monitoring, \( M_i = 0 \), the public’s prior information does not change). In either case the government is assumed to observe the value of \( M_i \) in period \( t \) prior making a move (which we believe to be realistic).

Monitoring costs in the literature are conventionally defined as a function of two variables: (i) the degree of informativeness of the signal, and (ii) the degree of difficulty of obtaining that signal. Therefore, we postulate the monitoring cost as a decreasing function of goal-TR, \( \frac{\partial m}{\partial TR} < 0 \), \( \forall TR \geq 0 \), which is consistent with Faust and Svensson (2001) and Bernanke (2003). For illustration, we will use

\[
m_i = \frac{\mu}{1 + TR_i}
\]

**Definition 9:** **Monetary policy credibility.** \( C \leq 0 \), refers to the degree with which the public expects the optimal long-run inflation level (target) to be achieved.

We follow Faust and Svensson (2001) and postulate

\[
C_i = -|\pi - \pi^e_i|
\]

The further expectations are from the (implicit or explicit) target the lower the credibility, i.e. \( C_i = 0 \) is the case of perfect credibility and if \( C_i < 0 \) the policy lacks credibility.

**2.3 Timing and Versions of the Game**

We will consider three versions of the game to explicitly incorporate two important features of the real world. First, game \( G \) will consider a pre-EIT world, in which goal-TR and AC are not available, and goal-CBI is exogenous (pre-determined). This will account for two facts: (i)
there exist a number of prerequisites that need to be satisfied before the EIT regime can be successfully adopted, such as absence of fiscal dominance, absence of exchange rate peg, sound infrastructure (developed capital markets), good forecasting and inflation control, instrument-CBI etc (for more see Masson, et al. (1997) or Blejer and et al. (2002)), and (ii) goal-CBI may be outside the government’s control.15

The second version of the game, $G^{CBI}$, will consider the pre-EIT world in which goal-CBI is endogenous, i.e. optimally chosen by the government. The fact that goal-CBI may be a choice variable in the pre-EIT world (i.e. while goal-TR and AC are still unavailable) expresses that it is less institutionally demanding and hence more readily available than EIT.

The third version we consider is the post-EIT world (game $G^{EIT}$), in which goal-TR (and thus AC) is optimally chosen by the monetary policymaker, taking the degree of goal-CBI as given.

The actions that happen in every period $t \geq 1$ are equivalent for all three versions of the game and can be summarized as follows (Figure 2 presents the extensive form).

1. The public updates $\theta_t^e$ by observing $g_t^{T_{t-1}}$.
2. There is a move of nature - realization of the $g$’s type, $T_t \in \{S,W\}$, as a random draw given $\theta$.
3. Unable to observe $g_t^{T_t}$ the public chooses from the monitoring set, $M_t \in \{0,1\}$.
4. Observing $M_t$ the government chooses whether to override/interfere, $R_t \in \{0,1\}$.
5. Inflation, $\pi_t$, is then set (through the interest rate) by either the monetary policymaker (in the case of $R_t = 0$) or the government (if $R_t = 1$).
6. Unable to observe $\pi_t$, and either able to observe $g_t^{M_t}$ (if $M_t = 1$) or unable to observe $g_t^{M_t}$ (if $M_t = 0$), the public forms inflation expectations $\pi_t^e$ (note that the latter is reflected in Figure 2 by the larger information set).
7. The pay-offs of period $t$ are realized.

This is the full description of $G$. The games $G^{CBI}$ and $G^{EIT}$ each contain one extra (one-off) move that occurs at the beginning of the game, in period $t = 0$, and can be observed by all

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15 There is a growing literature on ‘inflation culture’ that shows that the degree of (goal) CBI is driven by various long-run factors, for example the public’s attitudes towards inflation and/or inequality: see Posen (1995), Hayo (1998), and de Jong (2002).
players. In $G^{\text{CBI}}$ the government chooses goal-CBI from the set $CBI = [0,1]$, unable to consider $TR$. In $G^{\text{EIT}}$ the monetary policymaker chooses the degree of goal-TR from the set $TR \in [0,\infty)$, taking goal-CBI as given.\textsuperscript{16}

![Diagram](image)

Figure 2: The extensive form of game $G$ (the stage game).

