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Transparency, democratic accountability, and the economic consequences of monetary institutions

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Abstract

Debates about the appropriate mix between autonomy and accountability of bureaucrats are relevant to numerous areas of government action. I examine whether there is evidence of a tradeoff between transparency, democratic accountability, and the gains from monetary delegation. I begin by presenting a simple theoretical model which suggests that central banks that are transparent, in the sense of publishing their macroeconomic forecasts, will find it easier to acquire a reputation. Despite making central banks more subject to outside scrutiny then, monetary transparency can lead to improved economic outcomes. I also consider arguments about the effect of accountability provisions involving parliamentary oversight and control over central bankers. The paper then uses a new data set to examine these issues empirically, focusing on a natural experiment involving disinflation costs under different central banking institutions during the 1990s. Results suggest that countries with more transparent central banks face lower costs of disinflation while accountability provisions have no clear effect on disinflation costs. My results also concord with earlier findings that the effect of monetary institutions is conditional on other features of the political environment.

1   Introduction

Delegation to "independent" bureaucrats is a central feature of government policy making in many different domains. It can be beneficial when there are gains to be realized from allowing individuals to specialize in a particular area of policy. It can also be useful if politicians would face incentives to act opportunistically if they chose policies directly. This has been the primary argument in favor of central bank independence in recent years.[1] Bureaucratic delegation poses potential problems, however, to the extent that it involves handing power to unelected officials who may themselves face incentives to pursue policies that serve narrow, private goals rather than the interests of the public at large. Those who emphasize the need to guard against this possibility argue for steps to make bureaucratic activities transparent, as well as for provisions to make bureaucrats accountable to elected politicians. The type of transparency I consider in this paper involves public release by bureaucrats of information that they use to make decisions - in the case of central banks this refers to public dissemination of their economic forecasts. I also consider two forms of accountability: requirements for central bankers to appear regularly before legislative committees and possibilities for finance ministers to override decisions regarding interest rates. While many governments in recent years have given their central banks greater legal in-

[1] For a recent review of the political economy of monetary commitments see Bernhard, Broz, and Clark (2002).

dependence as part of an effort to commit to low inflation, there has been considerable variation between countries in which independence has been combined with provisions to make central banks transparent and accountable, and countries where such provisions have been absent. The key issue I address in this article is how transparency and accountability provisions for central banks affect economic outcomes. Do they undermine or do they instead enhance attempts to demonstrate a commitment to a certain policy? As I will argue below, experience with disinflation during the 1990s provides us with a natural experiment for examining this question empirically, because disinflation took place in countries with a variety of different central banking institutions.

If the gains from monetary delegation depend on preserving a central bank's enjoying absolute independence, then transparency and accountability may arguably have a negative impact on economic outcomes. Support for the argument that transparency might limit independence can be found in Max Weber's claim that "every bureaucracy seeks to increase the superiority of the professionally informed by keeping their knowledge and intentions secret."(1946, p.233) More recently, McCubbins, Noll, and Weingast (1987) have argued that administrative procedures like Freedom of Information Act disclosure requirements make it easier for politicians to observe bureaucratic actions and ultimately to impose sanctions.

On the other hand, there are also reasons to believe that monetary transparency might have a positive effect on economic outcomes. Several recent papers have shown how greater transparency in their operating procedures

makes it easier for central banks to build a reputation.[2] Section 2 shows formally why this might be the case. One key implication of the model I present is that if a central bank decides to disinflate, expected inflation should adjust downward more quickly under transparency, implying lower costs in terms of unemployment and lost output. The model also implies that the effect of transparency should be greater under Left governments which place a relatively high weight on output and employment objectives.

In section 2 I also consider, more informally, how accountability provisions might affect the gains from monetary delegation. Keech (1995) suggests that on one level, accountability can involve requirements for bureaucrats to provide explanations of their policy choices, while, on a second level, it can involve opportunities for dismissal or override of bureaucratic decisions. To the extent that the credibility of a monetary policy depends on a central bank having full independence from political control, then one might logically expect that introducing the possibility of a government override will reduce this credibility. In the context of a disinflation, reduced credibility would imply higher unemployment. However, I argue that there are also plausible reasons why accountability provisions might not have this negative effect. This might be particularly true if the establishment of explicit override procedures ensures that attempts to reverse central bank decisions become more visible to the public.

Recent experience provides us with a natural experiment for investigating the relationship between transparency, accountability, and the gains from

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[2]Faust and Svensson (2001) and Geraats (2001). Broz (2002) has also considered the impact of transparency on monetary policy outcomes, though in his case the focus is on transparency of the political system.

monetary delegation. The 1990s was a decade of disinflation both inside and outside the OECD, but disinflation occurred in different institutional contexts across countries. I consider whether costs of disinflation were lower in countries where central banks published their forecasts. I also consider whether costs of disinflation tended to be higher (or lower) in countries in which central banks were required to regularly report to national parliaments, and in countries where the central bank was subject to the possibility of a government override. Data on central bank forecasts, legislative oversight, and override procedures are drawn from a recent survey of central banks compiled by Fry et al. (2000). Using this new cross-country data set, I find no evidence that legislative oversight or possibilities for an override have negative consequences. With regard to transparency, when central banks publish their economic forecasts this appears to actually improve economic outcomes by reducing costs of disinflation. This observed effect of transparency, which is robust to controls for unobserved country effects, is particularly large for left of center governments.

In the remainder of this paper I first present my basic model of monetary policy transparency in section 2 while also considering the effect of accountability provisions on disinflation costs. Section 3 then reviews the data used to measure monetary policy transparency. Section 4 describes the different methods used to estimate costs of disinflation. Section 5 presents estimates of the determinants of disinflation costs. Section 6 concludes.

