Central Bank Independence and Inflation

by

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B.Ec.(Hons), University of Adelaide (1987)

Submitted to the Department of Economics
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Abstract

This thesis examines the issue of central bank independence and inflation. The first chapter provides a theoretical model of the relationship between the central bank, the government and the economy. The second chapter provides a case study of the effect of recent reforms to the structure of the central banks in New Zealand and Canada, using Australia as a control. The third chapter examines the historical underpinnings of the issues raised in the first two chapters.

The first chapter examines the issue of central bank independence in a model where there is more than one policymaker. It shows that the degree of central bank independence as generally defined in the theoretical literature on central bank independence is only one of the influences on the macroeconomic performance of the economy. The objectives of the fiscal authority, the commitment mechanisms available to the authorities and the nature of the policy game play a key role in determining the inflation rate and output in the economy. Furthermore, the optimal degree of central bank independence is shown to be a function of the preferences and objectives of society. One conclusion that emerges is that providing the central bank with a strong commitment mechanism may generate a socially preferable economic outcome.

The increase in the independence of the Reserve Bank of New Zealand in 1989 was subsequently followed by a fall in inflation to its current level of around 1%. Thus the theoretical implications of the central bank independence literature appear to have been confirmed. However, the similar inflationary experiences of Australia and Canada provide a rare set of controls to determine whether this was the case. This chapter shows that in the short term, the costs of disinflation have not been less in New Zealand than in Australia, and that in Canada, where increased credibility was only supported by rhetoric and not legislation, the costs were higher. However, other concurrent reforms in New Zealand may have clouded the picture and the true test may be the path of inflation in the three countries as the economies recover. Inflationary expectations indicate that New Zealand, and to some extent Canada, are more likely to maintain their low level of inflation in the longer term.

The issue of central bank independence has been discussed since the formation of the first modern central bank in England in 1694. Many of the greatest writers in monetary economics have discussed the issue, from Adam Smith through Thorn-
ton, Bagehot, Fisher, Hawtrey, Keynes and Friedman. As in many other areas of economics, some part of the current debate solely consists of reinventing the wheel, that is rediscovering the issues that have been raised before. The purpose of the third chapter is to provide the historical underpinnings of the discussion of the first two chapters, by summarising the historical literature on central bank independence. In doing so, the hope is to shed light on the current debate including the desire in some parts of the government to change the structure of the Federal Reserve, and the discussion about increasing the independence of the Bank of England.

Thesis Supervisor: Stanley Fischer
Title: Killian Professor of Economics

Thesis Supervisor: Rudiger Dornbusch
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I dedicate this thesis to my mother.

Acknowledgments

Writing this thesis has been like surfing. One minute you are on a great wave, the next minute you've wiped out head first into the sand. But you paddle back out again and catch the next wave, and one day you finally find tube city.

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It's been fun.
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Chapter 1

Central Bank Independence: A Free Lunch?

1.1 Introduction

Central bank independence has emerged at the forefront of political agendas around the world. A significant part of the impetus for increased central bank independence derives from the performance of the German economy under the Bundesbank, but it also comes from the recent theoretical and empirical literature which has highlighted the positive association between lower inflation and increased central bank independence.\(^1\) Furthermore, the empirical results suggest that the improved inflation performance is not at the expense of lower output.\(^2\) That is, increased central bank independence is a free lunch.

The theoretical rationale for increased central bank independence has developed from the time consistency model of Barro and Gordon (1983a,b). However, that model and most of its successors examine the effect of increased central bank independence on inflation and output in isolation from the actions of other policymakers.\(^3\) In effect

\(^1\)For a comprehensive survey of the existing theoretical and empirical literature, see Cukierman 1992


\(^3\)Some exceptions are Sargent and Wallace (1981), Parkin (1986), Alesina and Tabellini (1987), and Masciandaro and Tabellini (1988). Petit (1989) examines the issue in a dynamic model with
the central bank is assumed to be the only policy maker in the economy. However, monetary policy is not conducted in a vacuum, nor is the degree of central bank independence generally exogenous to other policy institutions.

The purpose of this chapter is to explicitly include a separate fiscal authority and examine the interaction between the two authorities in determining the macroeconomic performance of the economy (that is, the levels and variability of inflation and output). The modelling framework used is based on that of Alesina and Tabellini (1987) and considers interactions among three agents: the fiscal authority (government), the monetary authority, and wage setters. The government’s budget financing constraint acts to link the decisions of the Central Bank and the government. The effects of shocks, changing the nature of the policy game and the role of government debt are examined.

The chapter highlights three factors which affect inflation and output in addition to central bank independence (defined in terms of the monetary authority’s inflation preference).

Firstly, the objectives of the fiscal authority play a key role in determining the state of the economy. The monetary authority’s preferences no longer are the sole determining factor.

Secondly, the nature of the policy game affects the level of inflation and output. Unlike other papers which focus on the Nash equilibrium of the policy game, this chapter also examines the Stackelberg equilibria, which may be a more accurate depiction of the actual relationship between central banks and government. If the fiscal authority has the superior commitment technology (is the dominant player in the policy game), then the inflation rate is likely to be higher than if the two players move simultaneously (neither’s commitment is superior). If the monetary authority has the superior commitment technology, whether the inflation rate is higher or lower depends on the preferences of the fiscal authority.

Thirdly, the obligations to repay debt have an influence similar to that discussed in Sargent and Wallace (1981). If the monetary authority is responsible for some

two policymakers and concludes that cooperation between the two is optimal.
of the burden of debt repayment, then a lower bound is placed on its choice of the inflation rate.

These results contrast with the theoretical results that underpin the existing empirical literature.\textsuperscript{4} There, the adoption of the natural rate framework and the Barro-Gordon time consistency framework with only one policymaker guarantee that central bank independence is the only influence on inflation (see Appendix A.2), and that the workers play the dominant role in determining inflation through their choice of the employment target.

The framework in this chapter also allows the determination of the optimal degree of central bank independence (defined as the weight on inflation in the monetary authority's objective function). The optimal level depends on the preferences of the fiscal authority and of society, as well as the nature of the shocks hitting the economy. That is, the choice of central bank type may be a reflection of the underlying preferences of society. Under certain conditions, increased central bank independence, whilst always guaranteeing an improved inflation performance, may make society worse off. Whether or not this is so, depends on the relative weights in the policymakers' and society's objective functions.

The existing empirical results derive much of their significance from the 1970s and the reactions to the two oil price shocks. Accordingly the theoretical implications of the model presented here are tested empirically in the context of the two oil price shocks by contrasting the difference in fiscal institutions in addition to the monetary institutions in the industrial countries.

The following section presents the basic one period model and solves it to determine the equilibrium inflation rate and output level for the economy. It also discusses the determination of the optimal degree of central bank independence and the factors which affect it. Section 1.3 analyses the Stackelberg equilibria when the assumption of simultaneous policy action is removed. Section 1.4 examines the effects of changing the degree of central bank independence and introduces debt into a two period version

\textsuperscript{4}For example Eijffinger and Schalling (1993) only consider the interaction between workers and the central bank.
of the model. Section 1.5 critiques the existing empirical literature while section 1.6 tests the influence of institutional structure on the inflation performance of a number of industrial countries in response to the two oil shocks of the 1970s. Section 1.7 concludes.

1.2 One Period Model

The model is adapted from that in Alesina and Tabellini (1987). It consists of a representative firm and a worker, and two policy institutions: a central bank that chooses the level of inflation, and a fiscal authority that sets (distortionary) taxes and government spending. In this one period version of the model there is no debt. Section 1.3 will introduce debt explicitly. While debt may be issued in the short run, in the long run adjustment must be made to either taxes, government spending or seigniorage to maintain a stable debt/GDP ratio.

Society's loss function or the loss function of a social planner is given by:

\[ V_S = \frac{1}{2} [s_\pi \pi_i^2 + s_x (x_i - x^*)^2 + s_g (g_i - g^*)^2] \]  

(1.1)

This loss function may be interpreted as reflecting the preferences of society or alternatively the average of the political parties or that of the government immediately after an election. It is in contrast to the fiscal authority's loss function in equation (1.3) below. It is relevant in determining the optimal degree of central bank independence in section 1.2.2 below.

The social planner desires to have inflation (\( \pi \)) as close as possible to the target level of zero, and to minimise the deviations of output (\( z \)) and government spending (\( g \)) from their target levels \( z^* \) (full employment) and \( g^* \) respectively. Whether zero is the appropriate inflation target is beyond the scope of this chapter, but see the discussion in Lipsey (1990). Using a target of \( \pi^* \) different from zero does not alter the general conclusion. The targets \( z^* \) and \( g^* \) are those achievable in the presence of non-distortionary taxes. \( s_\pi, s_z \) and \( s_g \) denote the weights that the social planner
places on the various objectives.\textsuperscript{5}

The monetary authority has the following loss function, which it minimises through its choice of inflation.\textsuperscript{6} The monetary authority cares about deviations of inflation from its target level and deviations of output from its target \(x^*\), but not about the level of government spending. This loss function is generally the only one considered in the Barro-Gordon style analysis.

\[
V_M = \frac{1}{2} [\pi_t^2 + \mu(x_t - x^*)^2]
\]

(1.2)

The parameter \(\mu\) denotes the relative weight the central bank places on output compared to inflation. It is generally interpreted as the inverse of the degree of central bank independence and will be used in that context here except where otherwise noted. However, in the empirical literature measures of central bank independence incorporate the financial linkages between the central bank and the government as well as \(\mu\). The framework in this chapter allows these concepts to be distinguished so that the financial linkages reflect the nature of the game and the responsibility for debt, while \(\mu\) solely reflects the weight on inflation in the monetary authority’s loss function.