### 3 Results

#### 3.1 Game $G$

**Proposition 1:** If the public monitors, the institutional regime is never overridden, potential output always obtains in the steady state, and the two types of government are observationally equivalent.

\textsuperscript{16} Since these are one-off decisions we will drop the time subscript on CBI, TR, and AC (except in an overriding situation).

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Proof: We need to show that if $M_t = 1$ then $R_t^* = 0$ and $x_t^* = 0$, $\forall CBI, g_t^T$ (where an asterisk will denote an equilibrium level throughout). Solving backwards, using (3)-(4) and realizing that $R_t = 1$ leads to $CBI_t = 0$, the time-consistent inflation rate in the steady-state is

$$\pi_t^* = \pi + \frac{\lambda_0}{2\omega}(1 - CBI(1 - R_t)).$$

(9)

Note that with the exception of $CBI = 1, R_t = 0$, equation (9) implies $\pi_t^* > \pi$, which is the influential time-inconsistency result of Kydland and Prescott (1977) and Barro and Gordon (1983). For expositional clarity we relegate the rest of the proof to Appendix A. It shows that monitoring discourages even the weak government from overriding the regime as it eliminates the possibility of an inflation surprise induced output gain.

\[\Box\]

To keep our focus on the institutional design of monetary policy, we have examined what happens under no-monitoring, $M_t = 0$, in our companion paper Hughes Hallett and Libich (2007). The following four results are proven there (as Propositions 3-6):

1) The weak/impatient type of government always overrides the central banker, $R(g^{W})^* = 1$. Therefore, 2) the policy lacks credibility, $C_t^* < 0$, even if the central banker is fully independent and the government is never weak, $CBI = \theta = 1$. 3) Deterioration in the government’s reputation leads to a decrease in the monetary policy’s credibility. 4) As a consequence, the economy never operates at potential output in the steady-state regardless of the government’s type, $x_t^* = 0$, $\forall g_t^T, \theta_t^* \in [0,1]$.

We now continue by focusing on the monitoring case.

Proposition 2: The public will always monitor if all three of the following conditions hold (i) the government’s reputation is imperfect, (ii) there exists some institutional regime (that could be overridden), and (iii) the monitoring cost is sufficiently small.

Proof: We need to show that for all $CBI > 0$, $g_t^T$, and $m(\eta) < \overline{m}(\overline{\pi})$ (where $\overline{m}(\overline{\pi}) > 0$ is some threshold value), it is true that if $\theta_t^* < 1$ then $M_t^* = 1$. We do so in Appendix B.  \[\Box\]

The following remark demonstrates the advantage of our approach which includes the ‘disequilibrium’ (but potentially realistic) cases of $\theta_t^* = \theta$.

Remark 1: Consider countries A and B whose private sectors are inherently ‘suspicious’ and ‘gullible’ respectively, i.e. they tend to form $\theta_A^* < \theta_A$ and $\theta_B^* > \theta_B$. Proposition 2 then implies that under a sufficiently small monitoring cost, $m(\mu) \leq \overline{m}(\overline{\mu})$, it may be the case that the suspicious public monitors, $M_A^* = 1$, even if $CBI = 1 = \theta$; and the gullible public does not monitor, $M_B^* = 0$, even if $CBI < 1, \theta < 1$. 

13
As it is reasonable to suppose that all conditions of Proposition 2 generally hold in industrial countries, we will impose them throughout the rest of the paper: \(\theta_t < 1, \forall t\) and \(m(\mu) \leq \overline{m}(\overline{\mu})\).\(^{17}\) This allows us to focus on the relationships between the institutional features, since we know that the public will then always monitor \((M_t^* = 1, \forall t\) from Proposition 2\) and the regime will never be overridden \((R_t^* = 0, \forall t\) from Proposition 1\).

**Proposition 3**: Non-overridden goal-CBI reduces steady-state inflation and improves credibility.

**Proof**: This first claim follows by inspection of (9) and is in the spirit of Rogoff (1985) - with the qualification of McCallum (1995) regarding the overriding threat. It is also in line with a number of empirical results discussed in Section 5. The effect on credibility can be seen by substituting (9) and (15) into \(C_t = -|\overline{\pi} - \pi_t^*|\) from (8).\(^{18}\)

3.2 Game \(G^{CBI}\)

**Proposition 4**: If the government can choose to delegate monetary policy in the pre-EIT world, it will grant full goal-CBI to the central banker.