2 Monetary Institutions and Disinflation

This section considers arguments about the effect of transparency and accountability on the costs of disinflation. I begin by presenting a model which suggests that disinflation costs will be lower when central banks are transparent in the sense of publishing their macroeconomic forecasts. Transparency in forecasting is relevant because central banks have private information about the state of the economy, yet they also have incomplete control of macroeconomic outcomes. This incomplete control creates a potential for moral hazard to the extent that sudden changes in inflation outcomes can be blamed on unexpected economic shocks.[3] I then consider, more informally, whether provisions for legislative oversight and government overrides will alter disinflation costs.

2.1 Transparency

I consider an economy where a policy maker faces a time consistency problem of the sort modelled by Barro and Gordon (1983). The policy maker has a loss function that is quadratic in both output and inflation with b a positive constant that reflects the weight placed on stabilizing output relative to stabilizing inflation. The preferred rate of inflation is normalized to zero, and the preferred rate of output is $y^* + k$ with y^* representing the natural rate

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[3]Other types of transparency, such as publication of voting records of central bank boards, are also undoubtedly relevant for policy outcomes. In the interest of tractability and clarity, I do not consider these additional forms of transparency in this paper.

of output and k a positive constant.

$$L = \frac{1}{2}\pi^2 + \frac{1}{2}b(y - (y^* + k))^2 \qquad (1)$$

In addition, the economy has a standard expectations-augmented supply curve where output depends on the natural rate and on the difference between actual inflation π and expected inflation π^e.

$$y = y^* + \pi - \pi^e \qquad (2)$$

Finally, the inflation outcome depends upon both the rate of money growth chosen by the policy maker m and an exogenous shock to money demand v as in equation 3 below.

$$\pi = m + v \qquad (3)$$

A central bank will normally forecast future shifts in monetary demand, and so the shock can be decomposed into a forecastable component f and an unforecastable component e as in Canzoneri (1985). I assume that f and e are normally distributed, uncorrelated, and mean zero.

$$v = f + e \qquad (4)$$

The key question for transparency is how much information the policy-maker reveals about this forecast to the public. If she reveals no information about the forecast, then the public cannot directly observe the policy maker's

intended inflation rate. It observes the final outcome π, the rate of money growth m, and the velocity shock v, but the public cannot decompose v into f and e. If instead the public perfectly observed the forecast, then it would also perfectly observe the intended inflation rate since it observes, π, m, f, and e. Transparency can thus make policymaker intentions more observable.[4]

I first consider the equilibrium outcome of a one-shot version of this monetary policy game with the following sequence of moves:

1. The public fixes expected inflation π^e

2. The policy maker produces a forecast f of the money demand shock v. If the policy maker is transparent she reveals this forecast to the public

3. The policy maker chooses the rate of money growth m.

4. The money demand shock v is realized.

Given the timing assumed here, in the one-shot game it makes no difference whether the policy maker reveals her forecast, because the public has already fixed expected inflation at Stage 1. As will be shown below, however, forecast publication can have a major impact if the game is repeated and the public is initially uncertain about the policy maker's strategy. In the one shot game, as is true in the standard Barro-Gordon model, if members of the public must fix expected inflation before observing actual inflation, then the

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[4]This effect does not depend upon the policy maker having an informational advantage over the public in forecasting money demand. As long as the policy maker uses a forecast that remains private, the public will be uncertain to what extent observed inflation outcomes derive from policy and to what extent they are affected by shocks that the policy maker failed to anticipate. Likewise, the effect of transparency does not depend on the policy maker being able to forecast money demand with a high degree of accuracy in absolute terms.

politician has an incentive to choose a positive inflation rate that is intended to generate a rate of growth above the natural rate y^*. The problem is that, in equilibrium, the public will anticipate this incentive. The average equilibrium rate of inflation will be bk and the average equilibrium rate of output will be y^* (given that f and e are mean zero).[5]

The literature on monetary policy has considered a variety of mechanisms that might allow a politician to commit to a lower rate of inflation and as a result improve social welfare. One possibility is delegating policy to an independent central banker, who has a lower value of b than does the government. Another possibility occurs if the game is repeated. Then equilibria may exist where politicians "build a reputation" by pursuing a lower inflation rate than bk.

Transparency will be particularly relevant if the game is repeated and the public is initially uncertain whether the policymaker is in fact committed to a low rate of inflation. In the case where a new government is trying to "build a reputation" for sound policy there may be uncertainty whether the government has merely adopted a "fair weather" strategy and will revert to a higher rate of inflation at some subsequent point. Recent contributions in game theory have suggested that it may, in many cases, be more relevant

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[5] The game is solved through backwards induction in the same manner as the standard Barro-Gordon game. The policy maker's preferred rate of inflation is solved for by first substituting equation 2, the supply curve, into her loss function (equation 1). One can then obtain the first order condition of the resulting expression, solve for expected inflation, and for the policy maker's preferred inflation rate $\pi = bk$. Given that the policy maker's expectation of the money demand shock is f, she will then choose a rate of money growth $m = bk - f$ and equilibrium inflation will be $\pi = bk + e$ Given that the public's expectation of f at Stage 1 is 0 (in both the "transparent" or the "non-transparent" cases), the public will set expected inflation $\pi^e = bk$. As a consequence, equilibrium output will be equal to $y^* + e$

to think of reputation in a context where players are uncertain about each other's strategies in this manner, rather than being uncertain about preferences (Fudenberg and Levine, 1992). One might also consider a case where the public is uncertain whether a newly independent central bank is immune from political interference.