This (standard) loss function is consistent with the majority of central bank charters which explicitly include inflation and/or output in the objectives of the central bank, but do not refer to government spending. For example, the goal of the Reserve Bank of New Zealand is to “formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices.”\textsuperscript{7} Before the reform in 1989, its objectives were to maximise economic welfare “having regard to the desirability of promoting the highest level of production and trade, and full employment, and of maintaining a stable internal price level.”\textsuperscript{8}

\textsuperscript{5}In Debelle and Fischer (1994) \(s_p\) is set equal to zero. No conclusions are changed, however, some of the results below are more analytically tractable.

\textsuperscript{6}The monetary authority actually controls the money stock, which is assumed to map directly into the inflation rate. See footnote 9.

\textsuperscript{7}Section 8, Reserve Bank Act 1989

\textsuperscript{8}Section 8 (2) Reserve Bank Act 1964.
The fiscal authority is assumed to have the same loss function as the social planner but with different weights ($\delta_\pi$, $\delta_x$ and $\delta_g$) that reflect either political business cycle considerations or the different weights of the different political parties.

$$V_F = \frac{1}{2}[\delta_\pi \pi_t^2 + \delta_x(x_t - x^*)^2 + \delta_g(g_t - g^*)^2]$$  \hspace{1cm} (1.3)

The assumption is that $\delta_x/\delta_\pi > \mu$. That is, the fiscal authority puts relatively more weight on output (less weight on inflation) than the monetary authority, as is observed in practice.

Distortionary taxes $\tau$ are levied on production and are the only form of taxation available to the government.\(^9\) The fiscal authority chooses the level of distortionary taxes which enables it to fund more government spending but creates a cost through the effect on output. An increase in taxation reduces output (which in equilibrium is always below target), thus increasing the loss.

Output is produced by labour $L$ and is subject to a white noise productivity shock $\alpha$:

$$X_t = L^\gamma e^{\alpha_t/2}$$  \hspace{1cm} (1.4)

Workers set the nominal wage $w$ (in logs) to achieve a target real wage $w^*$.\(^{10}\) They choose the nominal wage in advance of the actions of the two policymakers but knowing the objective functions of the policymakers. That is they minimise the objective function:

$$V_W = E[\frac{1}{2}(w_t - p_t - w^*)^2]$$  \hspace{1cm} (1.5)

This implies that workers set a wage $w_t = p_t^e + w^*$.

The representative firm's profit function is given by:

$$PL^\gamma e^{\alpha_t/2}(1 - \tau) - WL$$  \hspace{1cm} (1.6)

Solving for the firm's labour demand, and assuming it can hire the labour it

\(^9\)Analytically, this is the same as a wage income tax.

\(^{10}\) $w^*$ may be explained by efficiency wage theories or an insider/outsider model. See the discussion in Alesina and Tabellini (1987) footnote 5, p621.
demands at the given nominal wage, gives (the log of) output:\textsuperscript{11}

\[ x_t = \alpha(\pi_t - \pi_t^e - \tau_t - w^* + \log \gamma) + \frac{a_t}{2(1 - \gamma)} \]  \hspace{1cm} (1.7)

where \( \alpha = \gamma/(1 - \gamma) \). For algebraic simplicity \( \alpha \) will be set equal to one (that is, \( \gamma = 1/2 \)).

Equation (1.7) illustrates the fact that the general problem of time inconsistency of monetary policy in Barro-Gordon models can be reduced to a lack of non-distortionary taxes.\textsuperscript{12} If there were non-distortionary taxes, the fiscal authority could raise the revenue to enable it to subsidise employment to achieve its output target (which is assumed to differ from that determined in the labour market), while still financing its desired level of government spending. That is it could set \( \tau = -w^* + \log \gamma - \frac{x^*}{\alpha} \) and achieve the target level of output \( x^* \). Given that output (employment) would now be at the desired level, there would be no incentive for the monetary authority to inflate. The economy would thus be at the target level of output with no inflation.

The government budget financing constraint is given by:\textsuperscript{13}

\[ g_t = \tau_t + \pi_t \]  \hspace{1cm} (1.8)

where \( g \) and \( \tau \) are expressed as a ratio to output. That is, government spending can be financed only by taxes and seigniorage. Seigniorage is likely a non-linear function of inflation, but for simplicity has been linearised here.\textsuperscript{14} \textsuperscript{15} One can regard the seigniorage term as incorporating all the means by which the government can raise additional revenue through inflation, such as bracket creep.

\textsuperscript{11}\( \ln(1 - \tau) \) has been approximated by \( -\tau \).
\textsuperscript{12}This was pointed out by Fischer (1980) and Alesina and Tabellini (1987) p620.
\textsuperscript{13}As in Alesina and Tabellini, the following assumptions are made. Money demand is given by \( M_t = P_t + \bar{X} \) where \( \bar{X} \) is independent of \( \tau \). Thus \( \pi_t = m_t - m_{t-1} \). The government financing constraint is \( G_t = \tau_tP_tX_t + M_t - M_{t-1} \) which when divided by nominal income gives \( g_t = \tau + (M_t - M_{t-1})/M_tX_t \) and hence approximates to equation 1.8
\textsuperscript{14}It is also assumed that the economy is on the left hand portion of the seigniorage Laffer curve.
\textsuperscript{15}The seigniorage term may be also interpreted as the ability to inflate away debt.
1.2.1 Nash equilibrium

The monetary authority chooses $\pi_t$ and the government $\tau_t$, taking expectations and each other’s actions as given, after the workers have chosen the wage. Expectations are formed rationally. The reaction functions of the two authorities are:

Monetary:

$$\pi = \frac{\mu}{1 + \mu}(\pi^e + \tau + C - g^* - a) \quad (1.9)$$

Fiscal:

$$\tau = g^* + \frac{\delta_x - \delta_g}{\delta_x + \delta_g} \pi - \frac{\delta_x}{\delta_x + \delta_g} (\pi^e + C - a) \quad (1.10)$$

where $C \equiv (g^* + w^* - log \gamma + x^*)$ is constant and independent of the policy weights.

These equations imply:

$$\pi_t = \frac{\mu \delta_g}{\delta_x + \delta_g + \mu \delta_g} C - \frac{\mu \delta_g}{\delta_x + \delta_g + 2 \mu \delta_g} a_t \quad (1.11)$$

$$x_t = x^* - \frac{\delta_g}{\delta_x + \delta_g + \mu \delta_g} C + \frac{\delta_g}{\delta_x + \delta_g + 2 \mu \delta_g} a_t \quad (1.12)$$

$$g_t = g^* - \frac{\delta_x}{\delta_x + \delta_g + \mu \delta_g} C + \frac{\delta_x}{\delta_x + \delta_g + 2 \mu \delta_g} a_t \quad (1.13)$$

$$\tau_t = g^* - \frac{\mu \delta_g + \delta_x}{\delta_x + \delta_g + \mu \delta_g} C + \frac{\mu \delta_g + \delta_x}{\delta_x + \delta_g + 2 \mu \delta_g} a_t \quad (1.14)$$

The key result is that, in contrast to the existing literature, inflation and output depend not only on the central bank’s weight on output, but also on the fiscal authority’s weights. They also depend on the parameters $x^*$, $g^*$ and $w^*$ which reflect the institutional and political structure of the economy. This suggests that empirical estimates of the relationship between central bank independence and inflation should also control for the fiscal authority’s parameters and other institutional parameters such as the output and spending goals.

The average level of inflation:

$$\bar{\pi} = \frac{\mu \delta_g}{\delta_x + \delta_g + \mu \delta_g} C \quad (1.15)$$
depends positively on the Central Bank’s weight on output, \( \mu \). This is the standard time inconsistency problem: the more weight the central bank places on output, the greater the incentive to create surprise inflation. Since this is perceived by the workers, in equilibrium, there is higher inflation but no gain in output. When the central bank’s weight on output is zero \( (\mu = 0) \), then equilibrium inflation is zero. In that case, the loss function is like that of the Reserve Bank of New Zealand, where the focus is only on price stability.