**Proof**: It is shown in Appendix C that \(CBI^* = 1\).

**Proposition 5**: EIT, goal-TR, and AC (weakly) reduce inflation and improve credibility.

**Proof**: Denoting all post-EIT variables of game \(G^{EIT}\) by a hat, and using the fact that Propositions 1-2 hold in \(G^{EIT}\), the time-consistent steady-state inflation level is\(^{19}\)

\[
\hat{\pi}_t^* = \overline{\pi} + \frac{\lambda^0}{2\omega} (1 - CBI) - \frac{\gamma T R}{2}, \quad \forall \hat{\pi}_t^* \geq \overline{\pi}, \quad \text{otherwise } \hat{\pi}_t^* = \overline{\pi}
\]  

(10)

Which, when combined with \((\hat{\pi}_t^*)^* = \hat{\pi}_t^*\) and \(C_t = -|\overline{\pi} - \pi_t^*|\), proves the claim - in line with a number of empirical findings surveyed below.

\(^{17}\) In terms of the small monitoring cost assumption, \(m(\mu) \leq \overline{m}(\overline{\mu})\), obtaining information has arguably become much more affordable in the era of internet and far reaching media. Alternatively, unlike the inflation and output gap costs that are borne by every member of the society the monitoring cost may be shared. Once the signal is ‘purchased’ by one individual it may be passed onto others with little additional cost. In terms of the imperfect reputation assumption, \(\theta^e < 1\), can best be supported by the length of time that was needed for central banks to re-establish their credibility in the 1980s and 1990s, after the inflationary excesses of the 1970s. Section 5 has more discussion of this.

\(^{18}\) Hughes Hallett and Libich (2007) show that the result is in fact stronger - if the public does not monitor, CBI increases credibility even if it is overridden.

\(^{19}\) The appropriate threshold monitoring cost, \(\overline{\mu}\), is now lower due to the inflation reducing effect of goal-TR, but the derivation of (17) implies that a sufficiently low positive level exists.
3.3 Game \( G^{EIT} \)

**Proposition 6**: (i) Under a sufficiently small punishability aversion, \( \kappa < \bar{\pi} \), goal-TR and AC are both positive but decreasing in goal-CBI (as well as in \( \gamma, \omega \), and \( \tau \), and increasing in \( \lambda \)). In such a case, equilibrium steady-state inflation is on target regardless of goal-CBI, \( \hat{\pi}^* = \bar{\pi} \), \( \forall \text{CBI} \). (ii) In contrast, under \( \kappa \geq \bar{\pi} \), the goals of monetary policy remain opaque and unaccounted for, \( \hat{AC}^* = \hat{TR}^* = 0 \), and equilibrium steady-state inflation deviates from the target for all \( \text{CBI} < 1 \).

**Proof**: Substitute (10) into (4) together with (5) and all other relevant information derived in the above proofs, differentiate with respect to goal-TR, set equal to zero and rearrange to obtain

\[
TR = \frac{2\kappa}{\gamma^2\tau} \tag{11}
\]

From the fact that the second derivative is positive it follows that such goal-TR level minimizes the policymaker’s utility. This, combined with the fact that his utility is a parabola, implies a corner solution. Depending on the punishability aversion \( \kappa \), the optimal degree of goal-TR is either zero or the highest level that still reduces inflation, which is, using (10), the following

\[
\hat{TR}^* = \frac{\lambda(1-CBI)}{\tau\gamma\omega} \quad \text{and hence} \quad \hat{AC}^* = \tau\hat{TR}^* \tag{12}
\]

Specifically, from the fact that the parabola is symmetric it follows that the threshold level is, using (10) and (11),

\[
\bar{\pi} = \frac{\lambda \gamma (1-CBI)}{4\omega} \tag{13}
\]

If \( \kappa < \bar{\pi} \) then the minimum utility level from (11) is closer to zero, and hence the equilibrium levels of goal-TR and AC are those in (12). In contrast, if \( \kappa \geq \bar{\pi} \) then \( \hat{TR}^* = 0 \). Substituting these levels into (10) yields the claimed \( \hat{\pi}^*_t \) values, and completes the proof. \( \Box \)

The next proposition summarizes the welfare results of the paper and provides the basis for our key policy recommendations.