To demonstrate the effect of transparency on learning by the public I consider a scenario where the public knows the policy maker's loss function, but it is initially uncertain whether the policy maker is pursuing the "discretionary" rate of inflation consistent with the one-shot version of the Barro-Gordon game, bk, or alternatively, whether the policy maker is committed to pursuing a zero rate of inflation. I assume that members of the public begin with a prior belief p that the intended inflation rate is 0 and a prior belief $(1-p)$ that the intended inflation rate is bk. As a consequence, the public's expected inflation can be expressed as in equation 5.

$$\pi^e = p(0) + (1-p)bk \tag{5}$$

After each period of observed inflation the public will update its prior probability according to Baye's rule as follows where $\overline{\pi}$ represents the policymaker's intended rate of inflation and π represents the actual inflation outcome (remembering that the policymaker has incomplete control). In cases where the policymaker is, in fact, committed to pursuing $\overline{\pi} = 0$ then p

will eventually converge to 1. The question is how quickly this will occur.[6]

$$p_{t+1} = \frac{p \Pr(\pi|\overline{\pi} = 0)}{p \Pr(\pi|\overline{\pi} = 0) + (1-p) \Pr(\pi|\overline{\pi} = bk)} \tag{6}$$

The rate at which the public will update its prior belief p depends directly on the extent to which the policy maker reveals her forecast for the money demand shock. As discussed above, in the extreme case where all members of the public knew the policy maker's exact forecast, then the public would perfectly observe the intended rate of inflation, and after one period they would update to either $p_{t+1} = 1$ or $p_{t+1} = 0$. When the policy maker instead does not reveal all information about her forecast, then the members of the public face a more complicated problem of inference. They must update by judging the likelihood that the observed rate of inflation is drawn from a distribution with mean 0 versus the likelihood that the observed rate of inflation is drawn from a distribution with mean bk.[7] The less information that the public has about the forecast, the more the probabilities $\Pr(\pi|\overline{\pi} = 0)$ and $\Pr(\pi|\overline{\pi} = bk)$ will converge, and as a result the more slowly members of the public will update their priors.

By substituting equation 5 into equation 2 we can see in equation 7 that if the policy maker is in fact committed to pursuing a zero rate of inflation, then

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[6]Fudenberg and Levine (1992) have produced a general result showing that even if players observe actions of other players imperfectly, Bayesian learning will eventually result in their prior belief about other players actions converging to the true state. The same result would also apply in an adaptive learning model of the type surveyed by Evans and Honkapohja (2001).

[7]Given that a policymaker pursuing the discretionary strategy will choose a rate of money growth $m = bk - f$ while a policymaker committed to low inflation will choose a rate of money growth $m = -f$, offsetting the forecastable component of the money demand shock.

in any given period output will be increasing in p. If transparency about the forecast results in swifter convergence to $p = 1$, then this demonstrates that transparency will be associated with higher levels of output. In a context where the policymaker was trying to disinflate, then, transparency would reduce costs of disinflation.[8]

$$y = y^* - (1 - p)bk + e \qquad (7)$$

The model also has a second important observable implication involving the interaction between transparency and partisanship. An increase in transparency should lower the cost of disinflation by a greater amount in countries with "Left" governments that place a relatively higher weight on stabilizing output rather than on stabilizing inflation. Because the value of b will be higher for Left governments - reflecting the greater weight they place on output stabilization - if a Left government is in fact committed to disinflating, then, given equation 7, an increase in transparency which allows p to converge to 1 more quickly will have a greater effect on output than would be the case for a right government that had a lower value of b.

It is worth mentioning that each of the above predictions is contingent on the assumption that the central bank does not lie about its forecast. In an early paper on this subject, Canzoneri (1985) argued that a central bank with a time-consistency problem will face an incentive to dissemble. For example, it might try to downplay the risk of positive exogenous shocks to inflation in order to increase the likelihood that actual inflation would

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[8] Faust and Svensson (2001) and Cukierman and Meltzer (1986) have previously shown that greater ability to observe central bank actions will lower disinflation costs.

be above expected inflation. Goodfriend (1986) argued that this problem can be solved by separating responsibilities within the central bank between those who set monetary policy on one hand, and those who produce the forecast on the other. This seems like a plausible description of central bank operations in most countries, since forecasts tend to be produced by central bank staff economists rather than by the central bank board members who set interest rates. If future career prospects for staff economists depend on them developing a reputation for accurate forecasting, then they might be inclined to resist any encouragement to "massage the numbers". However, in some central banks board members are the ones with final responsibility for making a forecast public, and they retain the option to alter predictions produced by staff economists. Future work might consider in greater detail whether it matters for economic outcomes who makes the forecast public.

2.2 Accountability Provisions

In addition to taking steps to become more transparent, a number of governments during the 1990s clarified or established provisions requiring central bankers to appear regularly before national parliaments, as well as provisions explicitly allowing ministers to override central bank decisions. This section presents alternative hypotheses about the effect of such measures.

A first hypothesis would suggest that accountability provisions will have a negative impact on economic outcomes because they reduce independence of central bankers from political control. Central banks that do not have the final word on monetary policy, because they are formally subject to

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an override, are scored as being less independent on the well-known index of central bank independence developed by Cukierman (1992). The same index does not consider requirements for central bankers to report to national parliaments. These probably pose less of an intrusion on independence than would the threat of an override, but reporting requirements might still have an impact on policy outcomes to the extent they provide legislators with an early warning of central bank policy decisions.

