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CNB CZECH NATIONAL BANK

RESEARCH AND POLICY NOTES

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Carl E. Walsh

Inflation Targeting and the Role of Real Objectives

Carl E. Walsh*

Abstract

In this paper, I focus on two aspects of central banking – flexibility and transparency – that have been affected by monetary policy debates over the past twenty years. Because criticism of inflation targeting, at least in the United States, often focuses on the claim that an inflation targeting central bank may ignore real economic fluctuations, I direct my comments to the role real objectives play in the design of optimal monetary policy. That is, I focus on how flexible the central bank should be. I argue that, while the recent trend in the academic literature to view central bank objectives as derived from the welfare of the representative agent can be insightful, this perspective is not the only one for thinking about the goals assigned to the central bank. There are reasons why the objectives of a central bank should, potentially, deviate from social welfare, and I will focus on two such reasons; one related to imperfect monitoring and accountability, the other arising from asymmetric information.

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Keywords: Central Banks, Monetary Policy, Inflation Targeting.

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Presented at the CNB/CERGE-EI/CSE seminar on 18 September 2007.

Nontechnical Summary

This paper focuses on two aspects of central banking – flexibility and transparency – that have been affected by monetary policy debates over the past twenty years. Because criticism of inflation targeting, at least in the United States, often focuses on the claim that an inflation targeting central bank may ignore real economic fluctuations, I direct my comments to the role real objectives play in the design of optimal monetary policy. That is, I focus on how flexible the central bank should be.

I will argue that, while the recent trend in the academic literature to view central bank objectives as derived from the welfare of the representative agent can be insightful, this perspective is not the only one for thinking about the goals assigned to the central bank. There are reasons why the objectives of a central bank should, potentially, deviate from social welfare, and I will focus on two such reasons; one related to imperfect monitoring and accountability, the other arising from asymmetric information.

The past twenty-five years have seen tremendous changes in the practice of monetary policy, both in the institutional frameworks within which policy is conducted and in the manner in which it is implemented. While modern central banks are committed to maintaining low and stable inflation, political pressures, uncertainty, measurement problems of both a conceptual and empirical nature, and the lack of formal commitment mechanisms all suggest a reoccurrence of inflation is always possible.

Using a simple model of asymmetric information, I found that the desirability of transparency depended on the nature of the underlying shocks, but whether transparent or not, a conservative central banker (i.e., one who operates with less flexibility) improved welfare by offsetting some of the distortion created by asymmetric information.

Of course, while imperfect monitoring and asymmetric information may affect how flexible a central bank should be, it is important to keep in mind that my discussion presumed that the most important task of a central bank – providing a nominal anchor – was being met.

1. Introduction

In this paper, I will focus on two aspects of central banking – flexibility and transparency – that have been affected by monetary policy debates over the past twenty years. By flexibility, I refer to the ways in which a central bank responds to objectives other than inflation. I have in mind here objectives such as stabilizing the real economy; hence, the role of real objectives in my title. My usage of flexibility is, therefore, what is meant when referring to flexible, as opposed to strict, inflation targeting. I will review what theory has to tell us about how flexible a central bank should be and the ways in which optimal flexibility is affected by how transparent the central bank chooses to be.

Inflation targeting is widely accepted as best practice for a modern central bank today, so my discussion will, by and large, take for granted that we are dealing with an inflation targeting monetary authority. While any monetary policy that credibly establishes a nominal anchor can suffice to control inflation, an announced inflation target is the current anchor of choice. Because criticism of inflation targeting, at least in the United States, often focuses on the claim that an inflation targeting central bank may ignore real economic fluctuations, I direct my comments to the role real objectives play in the design of optimal monetary policy. That is, I focus on how flexible the central bank should be.

I will argue that, while the recent trend in the academic literature to view central bank objectives as derived from the welfare of the representative agent can be insightful, this perspective is not the only one for thinking about the goals assigned to the central bank. There are reasons why the objectives of a central bank should, potentially, deviate from social welfare, and I will focus on two such reasons; one related to imperfect monitoring and accountability, the other arising from asymmetric information.

Before getting to these topics, I first focus on what has been the most profound change in central banking over the past twenty years – the increase in central bank independence.

2. Central Bank Independence

Dating from the passage of the 1989 Reserve Bank Act of New Zealand, the past twenty years have seen a major evolution in monetary policy thinking, an evolution that has stressed the importance of the institutional structure within which policy decisions are made.[1] A primary consequence of this emphasis on institutional structures is that many countries have undergone reforms aimed at increasing the degree of independence exercised by their central banks. These reforms have affected central banks in developed economies and in developing economies.[2]

Empirical studies that discovered an inverse relationship between central bank independence and inflation during the 1970s and 1980s (see Cukierman 1992 and the references he cites) supported the notion that political interference in the conduct of monetary policy produced an inflationary bias. Perhaps more important, however, for the wide acceptance of the desirability of independence was the finding that central bank independence was not associated with greater real volatility or lower economic growth (Alesina and Summers 1993).

[1] I had the good fortune to spend part of 1990 in New Zealand as a Fulbright Research Scholar at the New Zealand Institute for Economic Research, then headed by Alan Bollard who is now the Governor of the Reserve Bank of New Zealand.

[2] See Cukierman (2006) for a discussion of the evolution of central bank independence.

Some quantitative evidence on the trend towards increased central bank independence is provided by Arnone, Laurens, and Segalotto (2006b), who have recently updated an earlier 1991 index of central bank independence due to Grilli, Masciandaro, and Tabellini (1991). Included in their sample are 18 developed economies, 9 emerging market economies, and 4 developing economies. Figure 1 (in Appendix) plots the change in central bank independence, as measured by the standardized index constructed by Arnone, Laurens, and Segalotto (2006b, Appendix, Table 10), against the country's level of central bank independence in 1991-92. The scatter plot provides clear evidence of convergence among these countries.[3] Countries with lower levels of central bank independence in the original index have tended to experience the largest increases in independence over the intervening period.

Central bank independence has several dimensions (Cukierman 1992, Fischer and Debelle 1994). Grilli, Masciandaro, and Tabellini distinguished between political independence and economic independence. Figure 2 shows, for the 18 developed economies, the changes in these two components of independence. For many of them, the major increase in central bank independence was associated with the creation of the European Monetary Union (EMU) and the transfer of monetary policy authority from national central banks to the European Central Bank (ECB). Not surprisingly, countries such as Austria, Belgium, France, Greece, Ireland, Portugal, and Spain show large increases in political independence due to their membership in the EMU.[4]

While the trend has clearly been towards increased independence along both dimensions, not all countries have experienced positive changes. Political independence has fallen for the Reserve Bank of Australia and the Bank of Canada, while the shift of policy authority from the Bundesbank to the ECB reduced economic independence in Germany.[5]

Central bank independence gained popularity as a solution to the high average inflation rates of the 1970s and 1980s. Certainly average rates of inflation have fallen over the past twenty years, first among developed economies and then among developing economies. Figure 3 shows that average inflation began to drop in the 1980s among industrial economies but fell significantly among developing countries only in the past ten years. How much of this success in bringing down inflation should be attributed directly to central bank independence is still an open issue of debate. Campillo and Miron (1997) argued that after controlling for other variables,[6] they find no evidence that the degree of central bank independence mattered. Temple (1998) suggested that this result was heavily influenced by the presence of Iceland in the sample, and that once this outlier is removed, central bank independence is significantly and negatively related to average inflation. More recently, Cecchetti, Hooper, Kasman, Schoenholtz, and Watson (2007) have argued that, at least for the G-7 nations, inflation was brought under control before the advent of reforms designed to increase central bank independence.