Inflation depends positively on the spending target \( g^* \), as an increase in the spending target requires more seigniorage financing. Inflation also depends positively on output and wages, as a higher output (employment) target and/or a higher real wage target increase the desire to inflate. It depends negatively on the ratio of the fiscal authority’s weights \( (\delta_x/\delta_g) \). An increased weight on the government spending target means that taxes are increased, thus reducing output and increasing the incentive of the monetary authority to inflate. An increased weight on output means that the fiscal authority reduces taxes to increase output, thus moving output closer to its target and reducing the incentive to inflate.

The average level of output and government spending fall short of their respective targets, reflecting the tradeoff the fiscal authority faces between spending and output. The difference between realised and targetted output is decreasing in \( \mu \), and decreasing in \( \delta_x/\delta_g \). An increase in \( \mu \) means that the central bank places more weight on the output objective, thus inflating the economy more and decreasing the level of distortionary taxes, whilst the opposite applies to the government spending gap. Table 1.1 summarises the influence of the parameters on the economy.

The variance of inflation:

\[
\sigma^2 = \left[ \frac{\mu \delta_g}{\delta_x + \delta_g + 2\mu \delta_g} \right]^2 \sigma_a^2
\]

depends positively on \( \mu \) and negatively on \( \delta_x/\delta_g \).
Table 1.1: Effects of changing the parameters on the economy

<table>
<thead>
<tr>
<th></th>
<th>↑ μ</th>
<th>↑ δ_x</th>
<th>↑ δ_g</th>
<th>↑ x^*</th>
<th>↑ g^*</th>
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<tr>
<td>Inflation</td>
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<td>Output deviation (x - x^*)</td>
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<tr>
<td>Govt spending deviation (g - g^*)</td>
<td>↑</td>
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<td>↓</td>
</tr>
</tbody>
</table>

μ: monetary weight on output  
δ_x: fiscal weight on output  
δ_g: fiscal weight on government spending  
x^*: output target  
g^*: government spending target

The variance of output:

\[
\sigma_x^2 = \left[ \frac{\delta_g}{\delta_x + \delta_g + 2\mu \delta_g} \right]^2 \sigma_a^2 \tag{1.17}
\]

depends negatively on μ and δ_x/δ_g.

The increase in the variance of output when central bank independence is increased reflects the tradeoff between flexibility and commitment highlighted by Rogoff (1985) and Lohmann (1992). When central bank independence is increased to reduce the time consistency problem, the willingness to respond to shocks is decreased.

Inflation and taxation may be positively or negatively correlated. They respond in opposite directions to the productivity shock, but in the same direction to changes in the parameters (g^*, w^*). Optimal tax theory implies that inflation should be positively correlated with the level of other distortionary taxes, as each tax should be set such that the marginal distortion is the same. However, that assumes that the taxes are set by one authority. Here, the inflation tax is set by the monetary authority which has differing objectives. It is continually trying to reduce the amount of seigniorage whereas the fiscal authority always wants a higher level of seigniorage for a given level of government spending. Empirical examination of the relationship between inflation and taxation shows no definitive relationship.\(^{16}\)

\(^{16}\)See Grilli, Masciandaro and Tabellini (1991) who found no systematic relationship across coun-
The general presumption in the literature is that the decline in inflation as a result of increasing central bank independence must always decrease the value of the loss function (except in terms of the loss of flexibility discussed above). However, this relies on the specification of the loss function solely in terms of the central bank’s objectives. Here, although the inflation rate is clearly zero when the central bank is fully independent, society is not necessarily better off in this case. The expected loss in each period is:

\[ E[V_S] = E[\pi^2(s_\pi + \frac{s_x}{\mu^2} + s_g(\frac{\delta_x}{\delta_g\mu})^2)] \]  
\[ = [Var(\pi) + (E[\pi])^2](s_\pi + \frac{s_x}{\mu^2} + s_g(\frac{\delta_x}{\delta_g\mu})^2) \]  

The first term is increasing in \( \mu \); however, the second term is decreasing in \( \mu \), because whilst more central bank independence reduces the level and variance of inflation, it also decreases output and government spending.\(^{17}\)

### 1.2.2 Optimal Central Bank Independence

The optimal structure of the central bank has been discussed since Rogoff (1985) showed that the appointment of a “conservative” central banker can reduce the time consistency problem. Lohmann (1992) extended Rogoff’s analysis to allow for a more optimal tradeoff between credibility and flexibility. Like Rogoff, she argues for the appointment of a more conservative central banker but argues for only partial independence in the sense that the government can override the central bank in response to large shocks. Walsh (1994), Persson and Tabellini (1993) and Lockwood, Miller and Zhang (1993) examine the optimal contract which the government should put in place for the central bank, which includes explicit penalties for inflation.\(^{18}\)

\(^{17}\)This conclusion may be overstated if there are further negative effects of inflation not captured by the specification here. For instance, inflation may have a negative impact on productivity (see Howitt in Lipsey (1990), and Selody (1990)) so that the productivity shock \( a_t \) may be a function of inflation.

\(^{18}\)See also Cukierman 1993.
Once again, in this literature, no separate objective function is specified for the government and the social loss function is assumed to be that of the monetary authority. Here, equation (1.1) is a distinct concept.\(^\text{19}\)

The expected loss, equation (1.19) can then be used to determine the optimal level of central bank independence \(\mu\). Differentiating equation (1.19) with respect to \(\mu\) and setting it equal to zero gives an expression which can be solved for the optimal value of \(\mu\).\(^\text{20}\) While no explicit solution can be obtained for \(\mu\), a number of propositions can be established.

**Proposition:** The optimal degree of central bank independence is

- increasing with society’s weight on inflation.
- decreasing with society’s weight on output.
- decreasing with society’s weight on government spending.

The proof of this proposition is in Appendix A.3.

That is, the more weight that society places on inflation, the more independent a central bank it will desire. Thus the observed differences in central banks across countries may be the result of optimal decisions of societies with different objective functions. As Issing states “it is no coincidence that it is the Germans, with their experience of two hyperinflations in the 20th century, who have opted for an independent central bank which is committed to price stability.”\(^\text{21}\)

### 1.3 Stackleberg equilibria

Thus far, the policymakers have moved simultaneously. This has been the convention in the literature. The Nash structure may be appropriate if we think that the two

\(^{19}\)It can be thought of as the objective function of a newly elected government wishing to structure the central bank to tie the hands of itself and future governments whose objectives are given by the fiscal objective function, equation (1.3).

\(^{20}\)The algebra supporting the conclusions in this section can be found in Appendix A.3.

\(^{21}\)Issing 1993 p18
Authorities have full knowledge of each others actions and reaction functions developed over a long history of playing the policy game. An alternative concept of central bank independence is the degree to which the monetary authority accommodates the fiscal authority's actions. In this section the effect on the equilibrium inflation outcomes and the welfare implications of these Stackelberg equilibria will be examined. Alternatively, the Stackelberg equilibria can be interpreted as reflecting the strength of the commitment technology available to the two authorities.\textsuperscript{22}

If the fiscal authority has the better commitment technology, it can credibly commit itself to a particular policy program regardless of the monetary authorities actions, and thus acts as the leader in the game. Examples of commitment mechanisms include projections of fiscal policy stated in the government's budget statements or legislation such as the Gramm-Rudman Act in the United States. For instance the fiscal projections in Canada for 1989 included a forecast inflation rate of 3% in the projected stance of fiscal policy at odds with the inflation target of 0-2%.\textsuperscript{23}

The assumption of a dominant fiscal authority yields the following inflation rate:

\[
\pi_p = \frac{\delta_g \mu (1 + 2 \mu)}{\delta \pi \mu^2 + \delta x + \delta_g (1 + \mu)(1 + 2 \mu)} C - \frac{\delta_g \mu (1 + 2 \mu)}{\delta \pi \mu^2 + \delta x + \delta_g (1 + \mu)(1 + 2 \mu) + \delta_g (1 + 2 \mu) \mu} a_t
\]

(1.20)

This structure implies that the fiscal authority chooses the level of government spending and the monetary authority chooses the means of finance, that is the split between seigniorage and distortionary taxation. However, unlike the Nash solution, the fiscal authority takes into account the reaction function of the monetary authority to the fiscal authority's choice of \( g \). This equilibrium may be a more appropriate description of fiscal-monetary interactions in practice than the Nash equilibrium.

Alternatively, if the monetary authority has the superior commitment technology then the inflation rate is:

\textsuperscript{22}I am grateful to David Laibson for suggesting this interpretation.
\textsuperscript{23}Johnson (1990)
\[ \pi_M = \frac{2\mu\delta_g^2}{(\delta_x + \delta_g)^2 + 2\mu^2} C - \frac{2\mu\delta_g^2}{(\delta_x + \delta_g)^2 + 4\mu^2} \alpha_t \] (1.21)

Its superior commitment could result because it is separated from the government and its independence is supported by legislation similar to that in New Zealand. Another example of a commitment mechanism for the monetary authority is the adoption of inflation target bands such as in Canada and New Zealand.