Given the suggestion by a number of authors that independent central banks will be able to disinflate with less cost, it seems logical to ask whether accountability provisions may actually raise costs of disinflation. The idea would be that the public may be skeptical of a disinflation announcement by a bank that is subject to parliamentary control and the risk of an override. The hypothesis that independent central banks face lower costs of disinflation has previously been tested using pre-1990 data. Interestingly, several studies have failed to produce any evidence that central bank independence is associated with lower sacrifice ratios.[9]

In contrast with the above argument, there are also plausible reasons why accountability provisions *may not* have an impact on disinflation costs. It may be the case in some countries that even if governments have the right to override central bank decisions, they will face substantial political costs from

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[9]Authors have attempted to reconcile these findings with existing theory by suggesting that central bank independence may increase credibility while also resulting in a modification in wage-contracting behavior, meaning that the implications of CBI for the sacrifice ratio are ambiguous. In particular, if monetary policy is more credible, then the private sector may begin to sign wage contracts of longer duration, and it may also reduce the degree of indexation in wage contracts. See the discussion in Hutchinson and Walsh (1998). The problem is that it is difficult to test this argument directly given the absence of quality cross-country data on the average length of wage contracts.

doing so. In fact, having an explicit override provision may actually raise the cost of reversing a central bank decision by making such a move more visible to the public.[10]

2.3 Summary

This section has developed an argument that central bank transparency will reduce costs of disinflation while also considering the effect of accountability on disinflation costs. I have suggested that accountability may increase disinflation costs to the extent it implies less independence from political control, but there are also reasons to believe that accountability provisions will not have an impact on disinflation costs. In the following sections I consider these issues empirically.

3 Data on Transparency and Accountability

My data concerning central bank transparency and accountability are taken from a survey of central banks conducted by Fry et al. (2000). The survey is based on responses by central banks to an extensive questionnaire.

3.1 Transparency

Most central banks in the survey report publishing some form of economic forecast (36 of the 44 countries in the sample considered in this paper). However, there is considerable variation in the quantity and quality of information that central banks make public. The survey reports four specific questions

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[10]I would like to thank Charles Goodhart for suggesting this point.

about central bank forecasts (as listed below). Questions 1 and 2 help distinguish between central banks that do not publish a forecast and those which publish a limited forecast such as "inflation will be 2.5% next year". Questions 3 and 4 ask whether a central bank reveals more detailed information about its forecast by discussing the likelihood that its current forecast might prove inaccurate while also discussing past forecast errors.

1. What is the form of publication of forecasts? Is it in words only, or is it also presented formally in terms of numbers?

2. Does the central bank publish forward-looking analysis in standard bulletins and reports on at least an annual basis?

3. Are risks to the forecast published, and if so in what form?

4. Is there a discussion of past forecast errors, and if so is this a standard feature of discussion?

In practice, the responses to the four above questions are highly correlated. As a result, any regression that included all four as explanatory variables would suffer from multicollinearity. This argues in favor of aggregating the four to produce a composite measure of transparency. Rather than simply taking the average of the responses, however, I have arranged the responses to form a Guttman scale where a higher value on the scale is associated with more information being made public by the central bank. Guttman scaling is a technique commonly used by researchers who work with qualitative data. Its major advantage is that unlike an average of several variables, a Guttman

scale constructed from several indicators does not result in a loss of information through aggregation. A Guttman scale is constructed by arranging variables in a sequence such that a positive value for one indicator implies a positive value for all previous variables in the sequence.

To construct a Guttman scale that I will call *forecast transparency*, I have ordered the questions as in the list above. As a result, if the response to question 1 is negative then the scale value is 0. If the response to 1 is positive, but the response to question 2 is negative, then the scale value is 1, etc.[11] A positive response to all four questions results in a scale value of 4. A few of the central banks in the sample do not fit this pattern (for example they discuss past forecast errors but not risks to their forecast). The method of scaling used here would "misrepresent" such a country to the extent that it would be given a value of 2 for *forecast transparency* despite the fact that its central bank received a positive response to question 4. The great advantage of the method, however, is that for the countries that are correctly classified, each value on the scale corresponds to a specific set of practices. So, for example, it would be known that a central bank that received a 2 published a limited forecast together with forward-looking analysis, but it did not publicly discuss risks to its forecast or past forecast errors. A common criterion for judging whether data can be ordered in a Guttman scale is if the "coefficient of reproducibility", defined as $1 -$ (number of errors/total responses) is greater than 0.90 ("errors" are cases where ordering according to a Guttman scale results in a false prediction for a response). The trans-

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[11]This same index has previously been used in Chortareas, Stasavage, and Sterne (2002) to investigate the relationship between forecast transparency and average inflation.

parency data easily satisfy this criterion with a coefficient of reproducibility of 0.96.[12] The scale values for each country in the sample are listed in the appendix.

The resulting *forecast transparency* index is very well suited to testing the hypotheses laid out in the previous section, because higher values on the scale correspond to a central bank releasing more and more precise information about its economic forecasts. It is also worth noting that the index of forecast transparency is uncorrelated with existing indices of central bank independence.

3.2 Accountability

Just as the Fry et al (2000) study shows that there is variation in terms of central bank transparency, there are also differences in the extent to which central banks in different countries are accountable to elected politicians. In 32 of the 44 countries considered for this paper there is a specific requirement for central bank officials to testify before a national parliament on a regular basis. When one considers a sample restricted to the high income OECD countries, a similar proportion appears, 14 countries have provisions

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[12]This method of scaling did result in some loss of information since it made it necessary to transform the responses to each of the four survey questions into binary responses (the responses to the four survey questions were originally given values of $0, 25, 50, 75,$ or 100). However, the most frequent responses to the four questions tended to be 0 or 100. As a result, the information loss was not as great in practice as might be imagined. I preferred to accept the remaining information loss in order to obtain a more theoretically informed measure of transparency. In any case, all results with regard to transparency remained significant when I used a variable based on the average of the responses to the four survey responses, instead of the Guttman scale. Finally, it should also be noted that when included in a regression, the Guttman scale also imposes the assumption that each step on the scale has an equal effect. Of course, simply taking the average of the responses to the above four questions would have imposed a similar assumption.

for parliamentary monitoring of central banks while in the other 8 cases, no such requirement exists. The table in the appendix lists whether there is a parliamentary monitoring requirement for each country in the data set. I later use this as a 0-1 dummy variable called *report to legislature.*

While most countries require their central banks to report to parliament, a smaller number of countries also have provisions for a government override of central bank decisions. The table in the appendix reports whether the central bank law specifically states that the government may override a central bank decision. This is the case for 12 of the 44 countries in my overall sample and for 5 of the 22 central banks within the group of high income OECD countries. I later use these responses as a 0-1 dummy variable entitled *override possibility.* It is interesting to note that all 5 high income OECD central banks that are subject to the possibility of a legal override also score relatively high on the *forecast transparency* index.