Figure 4 plots the change in average inflation between 1970-79 and 1998-2005 against the change in central bank independence between 1991-92 and 2003 as measured by Arnone, Laurens, and Segalotto (2006b). The negative relationship suggests that those countries experi-

[3] The correlation between the change and the 1991-92 level is -0.64.

[4] Among the developed economies, increases in political and economic independence have generally gone together, with the correlation between the change in the two equal to 0.36.

[5] The Reserve Bank of Australia and the Bank of Canada receive a lower score on political independence according to ALS because of a weakening of their relative position in the case of a conflict with the government. The Bundesbank receives a lower economic independence score because of reduced autonomy in setting the discount rate.

[6] Such as a measure of political instability, imports to GDP, income, income per capita, the debt to GDP ratio, and the exchange rate regime.

encing the largest increases in central bank independence also enjoyed the biggest declines in inflation. Regressing the change in inflation on the change in central bank independence yields a large and statistically significant negative coefficient (see row 1, Table 1). To give some context to the magnitude of the coefficient estimate, it implies that the change in the Bank of England's independence would account for just under 3 percentage points of the 10 percentage point drop in average UK inflation over this period. Expressed alternatively, inflation in the UK declined by 10.1% from 1970-79 to 1998-2005, while inflation in the US fell by 4.6%; the increase in the independence of the Bank of England can account for just over half of this difference.

Table 1: Change in inflation and central bank independence
(Developed economies)

		$constant$	$cbi_{02} - cbi_{91}$	π_{70-79}	R^2
1)	$\pi_{98-05} - \pi_{70-79}$	-4.49^{**}	-9.39^{**}		0.32
		(3.65)	(2.78)		
2)	$\pi_{98-05} - \pi_{70-79}$	0.94^{*}	0.59	-0.89^{**}	0.95
		(1.87)	(0.52)	(14.40)	
3)	$\pi_{98-05} - \pi_{70-79}$	0.93^{*}		-0.87^{**}	0.95
		(1.91)		(18.17)	
4)	π_{98-05}	1.61^{**}	1.82^{*}		0.18
		(4.58)	(1.89)		

* Significant at the 10% level. ** Significant at the 5% level.

But does this really provide any evidence that central bank reforms have mattered? Once one controls for a country's average inflation in the earlier period, any impact of central bank reform disappears (see row 2, Table 1). Countries with high inflation in the 1970-79 period experienced the biggest declines in inflation, with no explanatory power attributed to changes in central bank independence. Figure 5 plots the change in central bank independence for the developed economies against the inflation rate during 1970-79, both variables expressed relative to their means. The strong positive association suggests that causality might have run not from central bank independence to inflation but the other way. Countries that experienced relatively high inflation in the 1970s tended to implement reforms that produced the largest gains in central bank independence.

As noted earlier, Cecchetti et-al. argue that central bank reform among the developed economies occurred after the decline in inflation. Most likely, the factors that led to policy actions to reduce inflation also supported the reform of central banks as a means of protecting against the recurrence of inflation. Thus, even if central bank reforms were directly responsible for only a small part of the reduction in inflation, the more interesting and important question is whether, given that we are in a post-reform era, the reforms of the 1990s are sufficient to ensure high inflation will not again become a problem. The relatively mild inflationary consequences of oil price increases in recent years, and the stability of inflation expectations, suggests the post-central bank reform era is a less inflationary one than the pre-reform era, but the degree to which central bank independence is responsible for this is an open question.

To summarize this discussion of central bank independence, inflation was reduced prior to the major central bank reforms among developed economies, the sample of countries on which the primary empirical support for a relationship between the two was based. It is difficult, therefore,

to attribute the drop in inflation to the adoption of central bank independence. The reforms are best seen as a form of insurance, designed to reduce the chances of a return to high inflation. The relatively muted inflationary consequences of oil price increases in recent years offers some, but limited, evidence that the reforms have worked.

3. Flexible Inflation Targeting

Once a central bank has its independence, what should it do? Mervyn King has stated that central banking institutions "are set up explicitly to exercise a degree of discretion, 'constrained discretion,' subject to the broad objective of price stability." (King (2004, p. 5) How does a central bank operate with constrained discretion?

The answer for many central banks is reflected in the wide-spread adoption of inflation targeting. In contrast to independence, which reflects the institutional structure that governs the relationship between the central bank and the government, inflation targeting is primarily an implementation strategy for monetary policy. Figure 6 shows how the number of formal inflation targeters has grown since New Zealand became the first in 1990. While the initial adopters were all industrial economies, the last ten years has seen thirteen emerging market economies join the ranks of the inflation targeters.

Andy Rose has offered an interesting interpretation of inflation targeting as the emerging new international monetary system, one that contrasts significantly with the Bretton Woods system. Table 2, taken from Rose (2006), lists several characteristics of both the Bretton Woods and the current inflation targeting regimes. The contrast between the two systems has led Rose to describe inflation targeting as Bretton Woods reversed. Of particular relevance is the association of inflation targeting with independent but accountable central banks, their high degree of transparency, and the alignment of inflation targeting with current academic research.

Table 2: Rose's comparison of Bretton Woods and Inflation Targeting (Rose 2006)

		Bretton Woods	**Inflation Targeting**
1	Regime durability	Low	High
2	Exchange rate regime	Fixed	Floating
3	Focus of monetary policy	Partly international	Wholly domestic
4	Intermediate target	Exchange rate	None/Inflation forecast
5	Capital mobility	Controlled	Relatively unrestricted
6	Current acc. imbalances	Limited	High
7	System design	Planned	Unplanned
8	International cooperation	Necessary	Not required
9	Role of IMF	Key in principle	Small
10	Role of gold	Key in practice	Negligible
11	Role of US as center	Key in principle	Small
12	Key members	Large, northern	OCED/LDC's, often small
13	Central banks	Dependent, unaccountable	Independent, accountable
14	Transparency	Low	High
15	Alignment with academics	Worrisome	High

But what does it mean to be an inflation targeter? The formal requirements seem to consist of only two: 1) that a target for inflation is formally announced; and 2) that the central bank's policy instrument is adjusted in a manner consistent with achieving the target over some horizon. This is a very minimalist definition of inflation targeting, and the actual details of how policy is conducted can vary significantly among inflation targeters. The key is that the inflation target serves as a nominal anchor (Mishkin and Schmidt-Hebbel 2005) and that the target is formally announced.[7]

While inflation targeting regimes vary, no central bank appears to be a strict targeter, focused on achieving its inflation target regardless of the real consequences. Instead, inflation targeters behave in ways consistent with a concern for both inflation and real economic stability, that is, as so-called flexible inflation targeters.

Actually, judging from the recent academic literature, one might conclude that all central banks are flexible inflation targeters. By that I mean that virtually all the modern academic literature on optimal monetary policy assumes the central bank has instrument independence and operates to minimize a loss function that calls for stabilizing inflation and real economic activity.[8] Typically, this loss function is represented by a simple quadratic of the form

$$L_t = \frac{1}{2}\left[(\pi_t - \pi^*)^2 + \lambda z_t^2\right] \tag{3.1}$$

where π is inflation, π^* is the inflation target (assumed here to be time invariant), and z is a measure of real economic activity, usually some definition of an output gap.