**Proposition 7**: (i) EIT, goal-TR, and AC increase social welfare. (ii) Pre-EIT goal-CBI reduces social welfare.

**Proof**: Noting that, \( \forall t, \hat{\pi}^*_t = 0 \), we need to substitute (7) into (3) and differentiate with respect to goal-TR and CBI (using (12) as a constraint in the latter case). Setting equal to zero and rearranging yields

15
\[ \frac{\partial \bar{u}^p}{\partial TR} = \frac{\mu}{(1 + TR)^2} > 0 \quad \text{and} \quad \frac{\partial \bar{u}^p}{\partial CBI} = -\frac{\mu \lambda^0}{\tau \gamma \omega} \left( \frac{\lambda^0 (1 - CBI)}{1 + \lambda^0 (1 - CBI)} \right)^2 < 0 \] (14)

which, by inspection, proves the proposition. \[\square\]

Thus goal-CBI granted in the pre-EIT era becomes socially undesirable in the post-EIT era as a goal-independent banker will not commit to a transparent inflation target. This has been shown above to have several adverse consequences: (i) a higher monitoring cost for the public, (ii) a decreased likelihood of monitoring, (iii) an increased likelihood of regime overriding, (iv) larger magnitude of the output gap (in expectation), (v) a higher probability of a democratic deficit (the disutility of which is not modelled here, but is potentially important).

4 Some Observations of the Empirical Evidence

Our analysis has a number of testable implications. Since our attention has been on the institutional features of monetary policy and the results of Propositions 1-2 do not significantly deviate from conventional wisdom we will focus on the remaining findings.\(^{20}\)

**Effect of goal-CBI (Proposition 3).** The commitment effect on inflation and credibility is in line with empirical findings of Grilli, et al. (1991), Cukierman, et al. (1992), Alesina and Summers (1993), Eijffinger and Schaling (1993), Briault, et al. (1997), and Eijffinger, et al. (1998).\(^{21}\) Furthermore, our analysis points to a possible explanation for the ‘puzzling’ empirical results of Posen (1998), who found CBI to be associated with higher sacrifice ratios – suggesting that controlling for the endogenously driven EIT may be crucial.

**Optimal Delegation (Proposition 4).** In the 1970s-80s some countries have appointed goal-independent central bankers and some have not. The existence of the former group (with US being the prime example) is consistent with the result about the government’s incentive to grant goal-CBI in the pre-EIT world. The existence of the latter group (with the UK as a prime example) provides some evidence for the claim that goal-CBI is often beyond the

\[^{20}\] The undesirable effect of imperfect reputation and/or lacking credibility on policy outcomes and their positive relationship seem uncontroversial, similarly to the gradual reduction of monitoring costs. The effect of the public’s monitoring on the government’s overriding incentives is intuitive.

\[^{21}\] It should be noted that concerns have been expressed over the some of these findings and approaches, e.g. Forder (2000).
government’s immediate control since it is determined by some long-term factors (e.g. Posen (1995), Hayo (1998), and de Jong (2002)).

**Effects of EIT, goal-TR and AC (Proposition 5).** Due to the relationship between EIT and CBI, our analysis implies that empirical findings crucially depend on the choice of the sample - in terms of countries, time frame, dates over which some variables are averaged, and the way CBI (and what type of CBI) is controlled for. This substitutability is likely to explain the contradictory findings of the literature: Wu (2004) and Hyvönen (2004) find inflation targeting to reduce inflation whereas Ball and Sheridan (2003) and Willard (2006) do not – all using the sample of industrial countries. It is however unsurprising that the effect of EIT will be small and/or insignificant in these countries - EIT was only adopted from 1990, by which time most industrial countries had disinflated. Thus EIT is important for keeping inflation low. It is less clear if it is the ideal way of getting inflation down.

This however in no way shows that EIT does not matter. The regime may still, in line with Proposition 5, have the effect of both *keeping* inflation low and *reducing* higher inflation. This is clearly confirmed if emerging and developing countries are included – see e.g. Corbo, et al. (2001). Many of these countries have even used EIT as a disinflation device. In line with this, Debelle (1997) finds inflation targeting to increase the policy’s credibility. Further, our results agree with the theoretical finding in Eijffinger, et al. (2000) and the empirical result by Chortareas, et al. (2002) who show transparency to lower the average rate of inflation. Also, this is consistent with Demertzis and Hughes Hallett (2007) who show average inflation to be unaffected by transparency in the absence of accountability in industrial countries. Likewise, accountability appears to reduce inflation in theory (Walsh (1995), Svensson (1997b), Schaling and Nolan (1998)) as well as in practice (Briault, et al. (1997)).