4 Measuring Costs of Disinflation

The next step in my inquiry is to consider how the costs of disinflation have varied across countries. The most commonly used measure of the costs of disinflation is the "sacrifice ratio" which is the number of percentage point-years of output or employment lost as a result of a one percent reduction in the annual rate of inflation. There are two common methods of measuring the sacrifice ratio. The first, popularized by Ball (1994), involves manually identifying actual periods of disinflation for individual countries and then calculating the change in the output gap or the unemployment rate over the

period, relative to the change in inflation. With the second method, sacrifice ratios for individual countries are calculated based on time-series estimates of short-run Phillips curves. There are advantages and disadvantages to each of these procedures, and so in this paper I use both.

Ball (1994) proposes a simple method to calculate the sacrifice ratio based on observation of actual disinflation episodes. I follow a slight variation on his method suggested by Andersen and Wascher (1999). For each country this involves first identifying the beginning of a disinflation period as a year in which the change in the CPI was less than the change in the previous year. The end of the disinflation period is identified in a similar manner. The sacrifice ratio is then calculated as the cumulative change in the output gap over the period (calculated using an HP filter), divided by the change in inflation. Alternatively, one can use the cumulative change in the unemployment rate as a substitute for the change in the output gap. While this method makes it feasible to calculate the sacrifice ratio over a brief time period, it depends upon several strong assumptions. In particular, because this method does not control for changes in the natural rate of unemployment, it is possible for the calculated sacrifice ratio to be negative if the natural rate of unemployment declines during the course of the disinflation episode. The table in the appendix provides a list of sacrifice ratios by country using the Ball (1994) method.[13] Using this method within the OECD, France, Spain, Denmark, Germany, Belgium and Austria have relatively high sacrifice ratios, while Norway, the UK, Canada, Sweden, and Ireland have relatively low sacrifice

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[13]In calculating the sacrifice ratio using this method I chose the latest possible disinflation episode during the 1990s in order to maximize the likelihood that disinflation occurred subsequent to the establishment of transparency.

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ratios. It is interesting to note that the latter group scores relatively high in terms of central bank transparency while the former group does not.

For the second method, estimating a short-run Phillips curve, I follow Hutchinson and Walsh (1998) and Andersen and Wascher (1999) who propose empirically estimating equation (8) below, where x_t represents the percentage change in nominal output, and $\left(y_{t-1} - y_{t-1}^*\right)$ represents the lagged deviation of real output from trend output. Following Andersen and Wascher (1999), lagged inflation π_{t-1} is included as a proxy for expected inflation $E_{t-1}(\pi_t)$.[14] Hutchinson and Walsh interpret the lagged output gap term in this equation as correcting for cyclical conditions, and they suggest that if the term $\beta_2 x$ reflects the degree of rigidity of inflation, then the sacrifice ratio can be calculated as $\frac{1-\widehat{\beta_2}}{\widehat{\beta_2}}$.

$$\pi = \beta_0 + \beta_1 \pi_{t-1} + \beta_2 x + \beta_3 (y_{t-1} - y_{t-1}^*) + \varepsilon \tag{8}$$

In estimating equation (8) I used quarterly data over the period 1990-1999. As was the case for the sacrifice ratios calculated using the Ball (1994) method, the results presented in the Appendix show that within the OECD, France, Denmark, Germany, Belgium and Austria have relatively high sacrifice ratios. Overall, the individual country sacrifice ratios estimated from Phillips Curves are highly correlated with the unemployment-based sacrifice ratios calculated using the Ball (1994) method (pairwise correlation coefficient 0.53), though they are not highly correlated with the output gap-

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[14]This implies that all movement in inflation given $t-1$ information is unexpected. Using this proxy is inferior to using micro survey-based data on inflation expectations, but such data are available for only a limited number of countries in my sample for the entire time period considered.

based sacrifice ratios. One advantage of using the short-run Phillips curve estimates is that they provide an indication of how uncertain the estimate is for an individual country. Because of the presence of the lagged output gap term they also control for cyclical conditions in the economy. The potential disadvantage of this method is that it requires quarterly data which are not available for some countries, and in addition it does not focus on individual disinflation episodes. For this reason, in my empirical tests that consider the interaction between transparency and partisanship, I suggest that the sacrifice ratio measures based on actual disinflation episodes are better suited for the necessary test.

5 Estimation Results

Using the alternative measures of the sacrifice ratio, I investigated to what extent costs of disinflation are correlated with different levels of transparency and accountability, while also controlling for other determinants.