We would expect the inflation rate to be higher when the fiscal authority leads than in the Nash equilibrium, and to be lower than in the Nash equilibrium when the monetary authority leads.

\[ \pi_F > \pi_N \iff 2\delta_x > \delta_\mu \] (1.22)

Since the fiscal authority is likely to place more weight on output relative to inflation \((\delta_x/\delta_\mu)\) than the monetary authority \((\mu)\), we expect \(\pi_F > \pi_N\).

\[ \pi_M < \pi_N \iff \delta_x > \delta_g \] (1.23)

Inflation is lower when the monetary authority commits than in the Nash solution, when the fiscal authority's weight on output exceeds its weight on spending. An increase in the fiscal authority's weight on output causes it to raise less distortionary tax revenue due to the adverse effect on output. Thus there is less incentive for the monetary authority to create surprise inflation and output is closer to target, resulting in less equilibrium inflation.

Society's loss functions under the two different scenarios are given by:

Monetary:

\[ E[V_s] = [Var(\pi_M) + (E[\pi_M])^2] \left( \frac{s_\pi}{2\mu^2} \left( \frac{\delta_x + \delta_g}{2} \right)^2 + s_\theta \left( \frac{\delta_x (\delta_x + \delta_g)}{2\mu\delta_g^2} \right)^2 \right) \] (1.24)

\[ ^{24} \text{Both deviations from output and deviations from government spending can be expressed as a linear function of inflation, enabling the following expressions to be obtained.} \]
Fiscal:

\[ E[V_s] = [\text{Var}(\pi_F) + (E[\pi_F])^2](s_\pi + \frac{s_x}{\mu^2} + s_g\left(\frac{\delta_\pi \mu^2 + \delta_x}{\mu \delta_g + 2\mu^2 \delta_g}\right)^2) \]  

(1.25)

We could next ask whether it is better, from the viewpoint of society, for the central bank to be a Stackelberg leader. Comparing the expected value of the social loss function when the central bank is a Stackelberg leader with its value at the Nash equilibrium and setting \( s_g = 0 \), we find that the loss function is smaller (i.e. society is better off) when the central bank leads if condition (1.23) above holds and if \( \delta_g < 1 \) and \( \delta_g + \delta_x < 2 \). Thus provided the fiscal authority weights output losses at the margin more heavily than government spending increases, and does not place a very high weight on output and government spending, it is better from a social viewpoint for the central bank to lead.

This result can be interpreted as stating that it is better for the central bank to precommit to an inflation path than to move simultaneously with the fiscal authority, provided that the fiscal authority will not impose excessively distortionary taxes in order to finance desired government. This is not a ringing endorsement for monetary precommitment: monetary precommitment can be expensive if the fiscal authority is not responsible.

Society is always better off in the Nash equilibrium than if the fiscal authority leads provided condition (1.22) holds, that is provided the central bank is more inflation averse than the fiscal authority. Thus independence of the central bank, in the sense that it is not required to finance a predetermined deficit, is desirable in this model.

If the central bank is exceptionally weak, the fiscal authority may be able to force it to finance a pre-specified deficit. In this fiscal domination equilibrium, the fiscal authority in effect sets \( g \), \( \tau \), and \( \pi \), and the central bank is a cipher. If this happens,

\[ \text{The conditions with } s_g \neq 0 \text{ are similar but not as clean.} \]

\[ \text{This is a sufficient condition for society to be better off when the central bank is a Stackelberg leader. Note that the normalization in the loss functions is that the weight on inflation in the central bank's loss function is one. Further, it is assumed through the budget constraint (10) that one unit of } g \text{ can be financed with one unit of inflation.} \]

\[ \text{It is also likely that the fiscal authority is better off in this equilibrium. A sufficient condition is } \delta_e > 2\delta_g. \]

\[ \text{This is a sufficient condition.} \]
it appears likely that the inflation rate is higher than in the Nash equilibrium, and social welfare is lower.\textsuperscript{29} This means that the Stackelberg equilibrium in which the monetary authority leads is preferable to fiscal domination.

Thus the nature of the policy game, in terms of the commitment technology available to the two participants, has a significant effect on the inflationary outcome, in addition to the weights of the policymakers.

1.4 Two Period Model

The first part of this section examines the costs of increasing the degree of central bank independence (lowering $\mu$). The second part of the section introduces government debt and shows that the outcome depends on the assumption as to which authority is forced to repay the debt.

1.4.1 Costs of Increased central bank independence

The recent experiences of the New Zealand and Canadian economies provide examples where the degree of central bank independence was increased. This section will highlight factors which affect the costs of this adjustment.

Assume that the degree of central bank independence is increased from period 1 to period 2 so that $\mu_1 > \mu_2$. Assume that the workers either are not informed of this decision or that alternatively they do not find the announcement credible until they have observed the central bank acting with increased independence for one period. Thus workers form their inflationary expectations assuming that $\mu = \mu_1$ in both periods. The two periods may be thought of as steady states across which the value of central bank independence changes.

Assuming the Nash solution, society’s loss function in the baseline case where the level of central bank independence remains unchanged is given by:

\textsuperscript{29}That is, this result holds for all but unusual parameter values.
First period:

\[(\pi^e + \mathcal{O})^2(\delta_g + \delta_x + 2\mu_1\delta_g)^{-2}(s_\pi(\mu_1\delta_g)2)^2 + s_x\delta_g^2 + s_g\delta_x^2)\]  (1.26)

Second period:

\[\theta SC^2(\delta_g + \delta_x + \mu_1\delta_g)^{-2}(s_\pi(\mu_1\delta_g)2)^2 + s_x\delta_g^2 + s_g\delta_x^2)\]  (1.27)

The loss function when the level of central bank independence is increased is given by:

First period:

\[(\pi^e + \mathcal{O})^2(\delta_g + \delta_x + 2\mu_2\delta_g)^{-2}(s_\pi(\mu_2\delta_g)2)^2 + s_x\delta_g^2 + s_g\delta_x^2)\]  (1.28)

Second period:

\[\theta SC^2(\delta_g + \delta_x + \mu_2\delta_g)^{-2}(s_\pi(\mu_2\delta_g)2)^2 + s_x\delta_g^2 + s_g\delta_x^2)\]  (1.29)

Note that \(\pi^e\) in equations (1.26) and (1.28) is the same as the workers do not anticipate or believe the change in \(\mu\).

The differences in the loss functions between the two cases result from:

a) The higher inflation in both the first and second period in the baseline case due to the lower level of central bank independence.

This is offset by

b) lower output in the case where central bank independence increases, due both to the lower value of \(\mu\) and also due to the expectational errors in the first period which reduce output (so that \(\pi - \pi^e \leq 0\)). The latter effect corresponds to the deflationary period when the monetary authority needs to establish its credibility. This effect would not be present if the change were credible, however, the lower output because of the lower value of \(\mu\) would still be present. Different degrees of credibility could be captured by values of \(\mu\) on the interval \([\mu_2, \mu_1]\). The more credible the monetary
authority, that is the closer the workers’ perception of \( \mu \) to \( \mu_2 \), the lower is this element of the cost.

and c) a larger shortfall in government spending than in the baseline, also due to the lower value of \( \mu \).

Note that there are no gains in output associated with the improved inflation performance. Once again, this is because there is no direct effect of inflation on productivity and hence output; all the costs of inflation are captured in the first term of the loss function.

Whether society is better off depends on the magnitudes of the various parameters. In particular, the size of the reduction in \( \mu \) and the weight on the inflation objective \( s_\pi \) play important roles. If \( s_\pi \) is higher and also if the government has low weights on spending and/or output, then the loss is smaller. The adjustment costs of instituting a more inflation-averse central bank are less, the more society cares about inflation. That is, there is more incentive to institute a more independent central bank in an inflation-averse society. The key determinant of the transition cost is the beliefs about the \( \mu \). The larger the discrepancy between the workers’ expectation of \( \mu \) and its true value, the larger the cost.

1.4.2 Debt Financing

The fiscal authority is now assumed to be able to finance part of its spending by issuing debt. The model below is a two period game where all debt must be repaid in the second period. The burden of repaying debt is assumed to be such that the monetary authority must repay a proportion \( \beta \) and the government the remainder.

When \( \beta = 1 \), the model is similar to that of Sargent and Wallace’s unpleasant monetarist arithmetic: all the debt is inflated away in the second period. When \( \beta = 0 \), the burden of debt repayment falls solely on the fiscal authority. \( \beta \) can be regarded as reflecting the costs of reforming the central bank or of placing pressure on it to inflate away the debt.

\[ ^{30} \text{Sargent and Wallace (1981)} \]
This model brings together but distinguishes three aspects of central bank independence. Firstly, there is the weight on output in the objective function $\mu$ which was examined in section 1.2.1. Secondly, there is the nature of the game within each period, that is whether the fiscal or the monetary authority has the superior commitment mechanism, which was examined in section 1.2.3. (Only the Nash solution will be discussed here.) Thirdly, there is the financial relationship in the form of responsibility for the debt burden in the second period.\footnote{The responsibility for debt repayment could also be interpreted as a commitment mechanism.} All of these three features have a significant effect on the inflation and output performance of the economy. Empirical estimation of the effect of central bank independence on economic performance could thus control for all three features independently and determine the relative influence of each.