**Relationship of EIT, goal-TR and AC with Goal-CBI (Proposition 6).** Briault, et al. (1997) was the first paper to present evidence that *goal*-CBI and AC are *negatively* related. Later work, using differently constructed indices for different countries and periods, have confirmed this, de Haan, et al. (1999) and Sousa (2002): Figure 1 is one example (that has the largest sample of the three papers). This is also consistent with the empirical relationship between goal-TR and goal-CBI sketched out in Figure 3.

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22 For completeness, let us mention that in addition to the long-run effects of EIT the literature has identified a number of short-run stabilization effects of EIT. These regard primarily the anchoring effect, e.g. Levin, et al. (2004), Kuttner and Posen (1999), Gürkaynak, et al. (2005), or Libich (2008), and the effect on the volatility of nominal interest rates, e.g. Siklos (2004), Neumann and von Hagen (2002), or Eijffinger and Geraats (2004).
Furthermore, it is supported using the large sample in Fry, et al. (2000) in which the correlation between goal-CBI (item A.5:2) and goal-TR (item A.4:3) is −0.24 among industrial countries. As discussed in the introduction, the goal vs instrument CBI distinction is of crucial importance. This can be seen if we use the same sample and index, Fry, et al. (2000), in which the correlation between instrument-CBI (item A.5:3) and economic-TR (item A.7) in industrial countries is 0.38. This is in contrast to findings of Figures 1 and 3 and lends support to the CBI-cum-TR hypothesis of Geraats (2001) that implies complementarity of instrument-CBI and EIT.

![Transparency vs. Goal-independence](image)

*Figure 3: Source: goal-TR is from Eijffinger and Geraats (2006) for year 1998, goal-CBI from Briault, et al. (1997). The correlation coefficient equals -0.86 (t=-4.46). See Appendix D to H for details on the criteria, scores, and a discussion of the Bundesbank’s 1998 goal-TR score.*

**Inflation in the post-EIT world (Proposition 6).** Industrial countries have had low inflation rates for some time now. This is predicted by the model – these countries meet all the prerequisites of EIT discussed in Section 2.3, and the punishability aversion of their policymakers is arguably close to zero. In contrast, the position of (many) emerging and developing countries seems different because all of the prerequisites for adopting EIT have not been met. As a result: (i) a smaller proportion of these countries have adopted EIT, (ii) they have, on average, less economic-TR (which may indicate the quality of forecasting and
inflation control), and (iii) they still have, on average, higher levels of inflation and inflation variability.23

**Social welfare (Proposition 7).** The superiority of EIT from a welfare point of view is very hard to verify empirically – the popularity of EIT and the fact that no country has ever abandoned the regime only provide indirect evidence. Nevertheless, our conclusion on the inferiority of goal-CBI is supported by recent work – notably papers by Eggertsson and Le Borgne (2003), Hughes Hallett and Weymark (2004), Forder (1998b), and several by Lars Svensson – that cast doubt on the wide-spread belief about the unreserved desirability of CBI. These papers, like ours, imply that while instrument CBI is desirable, goal-CBI is not.

### 5 Summary and Conclusions

The paper attempts to make inferences about the socially optimal institutional design of monetary policy. While the past three decades have witnessed a general trend towards central bank independence (CBI), transparency (TR), accountability (AC), and inflation targeting, there have been striking differences across countries. We propose a simple but comprehensive model in which we explicitly incorporate (and precisely define) all these institutional features, as well as a number of related concepts such as overriding, reputation, credibility and monitoring.

We show that the distinction between instrument and goal CBI elaborated by Debelle and Fischer (1994) is crucial. This is because instrument-CBI is found to complement EIT (it is one of the regime’s prerequisite, i.e. a ‘friend’), but goal-CBI is found to act as a strategic substitute to EIT and hence may be a ‘foe’ to the regime. Our analysis demonstrates why this may be a problem.