5.1 Base Specification

Equation 9 below shows the basic structure of the regressions reported in Tables 1 and 2. In addition to the *forecast transparency* scale, I included the dummy variables *override possibility* and *report to legislature.* I included a measure of the degree of coordination in wage bargaining produced by Nickell et al (2001), based on the idea that wage bargaining coordination may lower the sacrifice ratio by increasing nominal wage flexibility (Calmfors, 2000). I also considered interacting this wage bargaining variable with

central bank independence measures, as well as transforming it to distinguish between countries with low, medium, and high levels of coordination. None of these additional variables were statistically significant, though it should be emphasized that the complex institutional interactions suggested by the CBI/CWB literature are a challenge to estimate with a small sample size.[15] Finally, I included two further controls. I added the initial rate of inflation π_0 when countries began a disinflation period, based on the previous finding that countries with higher initial rates of inflation faced lower costs of disinflation. For the regressions that pooled the high income and middle income countries, I added a *high income* dummy in order to control for unobserved factors that may explain the difference in sacrifice ratios between the two groups of countries. I also considered a number of additional controls including the length of a disinflation episode, a dummy for exchange rate pegs (including EMS membership), a dummy for inflation targeting, several measures of central bank independence, and interactions between CBI, transparency, and accountability. I found none of these additional variables significant.

$$SR = \beta_4 + \beta_5 \text{Transp} + \beta_6 \text{Override} + \beta_7 \text{Report} + \beta_8 \text{Wage} + \beta_9 \pi_0 + \varepsilon \quad (9)$$

Table 1 reports the results of estimates of equation 9 where the dependent variable is the sacrifice ratio measured from actual disinflation episodes. In the high income OECD sample the coefficient on the transparency variable

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[15]See Franzese (2001b) for a review. Also, this literature generally provides predictions about equilibrium levels of output and inflation but not about the rate at which expectations will adjust.

is negative and significant at the 5% level both when using change in unemployment and when using sacrifice ratios based on changes in output. In the broad sample regressions, the coefficient on transparency is again negative and highly significant when using the sacrifice ratio based on changes in unemployment, while it is not significant in the regression using output-based sacrifice ratios. In all four regressions the coefficient on the variable *report to legislature* is not statistically significant. Interestingly, the coefficient on *override possibility* is actually negative and significant in two of the four regressions.

Table 2 reports the results of regressions where the dependent variables are sacrifice ratios estimated from individual country short-run Phillips curves. Since these estimates for individual country sacrifice ratios vary in precision, I used weighted least squares here, weighting each observation according to the inverse of the standard error for the sacrifice ratio estimate. In the high income OECD sample the coefficient on the transparency index is negative but not significant at conventional levels ($p = .13$). In the broad sample the coefficient is negative and significant. In these regressions there is again no evidence that accountability provisions are associated with higher disinflation costs.

The estimates in Tables 1 and 2 provide a strong indication that countries in which central banks are more transparent tend to find disinflation less costly. These results are also substantively significant. Based on the high-income OECD sample regression in Table 1, a 2-point increase in the *forecast transparency* scale would imply that a 1% reduction in inflation could be achieved while sacrificing between 0.4 and 3.3 points less of extra unemploy-

ment over the disinflation period (taking into account the 95% confidence interval). All Table 1 and 2 transparency coefficients were negative and significant after outliers were excluded (identified using alternatively dfbeta values and Cook's distance) and when using robust regression techniques. The accountability results remained unaltered after exclusion of outliers.

5.2   Transparency and Partisanship

As a next step in the inquiry, I investigated whether the effect of transparency is itself contingent on the partisan orientation of the government during a disinflation period. That is, I ask whether the parameter β_5 in equation 9, above, is itself a function of partisan orientation. To do so I estimate an interactive model of the type shown in equation 10, below.

$$
\begin{aligned}
SR = \beta_4 + \beta_5 \text{Transp} + \beta_6 \text{Override} + \beta_7 \text{Report} + \beta_8 \text{wage} \\
+ \beta_9 \pi_0 + \beta_{10} \text{Partisan} + \beta_{11}[\text{Partisan}]\text{x}[\text{Transp}] + \varepsilon
\end{aligned}
\tag{10}
$$

Given that the partisanship index ranges from 0 to 10 with higher values for right-wing governments, the theoretical model developed above predicts that β_{11} will be positive.[16] For a given partisan orientation the combined effect of an increase in transparency (β_{11}Partisan $+\beta_5$) should be negative. As noted above, in order to test the theoretical proposition most directly I restrict attention in these estimates to sacrifice ratios calculated based on a specific disinflationary period. In these cases the variable *partisan* reflects the orientation of government at the beginning of the disinflationary period.

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[16]The partisanship data are based on expert responses to questionnaires and has been compiled by Franzese (2001a).

Table 3 reports my estimates. It should be kept in mind that since these are estimates of an interactive model, the standard error for the estimated effect of transparency must be calculated using both the variance of the individual coefficients on "Transp" and "[Partisan]x[Transp]" as well as their covariance. In the three rows at the bottom of the table I have indicated the estimated effect of an increase in transparency for a Left government whose partisan orientation is one standard deviation to the left of the median (partisan=4.07), for a "centrist" government (partisan=5.61), and finally for a "right" government where partisan orientation is one standard deviation to the right of the median (partisan=7.16). I also show the standard errors for these estimates. For left and centrist governments the predicted effect of increasing transparency is always negative and statistically significant. The results regarding transparency in the first regression of Table 3 remained robust after exclusion of outliers based on dfbeta values. This was not the case, however, for the second regression. Transparency results from both Table 3 regressions remained robust after excluding outliers based on Cook's distance, and when using robust regression. The accountability results were unchanged after exclusion of outliers.

5.3 Changes in Transparency and Disinflation Costs

One obvious question about the cross-sectional results presented here is whether the observed negative correlation between transparency and the sacrifice ratio is attributable to unobserved country effects. For example, it may be that countries like the US and UK, where substantial importance is placed

on transparency in public life, may also tend to be countries that have more "flexible" economies and thus lower sacrifice ratios.