[7] While inflation targeting is widely adopted, Fatás, Mihov, and Rose (2007) suggest that what is critical is having some quantitative goal (inflation, money growth, exchange rate); the exact choice is less important.

[8] Financial stability is also frequently identified as an objective of policy, represented commonly by including a term in interest rate volatility into the loss function.

Because strict inflation targeting is identified with a value of zero for λ, I will use λ as my index of policy flexibility.[9] It is a measure of how important real objectives, in addition to inflation, are in the conduct of monetary policy.

3.1 Where does λ come from?

A major criticism of the literature on the average inflation bias under discretionary monetary policy was that the loss function was ad hoc. No deep theory existed to rationalize its use. Instead, it was justified primarily on pragmatic grounds. The choice of a quadratic function in inflation and an output gap or unemployment rate gap seemed plausible as a representation of central bank preferences and was of great analytical convenience.[10] But where did λ come from?

The use of ad hoc preferences need not, by itself, be a substantive criticism. Part of the division of labor within the social sciences is that, by and large, we as economists take preferences as given, as part of the model environment that we do not try to understand. Understanding the consequences of preferences is our focus. So one could argue that ad hoc preferences are the norm in economics, not just in macroeconomics or in monetary policy analysis.

However, while our assumptions about the preferences of individuals may be ad hoc (psychologists have long criticized the assumptions economists make about preferences), we should at least be consistent in basing policy objectives on these same preferences. So the real objection to the quadratic loss function was that it was never connected to the welfare of the individuals who populate our models.

After first discussing the connection between λ and welfare, I will touch upon two other interpretations of λ.

[9] Before turning to λ, however, it is important to point out that the standard loss function is characterized by two other key aspects in addition to λ. These are π^*, the average inflation target, and z, the definition of real objectives. The determination of both of these has generated much controversy. I will do no more than list five considerations that have dominated the discussions of the optimal average inflation target. These have been 1) Friedman's work on the optimal quantity of money, 2) the costs of inflation in the face of nominal price rigidity, 3) the constraint imposed by the zero lower bound for nominal interest rates, 4) the use of a target range rather than a point target, and 5) the price index (e.g., CPI or GDP deflator, core or headline, include or exclude asset prices) to use in defining π^*.
Specifying z, the real variable the central bank should stabilize, raises both conceptual problems of definition and practical problems of measurement. These issues include 1) the appropriate theoretical definition of the output gap, and 2) the statistically measurement of the gap, including the potential consequences of mismeasuring the gap (Orphanides 2003). The problems of both definition and measurement can easily lead to policy errors. For example, consider what can happen if trend productivity growth increases. Standard measures of the output gap based on empirically estimated trends will not immediately reflect this higher trend growth rate, so as actual output expands, it will appear that a positive output gap has opened. The central bank is likely to engage in policies designed to slow the economy's growth. As a result, output will probably not grow as fast as the new, higher trend growth rate. So the inflation-relevant output gap – the gap between output and the flexible-price output – will actually be negative. The correct policy prescription would be for less contractionary policy.

[10] The standard loss function used in the Barro-Gordon literature, $L = \frac{1}{2}\left[(\pi - \pi^*)^2 + \lambda(x-k)^2\right]$, where x is the output gap (equal to zero in equilibrium) and $k > 0$ is the central bank's desired output gap, can be written as $\frac{1}{2}\left[(\pi - \pi^*)^2 + \lambda x^2 + k^2\right] - \lambda k x$. Thus,minimizing L is equivalent to maximizing $\lambda k x - \frac{1}{2}\left[(\pi - \pi^*)^2 + \lambda x^2\right]$, which implies the central bank wants to reduce inflation volatility and volatility of the true output gap, but it also, through the first term, prefers more output to less.

3.2 As a welfare measure

The most interesting insights into the factors that determine the value of λ have come from the line of research on welfare-based optimal policy initiated by Julio Rotemberg and Mike Woodford (1996). Woodford (2003) derived a second order approximation to the welfare of the representative agent in a new Keynesian model and showed the conditions under which this approximation took a form identical to the ad hoc quadratic loss function. The great contribution of this work was to show how the loss function is related to the underlying structural parameters of the representative agent's utility function and the parameters that characterized the degree of nominal price stickiness. The approach also allows for a direct calculation of the welfare costs of economic fluctuations due to nominal rigidities.

Four interesting consequences follow from this welfare-based approach. First, λ depends on the specific model of nominal rigidities. Most modern models of nominal stickiness incorporate the notion of staggered, overlapping adjustment originally developed by Taylor (1980). With individual firms adjusting in a staggered fashion, inflation generates a dispersion of prices across firms. This dispersion of relative prices is at the core of the efficiency loss associated with inflation variability. However, how costly inflation will be depends on the specific assumptions about how individual firms adjust their prices. For example, with the popular Calvo-type adjustment, there will be some prices that have not adjusted for a very long time. This can create large distortions. As a result, the welfare-based value of λ is smaller under the assumption of Calvo pricing than it is under the assumption of Taylor contracts. Hence, the weight a policy maker should place on real volatility relative to inflation volatility depends on the model one assumes for price adjustment. It will also depend on whether prices are sticky, whether wages are sticky, or whether both are.

Second, uncertainty about the correct model of the economy translates into uncertainty about the correct λ to use in trading off the policy maker's objectives (Levin and Williams 2005, Walsh 2005b, Edge, Laubach, and Williams 2007). If one doesn't know whether prices adjust ala Calvo or ala Taylor, than one doesn't know how much weight to put on real stabilization versus inflation stabilization.

Third, linking economic structure and welfare can cast light on some key policy parameters, showing them to depend on aspects of the economy's structure that would not normally be thought to be relevant. For example, in a benchmark new Keynesian model, the critical parameter that characterizes the central bank's optimal targeting rule is actually independent of the degree of nominal rigidity and instead depends on the degree of imperfect competition in the final goods market. It does so because this is what determines the welfare costs of relative price dispersion that arise with inflation volatility.

A fourth implication of the link between welfare and structural models has to do with the role of policy advisor and policy maker. The traditional separation between the economist who provides projections of output and inflation under alternative policy scenarios and the policy makers who choose among these based on their preferences breaks down. Not only alternative models generate different projections, but the way the outcomes should be weighed differs as well.

At least two potential problems arise in using representative agent models to derive welfare-based policy objectives and that advise caution in adopting this approach. First, there are significant objections to conducting welfare analysis within the context of representative agent

models (Kirman 1992). Since individuals do differ, the representative agent is a stand-in for the aggregate behavior of the individuals in the economy. Even when conditions hold such that one can aggregate the behavior of the individuals so as to obtain a representative agent, it is still possible that misleading conclusions about the welfare ranking of outcomes can be drawn. Examples have been constructed in which the representative agent prefers outcome x to outcome y even though every individual agent in the economy prefers y to x. Policy based on the representative agent would attempt to achieve outcome x, thereby making all individuals in the economy worse off.