The authorities maximise the two period version of equations (1.2) and (1.3) subject to the following financing constraints:

$$g_1 = \tau_1 + \pi_1 + d$$  \hspace{1cm} (1.30)
$$g_2 + Rd = \tau_2 + \pi_2$$  \hspace{1cm} (1.31)

Where $d$ denotes the debt to GDP ratio and the gross interest rate $R$ is assumed to be constant.

This game is solved sequentially with the central bank and government choosing inflation and taxation respectively in the second period taking each other's actions and the level of debt as given. Then the first period problem is solved where the government chooses $d$ and $\tau_1$, and the monetary authority chooses $\pi_1$.

This yields the following solution:\footnote{The FOCS are in the appendix. The productivity shock is ignored for simplicity.}

$$d = \frac{\delta_x - \theta_F K_2}{\delta_x + R\theta_F K_2} C$$  \hspace{1cm} (1.32)

$$\pi_1 = \frac{\mu \delta_x \theta_F K_2 (1 + R)}{K_1 \delta_x + R\theta_F K_2} C$$  \hspace{1cm} (1.33)
\[ \pi_N \theta_F K_2 (1 + R) = \frac{\theta_F K_2 (1 + R)}{\delta_z + R \theta_F K_2} \]  
(1.34)

\[ \pi_2 = \frac{\mu \delta_{\gamma} \delta_z (1 + R)}{K_1 \delta_z + R \theta_F K_2} C \]  
(1.35)

\[ = \pi_N \frac{\delta_z (1 + R)}{\delta_z + R \theta_F K_2} \]  
(1.36)

where \( K_1 = \delta_z + \delta_g + \delta_g \mu \) and \( K_2 = \frac{R}{K_1} (\delta \pi \delta_g \mu^2 + \delta_z \delta_g (\mu - 1) + \delta_z^2) \), and \( \pi_N \) is the inflation rate from section 1.2.1.

For positive debt in the first period \( \theta_F K_2 < \delta_z \) is required. In this case, the use of debt in the first period reduces the need for seigniorage and the need to inflate, thus resulting in a lower inflation rate in period 1, but a higher inflation rate in period 2.\(^{33}\)

Finally, if enough debt is issued in the first period such that the monetary authority is constrained to set second period inflation above its optimum, then it is possible that the solution is at a corner where \( \pi_2 = \beta d \).

The results above highlights the role of the three differing aspects of central bank independence discussed in this chapter. Firstly, the preferences of the fiscal authority determine the equilibrium inflation rate in addition to those of the monetary authority. Secondly, the nature of the policy game, in terms of which of the players is dominant results in differing inflation rates, and thirdly, the responsibility for debt repayment alters the inflation rate.

### 1.5 Existing empirical literature

The existing empirical work examining the effect of central bank independence on the macroeconomic performance of the economy generally adopts the approach of regressing specific macro variables (inflation, output growth) on an index of central bank independence in a cross-section of countries. The index is constructed by aggregating the number of criteria contained in the central bank's charter that the author

\(^{33}\)Assuming no corner solutions.
considers compatible with central bank independence.

Bade and Parkin (1982) constructed two indexes to capture the degree of financial independence of the central bank and the degree of policy independence. Alesina (1988) extended the latter index to include four more countries (Table 1.2). This policy index aggregates four characteristics: the procedure to appoint the central bank governor, the influence of the government on the central bank board, and the frequency and nature of contact between the government and the central bank. Each central bank charter is assessed on a 0,1 basis as to whether it meets the author's standard, thus generating an index which ranges between 0 (least independent) and 4. The most independent central bank is the final policy authority on monetary policy, has no government official on its board and makes at least some of its appointments independent of the government.

<table>
<thead>
<tr>
<th>Country</th>
<th>Index</th>
<th>Inflation</th>
<th>Country</th>
<th>Index</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>4</td>
<td>3.3</td>
<td>Netherlands</td>
<td>2</td>
<td>4.5</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4</td>
<td>3.8</td>
<td>Norway</td>
<td>2</td>
<td>6.4</td>
</tr>
<tr>
<td>Japan</td>
<td>3</td>
<td>5.4</td>
<td>Sweden</td>
<td>2</td>
<td>6.8</td>
</tr>
<tr>
<td>U.S.</td>
<td>3</td>
<td>4.9</td>
<td>U.K.</td>
<td>2</td>
<td>7.6</td>
</tr>
<tr>
<td>Belgium</td>
<td>2</td>
<td>4.7</td>
<td>Italy</td>
<td>1.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Canada</td>
<td>2</td>
<td>5.3</td>
<td>Australia</td>
<td>1</td>
<td>6.6</td>
</tr>
<tr>
<td>Denmark</td>
<td>2</td>
<td>6.7</td>
<td>New Zealand</td>
<td>1</td>
<td>8.4</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
<td>7.3</td>
<td>Spain</td>
<td>1</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Source: Alesina (1988) and IMF International Financial Statistics
Note: Inflation is the average rate of inflation over the period 1959-91

Regressing this index against inflation reveals a strong negative relationship. Alesina and Summers (1993) also find that there is no relationship between the index and the level or growth of output.

Grilli, Masciandaro and Tabellini (1991) (GMT) also construct an index of political independence and an index of economic independence (Table 1.3). The political independence index is constructed similarly to the Bade and Parkin index but in-
cludes more criteria, resulting in an index that varies from 0 (New Zealand\textsuperscript{34}) to 6 (the Netherlands and Germany) out of a possible maximum of 8 (full independence). Their index of economic independence considers the nature of the financial linkages between the central bank and the government (the means and terms by which the central bank makes loans to the government), and the monetary instruments that the central bank has under its control in the conduct of monetary policy. This generates an index that ranges from Italy (the least independent which meets only one of the seven criteria) to the United States, Switzerland, Canada and Germany (which meet all the criteria). The two indexes are positively correlated but not perfectly so: Italy has relatively high political independence but low economic independence while the converse is true of Belgium. The combination of these two indexes covers the features of central bank independence modelled in the preceding sections.

Table 1.3: GMT Indexes of central bank independence

<table>
<thead>
<tr>
<th>Country</th>
<th>Political Index</th>
<th>Financial Index</th>
<th>Country</th>
<th>Political Index</th>
<th>Financial Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>3</td>
<td>6</td>
<td>Italy</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Austria</td>
<td>3</td>
<td>6</td>
<td>Japan</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Belgium</td>
<td>1</td>
<td>6</td>
<td>Netherlands</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Canada</td>
<td>4</td>
<td>7</td>
<td>New Zealand</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Denmark</td>
<td>3</td>
<td>5</td>
<td>Portugal</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
<td>5</td>
<td>Spain</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>6</td>
<td>7</td>
<td>Switzerland</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Greece</td>
<td>2</td>
<td>2</td>
<td>UK</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Ireland</td>
<td>3</td>
<td>4</td>
<td>US</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Grilli, Masciandaro and Tabellini (1991)

Grilli, Masciandaro and Tabellini then regressed the average inflation rates in particular decades against the two indexes. The indexes had a negative sign but the coefficient was insignificant with the exception of the 1970s (and the 1980s for

\textsuperscript{34}This index refers to the period prior to the recent reforms in New Zealand. While potentially, these indexes could vary significantly over the period in question, 1959-1990, in practice, the legal structure of the central banks of the developed countries has remained static until recently.
the economic index). They also find no adverse effect of increased central bank independence on output.

The above findings give rise to the claim that central bank independence is like having a free lunch: inflation is lower but at no cost to output.

1.5.1 A critique

The conclusion from the empirical literature is open to a number of criticisms: the lack of variation in the indices, the difference between the indices based on legislation and what happens in practice, the lack of control for factors besides central bank independence in the regressions, and the conclusion from section 1.2.2 that central bank independence may in fact be endogenous to each country.\(^{35}\)

There is little variation across countries in the index of central bank independence used. For example, nine of the sixteen countries in Alesina's sample have the same degree of independence yet their inflation rates range from 4% to 9%. The negative relationship between central bank independence and inflation could potentially be driven by the outlying countries: Germany and Switzerland at one extreme and Italy and Spain at the other. Pollard (1993) also argues that the results may be driven by the fixed exchange rate periods where monetary policy is endogenous. A large number of these countries have had a fixed exchange rate either under the Bretton Woods agreement pre-1973 or under the EMS.

There may also be a large difference between the degree of independence implied by the legislation and the practical level of independence. Accordingly, Cukierman (1992) constructs an index from the responses of central banks to a questionnaire. The correlation between this index and his "theoretical" index is low, particularly for the developing countries. Nevertheless, he finds that this variable has a negative correlation with inflation. He considers other proxies for central bank independence rather than legal indexes, including the rate of turnover of the central bank governor and the degree of compliance with the legislation and also finds a negative relation

\(^{35}\)Pollard (1993) also provides a similar critique.
between these variables and inflation. However, turnover may rather be capturing political instability than central bank independence.