Unfortunately, the survey data in Fry *et al* (2000) only cover procedures in place at one date, and so they cannot be used to examine changes over time. As a preliminary examination, however, I have been able to manually collect data on central bank transparency during the years 1987-89 in order to compare it with levels of transparency reported in the Fry *et al* survey, which took place in 1998. I consulted central bank publications for 21 high income OECD countries for the years 1987-1989 and scored each central bank for each of the four questions about transparency presented in Section 3. I then calculated a Guttman scale for the 1980s for each of the 21 countries. As one would expect, the average level of *forecast transparency* was significantly lower during the 1980s.[17] Finally, I was also able to use the raw data collected for the Cukierman (1992) study in order to examine whether central banks that in 1998 reported being subject to the possibility of a government override were also subject to the possibility of a government override during the 1980s.

Table 4 reports estimates where I took the first difference of the sacrifice ratio ($SR_{1990s} - SR_{1980s}$) and then regressed it on the first difference of each of the explanatory variables used in the Table 1 and Table 2 regressions.

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[17](the mean was 1.05 vs. a mean of 2.76 for the 1990s). The United States and Portugal were the only two countries to have a value of 4 for the 1980s. The following countries had a value of 2: Germany, New Zealand, Ireland, Norway, Canada, Italy, and Finland. All other central banks scored 0. To check the consistency of my manual data collection with the survey results, I also manually collected data for each of the 21 high income OECD central banks for 1998. I found that my own scores for 1998 for each country cohered quite closely to those reported by central banks in the Fry *et al* survey. The one exception here was Italy.

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First differencing the data here is one way of eliminating unobserved country-specific effects that may be biasing the Table 1 and Table 2 estimates. The coefficient on the variable $\Delta Transparency$ is negative and significant in the first two regressions and nearly significant in the third ($p = .14$) These results are quite interesting. Previously, Andersen and Wascher (1999) have observed that, in an environment of low inflation, sacrifice ratios have increased in a number of OECD countries during the 1990s. However, the regressions in Table 4 suggest that holding other factors constant, an increase in transparency during the 1990s would actually be associated with a decrease in the sacrifice ratio. The results reported for transparency in Table 4 also remain robust in fixed effects and pooled estimates and after exclusion of outliers. Because the method used to collect the transparency data was different for each time period, however, I have retained the estimates reported in Tables 1 and 2 as my principal results.

6   Conclusion

Though I have focused in this paper on the specific issue of monetary policy, the theoretical discussion and the empirical tests are also relevant to more general discussions of bureaucratic institutions in a democratic society. Transparency will be a relevant consideration in any area where bureaucrats choose policies based on anticipated outcomes, and where actual outcomes are affected by unanticipated events. If the forecasts upon which policy choices are based remain secret, then the fact that bureaucrats have incomplete control over outcomes creates a potential for moral hazard - the risk

that unelected officials will pursue their own private goals (or those of lobby groups) and that elected politicians will be unable to observe whether this is the case. This problem is not limited to central banking; it is also relevant in areas like environmental protection, food and drug regulation, or any area where bureaucrats choose policies based on anticipated effects.

The most direct way to eliminate problems of moral hazard is to make an agent's behavior more observable. McCubbins, Noll, and Weingast (1987) argue this can be achieved through administrative procedures that require bureaucrats to release information. In the US context such procedures have been embodied in legislation like the Freedom of Information Act. Obliging bureaucrats to be transparent makes it easier to observe their intended outcomes. The potential problem with this sort of transparency, one might argue, is that if it improves the ability of politicians to control bureaucrats, then it may also reduce the benefits of delegation in areas where it is desirable to remove policy decisions from day to day political interference. Monetary policy is one area where the virtues of bureaucratic independence have been emphasized, but the benefits of autonomy have also been stressed for regulatory agencies in domains as diverse as electric power, food and drug certification, and workplace safety. If transparency is combined with accountability provisions that allow politicians to override bureaucratic decisions or easily dismiss agency officials, then socially undesirable outcomes may arguably result.

My theoretical and empirical results suggest that even if transparency does reduce the relative autonomy of bureaucrats, it can still lead to more desirable outcomes because it also improves the ability of the general public

to observe whether bureaucrats are committed to a socially desirable course of policy. In the area of monetary policy, transparency can improve the ability of a central bank to acquire a reputation. My empirical results, which show that transparency is associated with lower disinflation costs while override provisions have no perceptible effect on these costs, suggest that the ability of central banks to convince the public of their commitment to a given policy may depend more on being transparent than on ensuring that central bankers have absolute independence from political interference. Transparency may have a similar effect in different regulatory arenas. As argued by Stiglitz (1998), transparency may allow the public to conclude that a government agency's announced policy is based on expert judgement rather than an unobserved influence from some lobby group. Future research could investigate whether my findings with regard to transparency, accountability, and monetary delegation parallel outcomes observed in other areas of government action.

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Appendix 1: Data on Institutions and Disinflation Costs