Fortunately, it appears that this may not be a significant problem for the class of models commonly used in macro applications. However, even if the aggregation issue is not a serious problem, the artificiality of the representative agent as a foundation for welfare-based monetary policy is particularly apparent in recent new Keynesian models that have incorporated modern theories of unemployment, including some of my own work (Walsh 2003c, 2005a, Ravenna and Walsh 2007).[11] These papers replace the standard Walrasian model in which all labor adjustment occurs on the intensive hours margin with a Mortensen-Pissarides search model of the labor market in which adjustment can also (or exclusively) occur at the extensive employment margin. However, in all these models, there is a representative household consisting of both employed and unemployed members so that there is complete consumption risk sharing. As a consequence, an unemployed worker suffers no consumption loss. If the so-called Hosios condition is met, the matching process is efficient and the welfare costs of fluctuations remain those associated with the inefficient dispersion of prices in the presence of inflation.

Ignoring heterogeneity among individuals and the incompleteness of insurance markets is likely to significantly skew the estimates our models provide of the cost of economic fluctuations. Whether this has important implications for macro policy in general, and monetary policy specifically, is less clear. Social insurance policies rather than macro stabilization polices may be the appropriate response to the absence of the sort of insurance markets commonly assumed in our models. (Costain and Reiter 2005).

3.3 Other roles for λ

The welfare of the representative agent provides a basis for thinking about the value of λ. But this is not the only perspective for thinking about the weight to place on real objectives. Long before Woodford's work, Rogoff (1987) showed how society might prefer a central bank to place more weight on inflation objectives than would be consistent with society's valuation of the inflation-output gap volatility trade off. Such a central banker would fail to deliver the optimal stabilization policy, but she would achieve lower average inflation. Rogoff's justly famous result – that society should appoint conservative central bankers – seemed consistent with the training and attitudes of many central bankers.

With the focus in recent years on commitment policies and the loss function as an approximation to social welfare, the notion that central banks should pursue 'distorted' objectives has lost favor. Yet often the distinction between commitment and discretion in the literature is too sharp. The establishment of formal institutions such as central banks clearly reflects a form of commitment, but as noted previously, Mervyn King has described policy as 'constrained discretion.' And if

[11] Arseneau, and Chugh (2006) analyze optimal capital taxation in a labor search model in which the utility of the unemployed differs from that of the employed, but consumption remains the same across both types.

discretion is still relevant, then it is also still relevant to consider whether we really do want central banks to maximize social welfare.

I want to suggest two additional roles that λ can play, both relevant in the face of imperfect or asymmetric information. One role arises from the need for accountability, the other from the incentive effects that asymmetric information generates. The distortions created by asymmetric information and discretionary policy puts us in the world of the third best, and structuring the central bank's objectives to differ from social welfare may actually be welfare improving.

3.3.1 As a performance measure

Maximizing social welfare is a difficult task, particularly so since it isn't something we can measure. Nor would it be easy even to reach agreement over what it is conceptually. Thus, while we might want a central bank to conduct policy so as to maximize social welfare, how would we really know whether it was doing so or not? It is difficult to enforce accountability when objectives are unobserved.

One factor that clearly does influence social welfare is inflation, and inflation is easy to measure. Inflation targeting can be viewed as defining a performance measure under which the central bank is judged on the basis of inflation outcomes. Of course, the problem in any principal-agent problem in which the agent is judged based on a performance measure that only imperfectly reflects the principal's true objectives (in this case, social welfare) is that the agent may overly focus on undertaking actions that make the performance measure look good, even if the actions are suboptimal from the perspective of achieving the principal's goals.

This is not a situation unique to monetary policy. In the U.S., there is a tremendous debate over the quality of educational achievement and teacher quality. At the same time, there is little agreement over how to measure either. Using student test scores as a performance measure for schools or teachers is common and these do partially measure educational quality. But their use risks having schools teach to the test, thereby potentially sacrificing broader, but harder to measure, educational objectives.

In designing performance measures, the power of the incentive scheme refers to how sensitive the agent's reward is to the performance measure. A high-powered scheme is one in which rewards are very sensitive to the performance measure. A typical problem in designing incentive schemes is to determine the optimal power – if rewards are linked closely to the performance measure, the agent will focus too much on the measurable outcomes to the potential detriment of overall objectives; if rewards are loosely connected to the performance measure, the agent faces little accountability.

A regime of inflation targeting, in which the performance of the central bank is measured by inflation outcomes, can be viewed as establishing an incentive scheme for the central bank. We know social welfare depends upon more than just inflation, and central banks do have effects on the real economy. But the latter are hard to determine and the welfare consequences of real fluctuations are not fully understood. We do observe inflation; we know it affects social welfare, and we know the central bank can control average inflation. Thus, inflation provides a convenient performance measure against which to judge the central bank.

One can interpret some of the criticisms of inflation targeting, particularly in the U.S., where the Federal Reserve has a dual mandate – price stability and maximum sustainable employment

– as reflecting a fear that inflation targeting causes the central bank to focus exclusively (or at least excessively) on inflation, at the cost of real stability – that it leads the central bank to be too inflexible.

What is the optimal power of the incentive scheme for a central bank, when inflation is measurable and other objectives may not be? Should the central bank be assigned a low λ (so that is focuses primarily on its inflation objective) or a high λ (so that it places more weight on non-inflation objectives)? One way to address this question is to imagine a central bank that cares about social welfare but whose performance is judged in terms of its success in achieving an inflation target (Walsh 2003a). It can be shown that the optimal weight for society to attach to achieving the inflation target – i.e., the power of the incentive scheme – depends on the nature of the shocks affecting the economy. And it does so in an intuitive manner.

Suppose fluctuations in the economy arise primarily from the demand side. In this case, times of excessive unemployment are likely to be associated with times in which inflation is below target. So the central bank's actions to achieve its inflation target (an expansionary policy) will be positively correlated with actions to maximize social welfare – a strict inflation targeting regime is called for. In contrast, in an environment in which cost shocks predominate, there will frequently be periods in which the central bank's actions to control inflation will conflict with society's desire for real output stability. In this case, the power of the incentive scheme should be lower so that the central bank does not overly focus on achieving its inflation target.[12]

Accountability and the role of transparency The need to use inflation as a performance measure rather than social welfare only arises because we cannot measure social welfare. Otherwise, we could just tell central bankers to maximize social welfare and boot them out if they don't. But part of holding policy makers accountable requires knowing what they should have done, and that necessitates knowing what information the central bank had available to it when it made its policy decisions.

Thus, transparency is critical if independent central banks are to be accountable.

To return to the example of teacher assessment, more complete information on the teacher's course materials and lesson plans reduces the need to rely heavily on test scores to assess teacher quality. Similarly, greater transparency reduces the optimal power of the incentive scheme and increases optimal central bank flexibility.

3.3.2 As a reaction to asymmetric information

As previously discussed, Rogoff's conservative central bank is a widely known solution for the average inflation bias associated with discretion. In the absence of such a bias, due for example to the central bank's choice of the correct output gap target, discretion still produces a bias in stabilization policy. Clarida, Galí, and Gertler (1999) showed that, if the underlying shocks are serially correlated, this bias would be reduced under a conservative central banker.[13]

[12] This finding is in accord with the microeconomic literature. Baker (1992) showed that with a risk neutral agent and a moral hazard problem, the optimal power of the incentive contract is related to the covariance between the marginal effect of the agent's effort on the performance measure and the marginal effect of the agent's effort on the principal's objective. If the two are positively and highly correlated, than the optimal contract calls for a high powered incentive contract.