This chapter suggests that other institutional characteristics may have an important influence on the inflation outcome. However, there have been few attempts to include variables reflecting other aspects of the institutional structure. GMT include measures of the political structure - the frequency of changes in government (both actual and significant changes), and whether the governing party has a majority - but find that these variables add little and are often of the wrong sign. Havrilesky and Granato (1993) include measures of the institutional structure of the economy such as the degree of unionisation, the percentage of the vote won by leftist parties, the power of leftist factions in cabinet, and the organisational unity of the labour movement. Using Alesina's index of central bank independence they find that their corporatist variables add little and central bank independence is still the only influence on inflation.

Section 1.2.2 suggests that the degree of central bank independence may be endogenous. Thus the empirical finding may only reflect the optimal choice by countries with different preferences.

Aggregating the criteria on an equal weighting may mask the important aspects of central bank independence. Accordingly three indexes were extracted from the GMT indices. The first is the presence of a statutory requirement that the central bank pursue monetary stability among its goals: INFOBJ. The second is the GMT measure of political independence, but excluding INFOBJ: POL7. The third is the GMT measure of economic independence minus the bank supervision criterion: EC6. The variable INFOBJ is a measure, albeit an imprecise one, of the lack of goal independence of the central bank, that is whether the central bank can choose its own goals. EC6 is a measure of instrument independence, that is the degree to which the central bank is free to choose the means by which it pursues its goals.

Table 1.4 shows the results of regressing the inflation rate on these three variables for the 18 countries in the CMT sample.

---

36 See Debelle and Fischer (1994).
Table 1.4: Inflation and the GMT index

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFOBJ</td>
<td>-1.76</td>
<td>-2.28</td>
<td>-4.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.72)</td>
<td>(1.61)</td>
<td>(1.30)</td>
<td></td>
</tr>
<tr>
<td>POL7</td>
<td>-0.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC6</td>
<td>-1.02</td>
<td>-1.02</td>
<td></td>
<td>-1.53</td>
</tr>
<tr>
<td></td>
<td>(0.55)</td>
<td>(0.55)</td>
<td></td>
<td>(0.42)</td>
</tr>
<tr>
<td>$\bar{R}^2$</td>
<td>0.44</td>
<td>0.44</td>
<td>0.37</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

The variable POL7 is insignificant, indicating that these aspects of central bank independence are not the crucial elements that determine the inflation performance. The more important components are the legislated goals of the central bank, and the freedom of instruments. These indexes capture the aspects of central bank independence highlighted here, namely the weight on inflation and the responsibility for debt (financial linkages). However, the goals of the government and the strength of commitment mechanisms are not captured.

1.6 Oil price shocks and institutional structure

Grilli, Masciandaro and Tabellini’s results suggest that the observed negative relationship between central bank independence and inflation is particularly strong during the 1970s. The institutional structure of the economy in terms of the preferences of the monetary and fiscal authorities may be more critical when large shocks hit than in more stable periods.

The model developed in section 1.2 has explicit implications about how countries will respond to supply shocks. These implications depend on the institutional structure of the countries. The country with the most independent central bank (lowest $\mu$) should have the smallest rise in inflation and the largest fall in output in response to a negative supply shock. This may be offset if the fiscal parameters differ across
Table 1.5: Political leaning of Government (POL)

<table>
<thead>
<tr>
<th>Country</th>
<th>1st shock</th>
<th>2nd shock</th>
<th>Country</th>
<th>1st shock</th>
<th>2nd shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1</td>
<td>5</td>
<td>Japan</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Austria</td>
<td>1</td>
<td>1</td>
<td>Netherlands</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Belgium</td>
<td>2</td>
<td>2</td>
<td>New Zealand</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Canada</td>
<td>2</td>
<td>3</td>
<td>Norway</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Denmark</td>
<td>2</td>
<td>2</td>
<td>Spain</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>France</td>
<td>5</td>
<td>5</td>
<td>Sweden</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Germany</td>
<td>2</td>
<td>2</td>
<td>Switzerland</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Greece</td>
<td>5</td>
<td>3</td>
<td>United Kingdom</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ireland</td>
<td>4</td>
<td>1</td>
<td>United States</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Italy</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1: left, 2: centre-left, 3: centre, 4: centre-right, 5: right.
First shock: Sep 73. Second shock: end 79.
Source: Author’s calculations derived from Banks (1992).

countries. A higher weight on output (δₓ) in the government’s objective function reduces the fall in output and reduces the rise in inflation, while a higher weight on government spending (δᵧ) in the government’s objective function reduces the fall in output and increases the rise in inflation.

To measure the effect of governments on inflation, the political inclination of the government in power during the oil price shocks was included in the empirical estimation. Table 1.5 summarises this variable, POL, which ranges from 1 (left-wing) to 5 (right-wing). It was calculated from an assessment of the political bias of the government in power at the time based on information in Banks (1992). Left-wing governments are likely to have a higher weight on government spending and output at the expense of a lower weight on inflation than right-wing governments. Thus, there should be a negative relationship between inflation and this index.

The explanatory variables used to measure the influence of monetary institutions were the central bank independence index of Alesina in Table 1.2 (ALES), and three versions of the GMT indexes in Table 1.3: the index of political independence (GMTP), the index of economic independence (GMT_E), and the sum of the two
Table 1.6: Regression Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>(1) Full</th>
<th>(2)</th>
<th>(3) 1st shock</th>
<th>(4)</th>
<th>(5) 2nd shock</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>6.34 (2.22)</td>
<td>12.4 (2.67)</td>
<td>7.53 (3.05)</td>
<td>13.3 (3.44)</td>
<td>4.69 (3.08)</td>
<td>11.6 (3.87)</td>
</tr>
<tr>
<td>ALES</td>
<td>-1.06 (0.76)</td>
<td>-1.86 (1.16)</td>
<td>-1.02 (0.31)</td>
<td>-0.50 (0.94)</td>
<td>-0.69 (0.34)</td>
<td></td>
</tr>
<tr>
<td>GMT</td>
<td>0.45 (0.49)</td>
<td>0.093 (0.46)</td>
<td>1.09 (0.76)</td>
<td>0.60 (0.60)</td>
<td>0.22 (0.63)</td>
<td>-0.41 (0.66)</td>
</tr>
<tr>
<td>POL</td>
<td>0.021 (0.26)</td>
<td>0.11 (0.43)</td>
<td>0.43</td>
<td>0.43</td>
<td>-0.12 (0.66)</td>
<td>0.11</td>
</tr>
<tr>
<td>$\bar{R}^2$</td>
<td>32</td>
<td>34</td>
<td>16</td>
<td>17</td>
<td>17</td>
<td>16</td>
</tr>
</tbody>
</table>

Standard errors in brackets.

($GMT$).\(^{37}\)

Two alternative dependent variables were used. The first $D MAX$ is the maximum difference between the actual and predicted level of inflation after the shock. It was created by estimating an autoregressive process for each country using data up to the quarter before the shock - the third quarter 1973 for the first shock and the second quarter 1979 for the second.$^{38}$ Using the estimated process for inflation, the inflation rate was forecast forward for the 12 quarters after the shock. Graphs 1.1 and 1.2 show the relationship between $D MAX$ and the political index $POL$. The second dependent variable difference ($INFCH$) is the difference between the post-shock peak in the actual inflation rate and the inflation rate in the quarter before the shock.

Table 1.6 summarises the results from the estimation. All the results use $D MAX$ as the dependent variable. The results when $INFCH$ was used are substantially similar except where noted below.

The results from estimating the model including both shocks are shown in columns

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\(^{37}\)The countries covered by the two indexes differ slightly. Norway and Sweden are omitted by GMT, while Austria, Greece and Ireland are added.

\(^{38}\)Appendix A.4 gives more details.
(1) and (2). The two indexes of central bank independence have the expected negative sign, although the Alesina index was not significant.\textsuperscript{39} However, the political variable \textit{POL} was not significant and had the wrong (positive) sign. To control for the differing effect of the two shocks, a dummy variable was included. It did not change the coefficients on the variables significantly.

Columns (3) - (6) show the results from estimating the model for each shock separately. The political variable does have the expected negative sign (although still insignificant) in the second shock. When \textit{INFCH} was used as the dependent variable, \textit{POL} had a negative sign in all the samples but again insignificant. In every case, the coefficient on the central bank independence indexes was negative, although the GMT index generally performed better than the Alesina index.

Thus the results suggest that the degree of central bank independence (as captured by the indexes) played a significant role in determining the rise in inflation after the two oil price shocks. However, the nature of the government of the time did not play a major role. Explanatory variables which more precisely capture the preferences of the government at the time should yield better results.

\subsection*{1.7 Conclusion}

The chapter has shown that the introduction of another policymaker, the fiscal authority, into the Barro-Gordon time consistency model modifies the standard results. In particular, inflation and output have been shown to be a function of the objectives of the fiscal authority, the nature of the policy game (commitment technology), and the nature of debt repayment obligations, in addition to the standard influence of the objectives of the monetary authority. The model has isolated and highlighted the way in which these different aspects of central bank independence affect the economic performance.