First, both goal-CBI and EIT are shown to reduce inflation and enhance credibility. Second, EIT is shown to be socially superior for four reasons: (i) EIT reduces the financial sectors’s monitoring cost through its goal-TR - as argued in Faust and Svensson (2001) and Imperato (2002). (ii) Because of that, EIT makes it more likely that the private sector monitors and hence it reduces the probability of the regime being overridden. (iii) EIT eliminates the democratic deficit, a situation of an independence central banker without a

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23 In terms of (ii), Fry, et al. (2000) show that out of the maximum rating of 10, average economic-TR scores for industrial, emerging and developing countries are 6.9, 5.7, and 5.1 respectively. Nevertheless, the data from transition and developing countries, using this index, support all the main conclusions of our analysis. First, EIT (TR and AC) are found to reduce inflation. Second, the negative correlation between goal-CBI and AC procedures obtains in both groups.
high degree of accountability, see Briault, et al. (1997). (iv) EIT’s incentive structure delivers a low-inflation-high-credibility outcome independently of the central banker’s degree of conservatism or independence. These results imply that an important advantage of EIT is the improvement of the central bank’s ability to communicate with the public.  

As a third step the model shows that EIT may be disliked by the policymaker because the associated AC increases the risk of dismissal/criticism. Therefore, goal-independent central bankers may be less likely to explicitly commit. The potential animosity between goal-CBI and EIT has important implications for optimal design of monetary policy.

The analysis suggests that EIT should be implemented (which includes goal-TR, AC, and instrument-CBI), but goal-CBI should be avoided. Unfortunately, many transition and developing economies have followed the Fed scenario and appointed goal-independent central bankers before EIT was fully established, which may have led to opaque objectives and a democratic deficit.

The analysis however implies two caveats to the above conclusions. First, the beneficial effects of EIT occur under many but not all circumstances. For example, the inflation target must be specified as a long-run objective, i.e. one that only needs to be achieved on average, not every point in time (which would unduly reduce the central bank's flexibility to stabilize the real economy). As another example, the model shows that increases in goal-TR and AC only improve outcomes up to a point, after which further increases lead to no change in steady-state inflation and credibility. Second, the paper has not given an overall evaluation of EIT. More research is required to provide a complete welfare assessment of EIT, especially in light of the current financial turbulences.

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24 The emphasis is however not so much on the details (providing information about shocks and forecasts which has been the focus of most of the literature) but in clarifying what the policy goals are. The need for this sort of communication is reflected in Cecchetti’s (2003) plea in the introduction. The fact that there may be room for improvement is implied by e.g. Goodfriend (2003) who describes the current ‘don’t ask, don’t tell’ situation in the US: ‘Congress doesn’t ask the Fed whether it places a priority on low inflation, and the Fed does not say whether it has such priority’.
References


Appendices

A: Proof of Proposition 1

As overriding is not observable the public forms an expectation of it, \( R^*_t \), and sets inflation expectations rationally

\[
(\pi^*_t) = \pi + \frac{\lambda^g}{2\omega} (1 - CBI(1 - R^*_t))
\]  \hspace{1cm} (15)

Moving forward let us examine the overriding choice. Under \( M_t = 1 \) the public knows the true \( g^T \), i.e. has full information about the opponents’ preferences and can thus perfectly anticipate overriding, \( (R^*_t)^* = R^*_t \). Using this constraint with (2), (9) and (15) yields

\[
\frac{\partial u^g}{\partial R} = -\frac{\lambda^g CBI}{2\omega} (1 - CBI(1 - R_t)) < 0
\]  \hspace{1cm} (16)

This implies that \( R^*_t = 0, \forall g^T \). The public therefore sets \( (R^*_t)^* = 0 \) in (15), leading to \( x^*_t = 0 \) from (1).