[13] Vestin (2006) and Walsh (2004) explore how assigning the central bank objectives that differ from social welfare can improve over pure discretion by leading to some of the inertia in policy that corresponds to the optimal commitment policy.

Clarida, Galí, and Gertler's result suggests that, in discretionary policy regimes, there may be a rationale for appointing central bankers who do not maximize social welfare. I want to pursue that idea and argue that even in the context of serially uncorrelated shocks (so the Clarida, Galí, and Gertler result does not apply), it may be welfare improving to distort the central bank's objectives. The basic idea is that with asymmetric information, policy actions by the central bank have both direct and indirect effects. The latter arise from the informational role policy actions play if the central bank and the public do not share the same information.

Let me illustrate these two effects of policy and how they affect the optimal degree of flexibility by employing an extremely simple model. Then, I will develop some more specific results employing a slightly less simple model.

Consider a standard new Keynesian Phillips Curve of the form

$$\pi_t = \beta E_t \pi_{t+1} + \kappa(\gamma) x_t + e_t$$

where the elasticity of inflation with respect to the output gap, $\kappa(\gamma)$, is a function of γ, the response of policy to cost shocks. The source of this dependence will be derived below, but the basic intuition is that with asymmetric information, the way policy responds to shocks can provide information to the public about the central bank's assessment of the economy, and thereby affect price setting decisions by firms.

Assume that social loss is given by

$$\frac{1}{2} E_t \sum_{i=0}^{\infty} \beta^i \left(\pi_{t+i}^2 + \lambda^S x_{t+i}^2 \right)$$

while the central bank sets policy under discretion to minimize

$$\frac{1}{2} E_t \sum_{i=0}^{\infty} \beta^i \left(\pi_{t+i}^2 + \lambda^{CB} x_{t+i}^2 \right)$$

It is straightforward to show that under the optimal discretionary policy, $x_t = \gamma^d e_t$, where γ^d solves

$$\gamma^d = - \left[\frac{\kappa(\gamma^d)}{\lambda^{CB} + \kappa(\gamma^d)^2} \right]$$

Suppose instead the central bank could commit to a simple rule of the form $x_t = \gamma^c e_t$. The optimal value of γ^c satisfies

$$\gamma^c = - \left[\frac{\kappa(\gamma^c)}{\lambda^S (1+\varepsilon)^{-1} + \kappa(\gamma^c)^2} \right]$$

where ε is the elasticity of κ with respect to γ^c. Comparing the expressions for γ and γ^c, it is apparent that a central bank operating under discretion should be assigned a λ^{CB} of

$$\lambda^{CB} = \frac{\lambda^S}{1+\varepsilon}$$

which will ensure that the same outcomes are obtained as occur under optimal commitment to a simple rule. Thus, the central bank should put less (more) weight on output stabilization than society if and only if

$$\varepsilon > (<)0$$

In other words, if responding more strongly (in absolute value) to stabilize inflation from cost shocks increases the output elasticity of inflation (i.e., if $\varepsilon > 0$), then the central bank should assign less weight to output stability.

The intuition is straightforward. In this sort of model, loss is decreasing in the parameter I have called κ. When κ is large, smaller real output fluctuations are necessary to stabilize inflation. By responding aggressively to cost shocks, κ is increased. But under discretion this effect is ignored, so the central bank does not respond aggressively enough to cost shocks. By instructing the central bank to focus more on inflation stability, policy comes closer to what would be achieved under commitment to a simple rule.

Of course, I have not yet explained why the output elasticity of inflation might depend on how strongly monetary policy reacts to cost shocks, nor why ε might be positive. So let me turn to a slightly richer model to illustrate why this may be the case.

Public information I will build on the notion of public versus private information as analyzed by Morris and Shin (2002). They examine an environment in which agents with idiosyncratic information must forecast a fundamental shock, and they must also forecast what others are forecasting. Into this environment, common information, such as an announcement by the central bank about its forecast of the shock, can have a large impact on what an agent believes about what other agents are forecasting.[14] Agents may overreact to this public information, making the economy more sensitive to any forecast errors in the central bank's information. The possibility of an overreaction to central bank announcements does capture a concern expressed by some policy makers. For example, in discussing the release of FOMC minutes, Janet Yellen, President of the San Francisco Federal Reserve Bank, expressed the view that "Financial markets could misinterpret and overreact to the minutes." (Yellen 2005).[15]

As is well known, the release of information can lead expectations to become more volatile (Geraats 2000). Inflation volatility may increase with greater transparency. If so, there may again be a case for a less flexible inflation targeting regime in which the central bank places greater weight on inflation stability than maximizing social welfare would call for.

I use a model based on a new Keynesian Phillips curve, but I assume the individual firms who are adjusting their price must do so before observing the equilibrium price level or the current realizations of all shocks.[16] Because firms care about their relative price, they must forecast what other firms are doing. I assume the central bank's instrument setting is observed before price setting decisions are made. It thus represents one source of public information. I then ask how announcements about the central bank's forecasts of inflation and the output gap can affect the weight that should be placed on inflation objectives.

[14] Woodford (2003) has investigated the role of higher order expectations in inducing persistent adjustments to monetary shocks in the Lucas-Phelps islands model. See also Hellwig (2002).

[15] However, Svensson (2006) has argued that the Morris-Shin result is not a general one. He shows that in their specific model welfare is increased by more accurate public information in the Morris-Shin model for all but unreasonable parameter values. A similar result is found by Hellwig (2004).

[16] The model is similar to the one I developed in Walsh (2006).

The model The basic model consists of the optimal price setting rule for a firm that adjusts its price, a link between policy actions and output, a specification of the information available to individual firms and the central bank, and an objective that the central bank maximizes under discretion. Individual firms have private but noisy information on aggregate cost and demand shocks, while the central bank has noisy information on these two shocks and on a shock to the efficient level of output.[17]

The fundamental informational issues are two. First, private agents cannot fully observe the information on which policy is based if they only observe the central bank's policy actions. Nor can they fully observe the central bank's information if only the central bank's inflation forecast is announced; in general, both the instrument and the inflation forecast depend on all three signals the bank received. Second, the Morris-Shin effect arises. Each firm will use information provided by the central bank to update its own forecast of the aggregate shocks and its forecast of what it expects other firms to do. Because policy actions and announcements provide information to the public, the central bank's incentives are affected. Hiking interest rates because the bank forecasts a positive demand shock may be misinterpreted as a signal the bank expects a positive cost shock. Because the latter interpretation would cause the public to revise upwards their expectations about inflation, the central bank may react less aggressively to offset demand shocks.

I consider two policy regimes:

1. No announcements (denoted by o)
2. Full transparency (denoted by f).

For each regime, policy is set under discretion and I consider whether social loss is reduced if the central bank's objectives are distorted so as to focus more heavily on its inflation goals – i.e., employing an older terminology, does society benefit from having a conservative central banker? I let τ_k^* denote the optimal extra weight on inflation in regime k. Optimal here is defined as the value that maximizes social welfare.

Results While the model does not in general lend itself to a simple analytical solution, it does so in one interesting case. Suppose firms have perfect information on the aggregate demand and cost shocks. In this case, neither the central bank's policy actions nor its announcements provide any useful information to the public. Because of this, the central bank does not need to worry about how its actions are interpreted, or misinterpreted, by the public. It turns out that the best policy is one in which the central bank does not put extra weight on inflation objectives relative to real stabilization goals, i.e., $\tau_k^* = 0$. This result is independent of the quality of the central bank's information. In that sense, we obtain a type of certainty equivalence that corresponds to the findings of Svensson and Woodford (2002) who investigate the case in which the private sector has perfect and common information while the central bank has imperfect information.