	Institutional Measures			Sacrifice Ratios		
	Forecast Transpar-ency	Report to legislature?	Override possible?	Disinflation episode Unemploy-ment	Disinflation episode Output gap	Short-run Phillips Curve Estimate
High Income OECD						
France	0	yes	no	4.3	5.2	4.5
Austria	0	no	no	1.9	4.5	10.2
Denmark	0	no	no	3.8	1.8	11.7
Greece	0	no	no	1.0	0.8	
Germany	2	no	no	2.8	2.8	3.5
Belgium	2	no	no	1.7	-1.9	7.3
Finland	2	yes	no	9.0	1.8	11.1
Spain	2	yes	no	4.3	5.6	1.8
Japan	3	yes	no	0.8	4.1	2.2
Australia	3	yes	yes	-0.1	-0.3	1.9
Switzerland	4	no	no	0.9	1.5	1.1
Italy	4	no	no	0.4	1.2	1.7
Sweden	4	yes	no	-0.6	0.6	7.1
Norway	4	no	yes	0.7	-2.0	5.1
USA	4	yes	no	0.8	3.5	2.7
Ireland	4	yes	no	0.2	-1.3	
Netherlands	4	yes	no	0.9	3.1	4.7
Portugal	4	yes	no	0.8	2.3	1.4
UK	4	yes	yes	0.1	-1.9	2.9
New Zealand	4	yes	yes	0.6	1.4	4.5
Canada	4	yes	yes	0.3	-0.5	-4.5
Other						
Poland	0	no	no	0.9		
Cyprus	0	yes	no	1.6		
Hungary	0	yes	no	-0.3	0.2	
Bahamas	0	yes	no	0.8		
Egypt	1	yes	no	0.9		
Hong Kong	1	yes	no	0.2	-0.3	2.8
Fiji	2	no	yes	-0.4		
Thailand	2	yes	no	0.6	-4.2	
Korea	2	yes	no	0.1	-1.2	6.9
Malaysia	2	yes	yes	-0.2	3.5	
Barbados	2	yes	yes	0.0		
Israel	2	yes	yes	0.0	0.7	1.8
Sri Lanka	2	yes	yes	-0.2		
Malta	2	yes	yes	-0.5		
Mexico	3	yes	no	-0.4	-1.2	2.4
China	3	yes	no	0.0		
Ecuador	3	yes	no	-0.1		
South Africa	3	yes	no	0.4		-1.9
Singapore	4	no	no	0.2	1.2	
Chile	4	no	yes	0.3	0.7	1.5
Czech Rep.	4	yes	no	0.4	1.7	1.8
Slovakia	4	yes	no	-0.4	-0.3	-1.9

Institutional measures from Fry et al. (2000). Sacrifice ratio is output loss from a 1% reduction in inflation. Negative figures imply either a poor estimate (for the Phillips curve estimates) or structural economic changes. See text for a description of estimates and calculations.

Table 1: Transparency, accountability, and the costs of disinflation
(sacrifice ratios calculated from actual disinflation episodes)

	High Income OECD		Broader sample	
	Sacrifice ratio (employment)	Sacrifice ratio (output gap)	Sacrifice ratio (employment)	Sacrifice ratio (output gap)
Forecast transparency	-.931** (.341)	-.666** (.305)	-.464*** (.152)	-.305 (.235)
Override possibility	-1.22 (.920)	-2.84*** (0.78)	-.737*** (.274)	-0.81 (2.80)
Report to legislature	1.05 (1.23)	1.51 (1.02)	-.047 (.547)	.074 (.829)
Wage coordination	-.329 (.529)	-.482 (.824)		
Initial inflation	-.166** (.073)	-.062 (.104)	-.016** (.007)	-.022 (.051)
High Income dummy			1.48*** (.559)	1.35 (1.06)
Constant	5.47*** (1.54)	4.51 (2.78)	1.71*** (.371)	1.32 (1.55)
N=	21	21	44	33
Prob>f	.024	.009	<.001	.305
R^2	0.45	0.45	0.40	0.18

Heteroskedastic consistent standard errors in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels respectively

Table 2: Transparency, accountability, and the costs of disinflation
(sacrifice ratios estimated from short-run Phillips curves)

weighted least squares estimates	High Income OECD	Broader sample
Forecast transparency	-.915 (.565)	-1.04** (.389)
Override possibility	1.05 (1.20)	1.25 (0.90)
Report to legislature	-.784 (1.11)	-1.19 (0.72)
Wage coordination	.506 (.814)	
Initial inflation	-.042 (.152)	-.033 (.084)
High Income dummy		1.67 (1.27)
Constant	5.04* (2.74)	4.93*** (1.40)
N=	19	27
Prob>f	.152	.017
R^2	0.27	0.40

Heteroskedastic consistent standard errors in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels respectively

Table 3: Transparency and partisanship

	Sacrifice ratio (output gap)	Sacrifice ratio (employment)
Forecast transparency	-2.37***	-1.60*
	(0.57)	(0.79)
Partisan orientation	-.801**	-.377
	(.256)	(.274)
Transparency*Partisan	.313***	.123
	(.083)	(.114)
Override possibility	-3.04**	-1.25
	(0.78)	(0.96)
Report to legislature	1.39	0.99
	(1.04)	(1.30)
Wage coordination	-.311	.245
	(.810)	(.580)
Initial inflation	-.030	-.147*
	(.081)	(.070)
Constant	8.42**	7.26***
	(3.14)	(2.38)
Transparency effect for left govt (partisan=4.07)	-1.09***	-1.10**
	(.292)	(0.43)
Transparency effect for centrist govt (partisan=5.61)	-.617**	-.905**
	(.235)	(.356)
Transparency effect for right govt (partisan=7.16)	-.132	-.714*
	(.242)	(.364)
N=	21	21
Prob>f (transp, transp*part)	.004	.065
Prob>f (model)	.001	.107
R^2	0.54	0.47

Heteroskedastic consistent standard errors in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels respectively

Table 4: First-Differenced Estimates (1990s vs. 1980s)

	ΔSacrifice ratio (employment based)	ΔSacrifice ratio (output gap based)	ΔSacrifice ratio (Phillips curve)
ΔTransparency	-.940**	-.680***	-.672
	(.396)	(.246)	(.429)
ΔOverride	-1.99	-.743	-1.53
	(1.71)	(1.68)	(0.94)
ΔCoordination	-1.01	-1.68	-9.18
	(0.74)	(1.10)	(6.54)
ΔInitial inflation	.056	-.006	.129
	(.069)	(.105)	(.135)
Constant	1.89**	1.40	2.66*
	(0.89)	(0.98)	(1.52)
N=	21	21	19
Prob>f	.039	.061	.334
R^2	0.39	0.19	0.17

Heteroskedastic consistent standard errors in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels respectively