In particular, it was shown that if the monetary authority has the stronger com-

\textsuperscript{39}The other two indexes of Grilli, Mesiandaro and Tabellini, \textit{GMTE} and \textit{GMP} gave similar results, although the index of political independence generally had the stronger effect.
mitment technology, then it is possible that there will be a superior outcome than if the fiscal authority is the leader. Furthermore, it may be in the government’s best interests to grant the monetary authority this stronger commitment technology.

The observed negative relationship between central bank independence and inflation may be a reflection of the underlying preferences of the economy in question. Those economies with a strong anti-inflation preference are likely to have already instituted an independent central bank with strong anti-inflationary tendencies. Other economies with higher inflation may have elected to institute a central bank whose preferences are more in keeping with their lower weights on inflation. To argue that such economies would benefit from having a more independent central bank requires there to be other negative effects of higher inflation on output than those which are modelled here, perhaps through the effect of inflation on productivity growth.
Chapter 2

The Ends of Three Small Inflations: Australia, New Zealand and Canada

The primary function of the Bank is to formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices.

Section 8 Reserve Bank of New Zealand Act 1989

2.1 Introduction

In 1989, the independence of the Reserve Bank of New Zealand was significantly increased. As the above section of the Reserve Bank Act indicates, price stability was specified as the primary objective of monetary policy. Furthermore, the Act provided for a clearer separation of the central bank from government and made the central bank, and in particular, the Governor, directly accountable for any failure to meet the objective of price stability.

This clearly defined increase in central bank independence provides a useful oppor-
tunity to test the implications of the theoretical literature on central bank independence.\textsuperscript{1} This literature argues that an increase in the weight on the inflation objective in the policymaker's objective function reduces the inflation rate of an economy, at no cost in terms of output. Furthermore, a central bank focused entirely on inflation should generate a zero rate of inflation as the standard time consistency problem of monetary policy is totally eliminated.

The inflation record in New Zealand after the increase in central bank independence appears to be consistent with these predictions. (See Graph 2.1\textsuperscript{2}) The inflation rate fell from an average of 12% in the period 1980-88 to an average of 1% in 1992. New Zealand has moved from having an inflation rate significantly above the OECD average to having an inflation rate significantly below. However, the inflation rate fell from 16% to around 8% before the legislated increase in central bank independence occurred.\textsuperscript{3}

Across the Tasman Sea, Australia's inflation rate has also fallen substantially over the same period, from an average of 8.5% to 1%. Yet the Australian economy, similar in many respects to New Zealand, did not undergo any explicit change in central bank independence. In fact, the 1989 appointment of Bernie Fraser as the Governor of the Reserve Bank of Australia, who was then Secretary of the Australian Treasury, at the time was thought of as reducing the independence of the Australian central bank.

In Canada, the inflation rate dropped to similarly low levels. The Bank of Canada, under Governor John Crow, lobbied hard for legislation similar to that enacted in New Zealand to increase its independence. However, the legislation did not pass parliament. Nevertheless, Crow's rhetoric during his tenure was directed at establishing his reputation as a "conservative" central banker type,\textsuperscript{4} focused on price stability.

The purpose of this chapter is to examine the impact of increased central bank independence by contrasting the recent economic performance of the three economies.

\textsuperscript{1}The recent literature dates from Kydland and Prescott (1977) and Barro and Gordon (1983) and is extensively surveyed and extended in Cukierman (1992)

\textsuperscript{2}GST means the inflation rate adjusted for changes in the goods and services tax, which has a one-off effect on inflation.

\textsuperscript{3}This point is raised in Pollard (1993) p30.

\textsuperscript{4}Where conservative is in the form defined by Rogoff (1985)
The experience of the three economies provides a natural experiment for central bank independence with the performance of the Australian and Canadian economies serving as controls for the New Zealand economy.

The economic situation of Australia and New Zealand both underwent major reforms in the mid to late 1980s which may have had an impact on the inflation outcome and the concurrent decline in output. The major institutional difference between the countries was the independence of the central bank. Thus the effect of central bank independence can be isolated to some extent.

The Canadian experience serves as a middle ground between Australia and New Zealand over this period. While there were no substantial structural reforms in Canada of the type that occurred in Australia and New Zealand, the reputation and credibility of the Bank of Canada as an anti-inflation institution was undoubtedly enhanced by the lobbying effort of Crow and his public pronouncements of a desire for price stability.

Thus the countries are examples of three types of central bank independence: New Zealand with complete independence supported by legislation and rhetoric, Canada with increased independence supported only by rhetoric and inflation targets, and Australia where formal central bank independence remained at a comparatively low level.

The next section discusses the theoretical implications of the central bank independence literature, which will provide a framework for the analysis. The institutional structures of the three central banks and the details of the central bank reforms in New Zealand are presented in Section 2.3. Section 2.4 provides details of other institutions which may have had an impact on the disinflation process, including the stance of fiscal policy, the effects of labour market reforms, and the other structural reforms that occurred over the period in question. Section 2.5 analyses the economic effect of central bank independence by examining sacrifice ratios, the changes in inflationary expectations, movements in interest rates, and changes in estimated Phillips curves. Section 2.6 summarises the results of section 5 and discusses the influence of the other factors discussed in section 4. Section 2.7 concludes.
2.2 Central Bank Independence in Theory

The theoretical rationale for increased central bank independence derives from the following model based on Barro and Gordon (1983).

The central bank minimises the loss function:

\[ L_{CB} = \pi^2 + \mu(y - k\bar{y})^2 \quad k > 1 \quad (2.1) \]

That is, it minimises the deviations of inflation from its target level of zero and of output from its target level of \( k\bar{y} \). \( \bar{y} \) is the level of output which results from the normal operation of the labour market. However, because of some distortion in the labour market, or a desire to have higher output for political purposes, the central bank's desired level of output is higher than the market clearing level \( (k > 1) \). \( \mu \) is the weight placed on the output objective relative to the inflation objective but is more generally interpreted as the degree of central bank independence.

The link between inflation and output is through an expectational Phillips curve:

\[ y = \bar{y} + \beta(\pi - \pi^e) \quad (2.2) \]

whereby the central bank can achieve a higher level of output, closer to its target \( k\bar{y} \), by creating unexpected or "surprise" inflation.

However, workers in the economy recognise this incentive to inflate and thus adjust their inflationary expectations accordingly. As a result, the economy ends up in the following Nash equilibrium where equilibrium inflation \( \pi_N \) is given by:

\[ \pi_N = \mu\beta(k - 1)\bar{y} > 0 \quad (2.3) \]

and output is \( \bar{y} \), the market clearing level.

There is a unnecessary welfare loss from this positive inflation. If the central bank could credibly commit ex ante to a zero inflation rate so that workers' inflationary expectations are also zero, then it is clearly better off: inflation is lower and output
is unchanged at ̇g. However, should it do so, ex post, it has an incentive to deviate and create surprise inflation and achieve higher output, thus reducing its loss. This result is the standard time consistency problem. The commitment to zero inflation is not time consistent.

The key parameter is μ, the weight on output. In the literature, it is more generally regarded as the inverse measure of central bank independence. A more independent central bank has a lower μ. Key influences on μ are:

- the legal specification of the central bank’s objectives;
- the ability of the government to influence μ by appointing central bankers of similar preference or applying covert pressure through having a representative on the central bank board;
- the credibility of μ or the public’s perception of μ, which is likely to differ from the legal definition.

The reform of the Reserve Bank of New Zealand may be technically regarded as setting μ = 0: price stability is its sole goal.\(^5\) This then generates a zero inflation rate, regardless of credibility considerations. The economy is better off as inflation is lower and output is unchanged. However, the focus is then shifted as to whether the institutional framework behind the price stability goal is truly credible. That is, while in theory the value of μ is zero, is it believed to be so by the public? For example, the legislation could always be repealed.

Rogoff (1985) showed that the appointment of a conservative central banker can also generate a lower inflation rate, as μ is reduced credibly. This is useful in interpreting the personalities of the three central bank Governors. The actions of Governors Crow and Brash (avowed inflation fighters) should have reduced the time consistency problem in Canada and New Zealand respectively while the appointment of Fraser (an inflation dove) may have increased the problem in Australia, and thus result in a higher inflation rate in Australia and a lower rate in Canada and New Zealand.

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\(^5\)This ignores the secondary goal of stability of the financial system which is discussed below.
The character of the central banker may be established ex ante, or the central banker may need to signal their type (their value of \( \mu \)) through public statements and policy actions. Note that while a conservative central banker reduces the time consistency problem, flexibility in adjusting to shocks is reduced.