To numerically evaluate the model, standard parameter values of the structural coefficients are employed. These are $\beta = 0.99$, $\omega = 0.75$, $\kappa = 1.8$, and $\lambda = 0.0625$ (corresponding to a value of $\lambda = 1$ if inflation is expressed at annual rates). All results are invariant to proportional changes in the variances of all the shocks, so I normalize by setting σ_s^2 and σ_v^2 equal to 1. Since welfare gap shocks are not standard in basic models, I initially set their variance to 0.0005.

[17] Details of the model and its structure are set out in an appendix available, upon request.

Let me now turn to the effects of information quality on the optimal $\tau^{*\prime}s$ and the relative ranking of the different policy regimes. When private information is imperfect and no longer common across firms, Morris-Shin effects arise. Firms must use their own information and the common information provided by central bank actions and announcements to forecast what other firms are going to do. Figure 7 shows loss, relative to full transparency and $\tau = 0$, under the alternative policies when $\gamma_j^i = 0.8$ and $\gamma_{cb}^i = 0.6$. With $\tau = 0$ so that the central bank shares society's preferences, full transparency dominates. However, a (slightly) lower loss is actually achieved when the central bank puts more weight on inflation stabilization – i.e., it acts as a Rogoff conservative central banker.

Table 3 reports optimal flexibility for different values of the signal to noise ratios. The optimal policy is always to be fully transparency, but to place greater weight on achieving the central bank's inflation objective – transparent under a conservative central banker. As the quality of the private sector's information deteriorates, the Morris-Shin effect is at work and private firms react strongly to central bank announcements. This effect can be limited if the central bank focuses primarily on keeping inflation stable, i.e., by setting $\tau^* > 0$. For a given level of the quality of private sector information, the same effect is at work as the central bank's information improves. This limits the volatility introduced when private agents respond strongly to the relatively accurate public information

Table 3: No welfare gap shocks

			γ_{cb}^i		
			.8	.6	.4
	1	$o = f$	0	0	0
	0.8	o	1.75	0.9	0.75
γ_j^i		f	**1.40**	**0.7**	**0.65**
	0.6	o	4.05	1.95	1.40
		f	**4.60**	**2.35**	**1.35**

Now suppose shocks to the welfare output gap become more important. To be specific, suppose their variance is now $\sigma_u^2 = 0.5$. With three shocks, we can now think of three policies – no announcements, the announcement of an inflation forecast, and full transparency. Figure 8 shows loss as a function of τ under each of these policies. Opaqueness dominates announcements dominates full transparency.

This simple model illustrates an important fact. In discretionary environments with asymmetric information, we should not necessarily charge central banks with maximizing social welfare or with being completely transparent.

3.4 Conclusions

The past twenty-five years have seen tremendous changes in the practice of monetary policy, both in the institutional frameworks within which policy is conducted and in the manner in which it is implemented. While modern central banks are committed to maintaining low and stable inflation, political pressures, uncertainty, measurement problems of both a conceptual and empirical nature, and the lack of formal commitment mechanisms all suggest a reoccurrence of inflation is always possible.

Rogoff (1985) long ago showed how, in the presence of a time-inconsistency problem, society might want the λ in the central bank's loss function to differ from the one appropriate for social loss. His analysis focused on the need to reduce the average inflation bias arising from discretion. However, even in the absence of such a bias, there are reasons the central bank might be structured so that the weight it places on output objectives differs from that of society. I have focused on two reasons – one linked to the need for accountability, one associated with the role of transparency. Both involve the presence of imperfect information in a discretionary environment. While the need for accountability calls for transparency, asymmetric information can affect both optimal transparency and flexibility in ambiguous ways.

Accountability requires some level of transparency so that the success, or failure, of the central bank can be monitored.[18] But an excessive focus on inflation objectives can limit the flexibility of policy in responding to real economic instability. That is the primary objection to formal inflation targeting. Thinking about inflation outcomes as a performance measure, one that is related to social welfare but that provides only an imperfect measure of welfare, provides some insights into the debate over inflation targeting.

Using a simple model of asymmetric information, I found that the desirability of transparency depended on the nature of the underlying shocks, but whether transparent or not, a conservative central banker (i.e., one who operates with less flexibility) improved welfare by offsetting some of the distortion created by asymmetric information.

Of course, while imperfect monitoring and asymmetric information may affect how flexible a central bank should be, it is important to keep in mind that my discussion presumed that the most important task of a central bank – providing a nominal anchor – was being met.

[18] See Walsh (2003a).