B: Proof of Proposition 2

For the public to find it optimal to monitor it is required that

\[
0 \leq u^g(M_t = 0) 
\]

Substituting all of the above results into (3) yields

\[
\theta^g \left( \frac{\lambda^g}{2\omega} (1 - \theta^g) CBI \right) + (1 - \theta^g) \left( \frac{\lambda^g}{2\omega} \theta^g CBI \right) - \frac{\lambda^g}{2\omega} (1 - \theta^g CBI) \leq -\mu - \frac{\lambda^g}{2\omega} (1 - CBI)
\]  \hspace{1cm} (17)

And after rearranging

\[
\bar{m} = \bar{\mu} \leq \frac{\lambda^g}{2\omega} (1 - \theta^g) CBI
\]  \hspace{1cm} (18)

Equation (18) makes clear that if \( \theta^g < 1 \) (condition i) and \( CBI > 0 \) (condition ii), then there exists \( 0 < m(\mu) \leq \bar{m}(\bar{\mu}) \) (condition iii) such that (17) is satisfied. Thus, for a sufficiently small monitoring cost the public’s trade-off is resolved in favour of minimizing the expectation error by costly (but not too costly) monitoring.

C: Proof of Proposition 4

It is evident that propositions 1-2 apply here as well, since their proofs are independent of how \( CBI \) is determined. Using \( M^*_t = 1, R^*_t = (R^*_t)^* = 0 \), substituting (9) and (15) into (2) and differentiating with respect to goal-CBI yields

\[
\frac{\partial u^g}{\partial CBI} = \frac{\lambda^g}{2\omega} > 0
\]  \hspace{1cm} (19)

which implies \( CBI^* = 1 \) in the spirit of Rogoff (1985) and Tinbergen (1954).
D: CBI Index (Sousa, 2002)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERSONAL INDEPENDENCE</strong></td>
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</tr>
<tr>
<td>1. Appointment of the central bank board members</td>
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</tr>
<tr>
<td>2. Mandate duration of more than half of the central bank board members.</td>
<td>1.00</td>
</tr>
<tr>
<td>3. Policymaker (or other fiscal branches representatives) participation at central bank meetings, where monetary decisions are taken.</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>POLITICAL INDEPENDENCE</strong></td>
<td></td>
</tr>
<tr>
<td>4. Ultimate responsibility and authority on monetary policy decisions.</td>
<td>1.00</td>
</tr>
<tr>
<td>5. Price stability</td>
<td>1.00</td>
</tr>
<tr>
<td>6. Banking supervision</td>
<td>1.00</td>
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<tr>
<td>7. Monetary policy instruments</td>
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<tr>
<td><strong>ECONOMIC AND FINANCIAL INDEPENDENCE</strong></td>
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</tr>
<tr>
<td>8. Policymaker financing</td>
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</tr>
<tr>
<td>9. Ownership of the central bank’s (equity) capital</td>
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</tr>
</tbody>
</table>

E: AC Index (Sousa, 2002)

Criteria and methodology of this index is adopted from De Haan et al. (1998). We only use the ‘final responsibility’ component that we believe best proxies the degree of EIT.

<table>
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<td>1. Is the central bank subject of monitoring by Parliament?</td>
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<tr>
<td>2. Has the policymaker (or Parliament) the right to give instruction?</td>
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<tr>
<td>3. Is there some kind of review in the procedure to apply the override mechanism?</td>
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<tr>
<td>4. Has central bank possibility for an appeal in case of an instruction?</td>
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<tr>
<td>5. Can the central bank law be changed by a simple majority in Parliament?</td>
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</tr>
<tr>
<td>6. Is past performance a ground for dismissal of a central bank governor?</td>
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F: Goal-CBI Index (Brialt, Haldane, and King, 1996)

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<tr>
<td>2) Whether more than half the appointments to the central bank board are made independently of the government</td>
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<tr>
<td>3) Whether there are government officials on the board</td>
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<tr>
<td>4) Whether the central bank does in practice set its own goals (for example, monetary or inflation targets).</td>
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G: TR Index (Eijffinger and Geraats, 2006)

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<td>b) Quantitative Targets</td>
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<td>c) Institutional Arrangements</td>
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<td>c) Policy Inclination</td>
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<td>c) Evaluation Policy Outcome</td>
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H: Evaluation Table

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*Assessment is based on situation in January 2002. # Excludes aspect 9 due to missing observations. ^Eijffinger and Geraats (2006) do not provide a value for the Bundesbank for the year 1998. The literature agrees that Bundesbank’s practices were very similar to Swiss National Bank’s (see e.g. Bernanke et al., 1999) and we indeed find all the two countries’ criteria scores to coincide. This is further supported by the fact that in Sousa (2002) and Fry et al. (2000) these two scores coincide (the latter in terms of goal-TR).