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Appendix

Figure 1: Converging Central Bank Independence

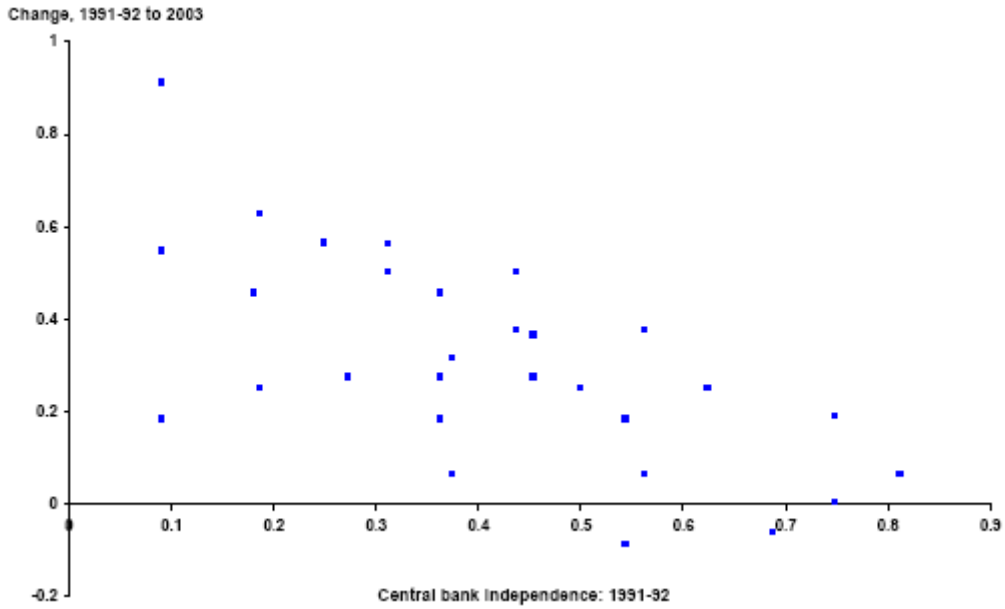


Figure 2: Changes in CBI for Developed Countries

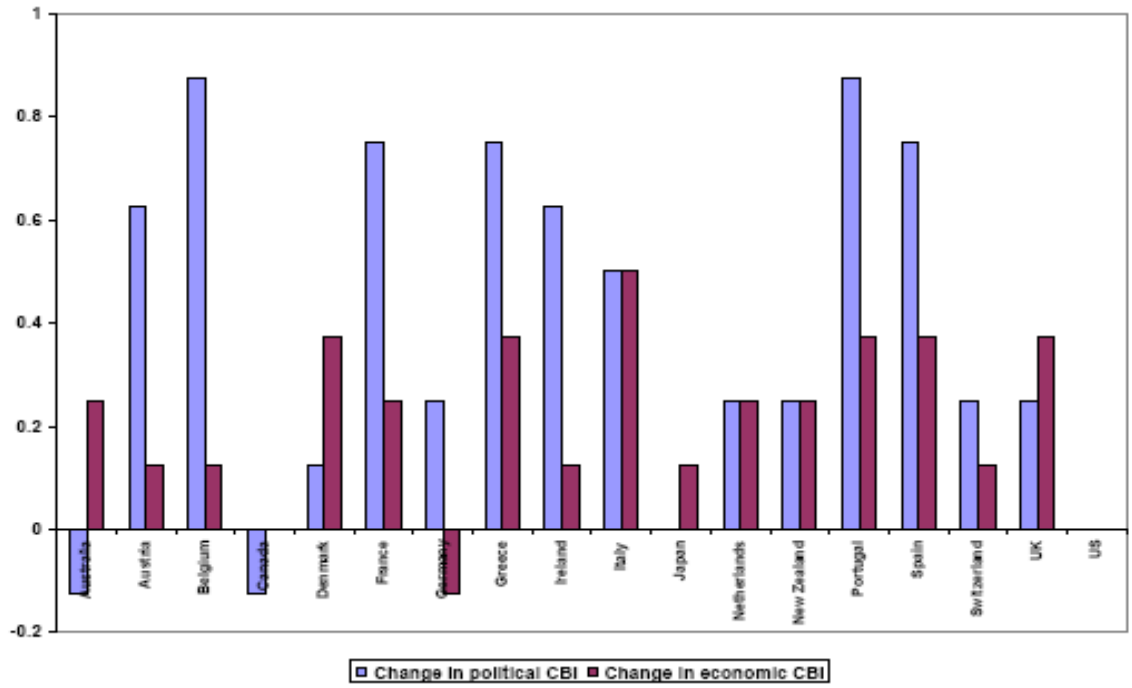


Figure 3: Average Inflation

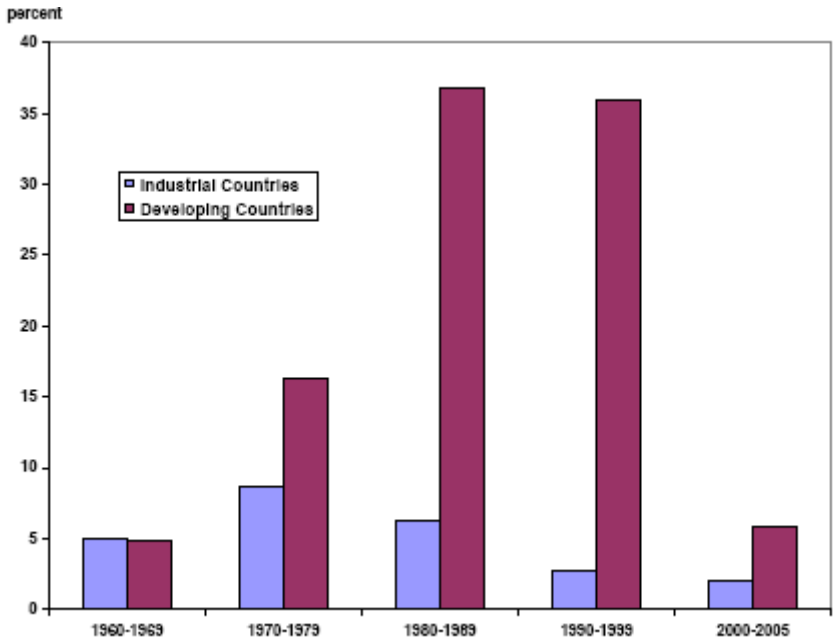


Figure 4: Change in Inflation, 1970-79 to 1998-2005, Versus Change in Central Bank Independence (Developed Economies)

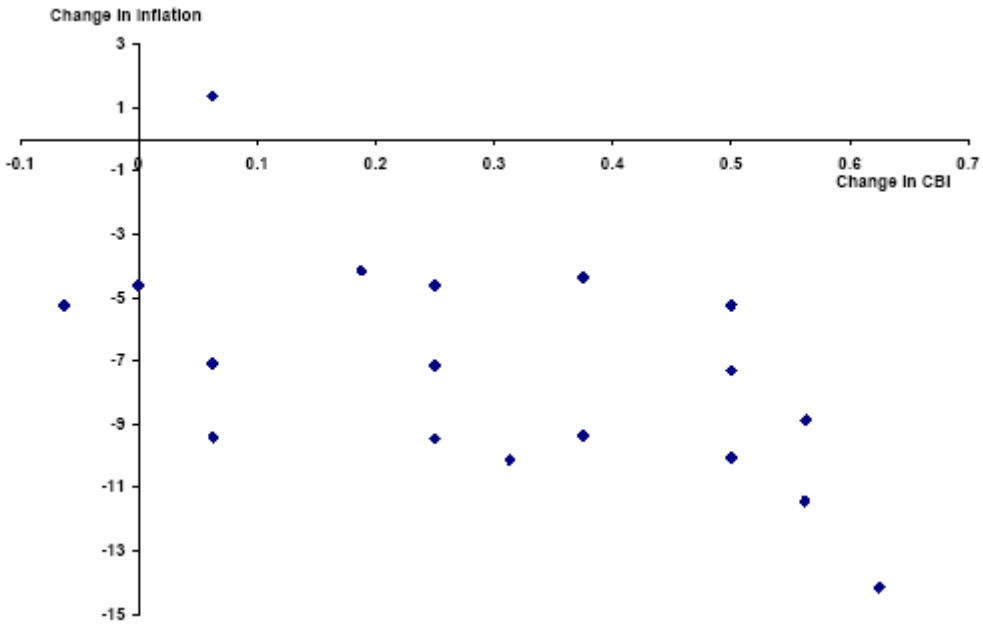


Figure 5: Change in Central Bank Independence

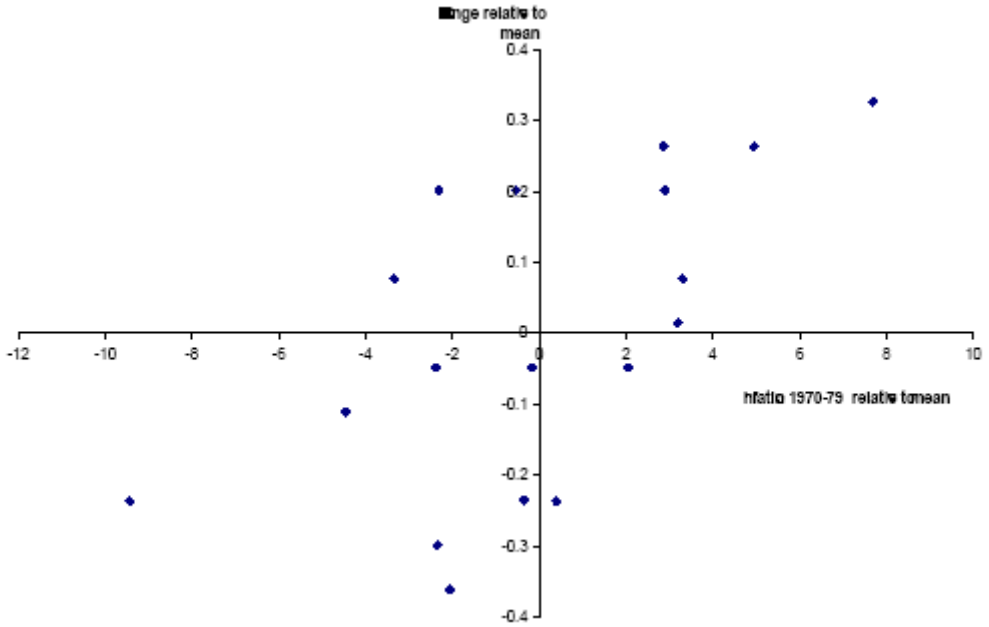


Figure 6: Number of Inflation Targeters (Batini and Laxton 2007)

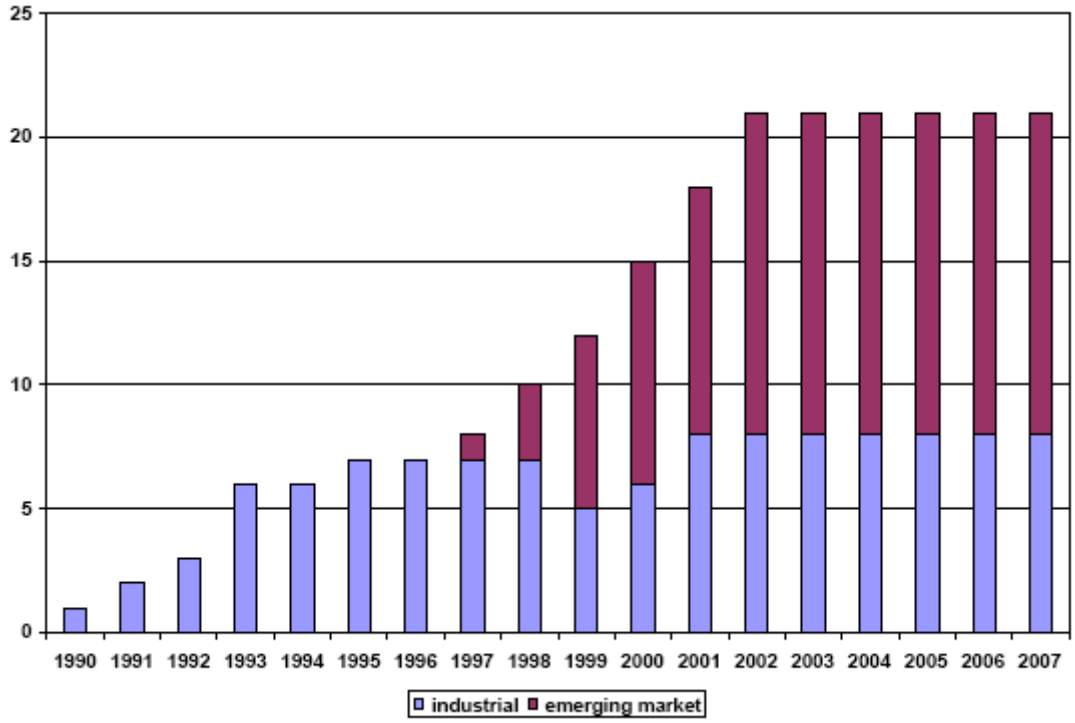


Figure 7: Efects of τ on Loss with only Lost and Demand Shocks

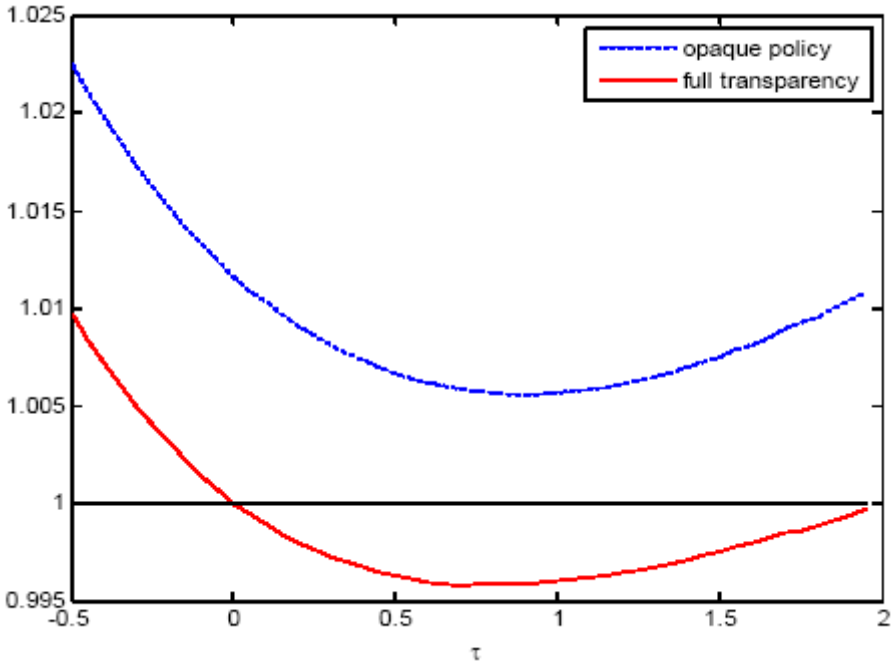
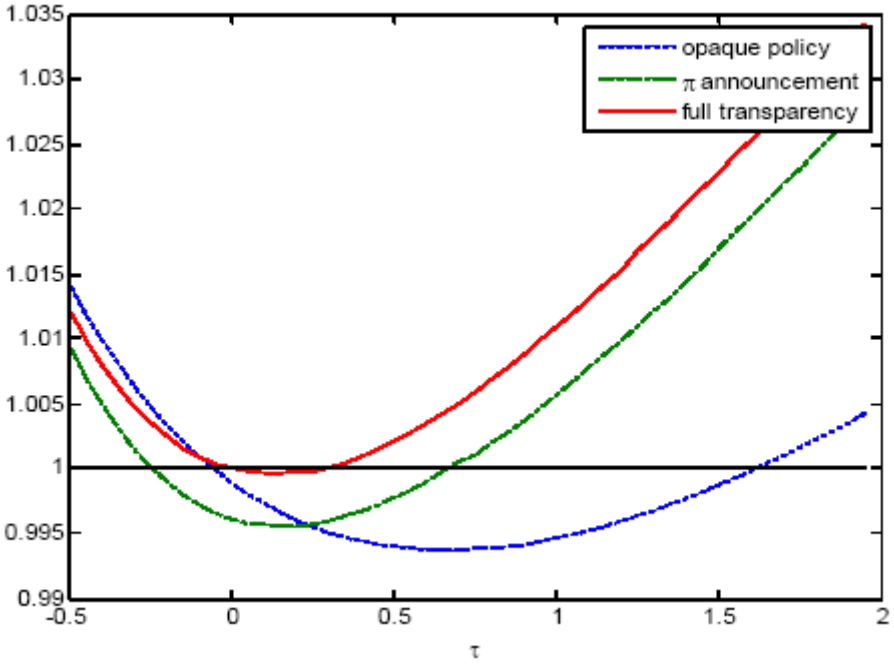


Figure 8: Loss as a Function of τ with All Three Shocks



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