A recent development in the literature is the optimal design of the central bank to decrease the time consistency problem. Lohmann (1992) extends the Rogoff analysis to allow for an override of the conservative central banker in times of large shocks, to improve the tradeoff between flexibility and credibility. Walsh (1994) and Persson and Tabellini (1993) argue however, that this tradeoff can be avoided by providing a contract to the central bank where remuneration is a linear function of the inflation rate, and cite New Zealand as a close approximation of the optimal theoretical contract.

In the Persson-Tabellini model, the announcements of inflation targets enhance credibility if they are “clearly understood and ... non-ambiguous ... and have a transparent procedure for revising them or accepting short run deviations from them.” In terms of the model above, the targets can serve as a signal of a conservative central banker as they present a benchmark against which the central banker may be held accountable, and thus \( \mu \) is lower again.

In tightening monetary policy during the late 1980s, the Australian authorities often masked their intentions in their policy announcements (see below). The models summarised in part II of Cukierman (1992) provide a rationale for this behaviour. Essentially, secrecy by the central bank in changing policy allows it to mask its true type (whether it is conservative or inflationary) and preserve its ability to increase output in the future by creating surprise inflation. The public only gradually discovers the central bank’s true type.

So far, the discussion has focussed on the equilibrium level of inflation. However, it is easily extended to encompass the relative costs of disinflation. The sacrifice ratio is the loss in output per point of inflation reduction. Using equation (2.2) this can

be written as:

\[ SR = \int_{t_0}^{t_1} \beta (\pi_t - \pi_t^e) dt \]  

(2.4)

where \( t_0 \) is the beginning of the disinflation and \( t_1 \) is the end.

The critical factor is the difference \( \pi_t - \pi_t^e \), which depends on the difference between the public’s expectation of \( \mu \) and its actual value. Assuming the other parameters \((\beta, k \text{ and } \bar{y})\) are the same for the three economies, then the difference in the sacrifice ratios will depend on this gap, and thus will be critically tied to credibility.

The central bank independence literature generally ignores the role of the other policymaker (the government) in the process. In chapter 1 I explicitly included the government in a model similar to that above, and examined the effect on inflation and output. A summary of the model and its implications for this analysis follows here.

In addition to the central bank loss function (equation 2.1), the government has its own loss function:

\[ L_G = \pi^2 + \delta_y (y - k\bar{y})^2 + \delta_\sigma (g - g^*)^2 \]  

(2.5)

where it cares about inflation, output and government spending with weights that can differ from those of the central bank. The government finances its spending through seigniorage and distortionary taxes (which reduce the level of output). I showed that the preferences of the government for inflation, output and government spending have a crucial role in determining the equilibrium inflation and output. An increase in central bank independence in this model results in lower inflation but leads to lower output.

Also this model shows that central bank independence may in fact be endogenous in the sense that the observed differences in central bank structure may reflect the optimal decisions by societies with different preferences for inflation as against output. An extension of this would then argue that the sacrifice ratio is irrelevant as society has already factored this into its decision in legislating a certain structure of central bank.
My model suggests that the government's preference for inflation relative to the other objectives should also be controlled for in examining the disinflations. The fact that such legislation was enacted in New Zealand is an indication of changed preferences, but there must also be evidence of a change in fiscal policy. These issues will be examined in section 2.5.

Sargent (1982) investigating stabilisations after hyperinflations, argued that the cost of stabilisation depends on "how resolute and evident the government's commitment was." In this "rational expectations" view, a significant change in the policy regime can break the momentum of inflation and reduce the cost of disinflation. Thus at face value, the legislation in New Zealand should have guaranteed a quick, almost costless disinflation, while the disinflation cost should have been significantly lower in Canada than in Australia, given that the anti-inflation agenda was much more explicit in Canada. However, Sargent also identified two prerequisites for a less costly disinflation. In addition to the creation of an independent central bank, there must be a simultaneous alteration in the fiscal policy regime. Continuing fiscal deficits raise questions about the sustainability of fiscal policy and create the expectation of inflation in the future when the monetary authority is forced to inflate away debt.

In summary, the implications of the existing theoretical literature are that New Zealand should have the lowest inflation rate and Australia the highest of the three countries. Furthermore, the literature implies there should be a lower cost to output (at least in the long run) of the lower inflation in the case of New Zealand than in Canada to the extent that the reforms are more credible in the former. The costs of disinflation will depend on the level of \( \mu \) and the credibility of \( \mu \).

### 2.3 Central Bank Structure and Reforms

This section describes the structure of the central bank in each country, in terms of the model of the previous section. It provides details of the recent changes in the

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7Sargent 1982 p42  
8See the discussion in Sargent and Wallace (1981).
central banks of New Zealand and Canada. Table 2.1 summarises the discussion in this section.

Table 2.1: Central Bank Structure

<table>
<thead>
<tr>
<th></th>
<th>New Zealand</th>
<th>Australia</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Goal</td>
<td>Price Stability</td>
<td>Stability of currency and Full employment</td>
<td>None in Act</td>
</tr>
<tr>
<td>Inflation Targets</td>
<td>Yes 0-2%</td>
<td>No None</td>
<td>Yes 1.5%-3.5%</td>
</tr>
<tr>
<td>Current Target</td>
<td>Failure to achieve targets</td>
<td>Only physical incapability</td>
<td>Only physical incapability</td>
</tr>
<tr>
<td>Grounds for Dismissal</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Governor’s term</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Electoral cycle</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Governor appointed by</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Govt member on Board</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Resolution of Disagreement</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td>Current Governor Appointed</td>
<td>5 years 3 years Bank Board No Public Statement</td>
<td>7 years 3 years Government Yes, Treasury Sec. Parliament due process</td>
<td>7 years 4 years Bank Board Yes but non voting Public Statement</td>
</tr>
<tr>
<td></td>
<td>Brash Sep 88</td>
<td>Fraser Sep 89</td>
<td>Crow Feb 87</td>
</tr>
</tbody>
</table>

Note: Crow has since completed his term after the 1993 election and been replaced by Gordon Thiessen, who was Crow's deputy.

The first group reflects the legislated value of $\mu$, thus New Zealand, where the goal is price stability, has a value of $\mu$ which is theoretically zero in equation 2.1.

However, as discussed above, $\mu$ captures several aspects of central bank independence beyond that of the goals of the central bank. In particular, the credibility of the goals is important. That is, while the legislation may stipulate a zero value of $\mu$, other features of the central bank affect what the public perceives as the true value of $\mu$. Inflation targets are a means of reducing $\mu$ as they establish a means by which the performance of the central bank governor can be monitored. Their effectiveness is enhanced by a provision such as that in New Zealand where the Governor can be dismissed for failing to achieve the targets.

The fifth group of characteristics deal with the ability of the government to directly
influence the central bank, either by appointing a governor sympathetic to their goals or by concealing changes in the goals of the central bank from the public. Thus the government can operate behind the legislative veil to covertly raise $\mu$.

The rest of this section describes the three central banks in detail.

### 2.3.1 New Zealand

In 1985, as part of the general structural reform of the New Zealand economy, the Lange Labour government decided to shift the focus of monetary policy to the more medium term goal of inflation control. However, there was no explicit change in the structure of the central bank at that time, nor was any new goal set for monetary policy beyond the general aim of inflation reduction. The Reserve Bank Act enacted in 1989 formalised “the essential elements of monetary policy as it has been practised since 1985, with the main change aimed at improving the transparency and consistency of monetary policy.”

There were three goals of the reform:

- To “cement in the gains” of the low inflation. “To make certain that no future politician can interfere with the Bank’s primary objective of ensuring price stability, or manipulate its operations for their own purposes, without facing the full force of public scrutiny.”

- “To increase the Bank’s accountability”

- “To separate management of the Public Accounts from the operation of monetary policy.”

The credibility of the reform was enhanced by the fact that both political parties supported the legislation. Without this bi-partisan support, the probability of revocation of the legislation at the next election would have diluted the legislation’s

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9Dawe 1990 p29
impact on credibility. In terms of the model of chapter 2, the weights in the social welfare function changed, making it socially optimal for the independence of the Reserve Bank to be increased.

As shown in the quote at the beginning of the chapter, the primary objective of the bank is now to focus entirely on price stability where price stability is defined as an inflation rate between zero and two percent. The previous legislation stated the objectives were to maximise economic welfare "having regard to the desirability of promoting the highest level of production and trade, and full employment, and of maintaining a stable internal price level."\(^{11}\) While formerly price stability was one of a number of objectives, it is now the primary focus of monetary policy. Employment is no longer even mentioned in the 6 monthly monetary policy statement.

However, the Act also notes that the Bank must also have regard to the overall stability of the financial system, which potentially could conflict with the achievement and maintenance of price stability. A vigorous pursuit of disinflation with the concomitant high interest rates could induce a debt-deflation scenario and induce financial distress in the banking sector. Thus the secondary goal of financial stability potentially could ameliorate the disinflationary efforts. However, financial distress resulting in deflation suggests that the Bank has overpursued its price stability goal, and thus the financial stability goal should in fact be subsumed in the price stability goal.

In the past, the Finance Minister could change the focus of monetary policy between the objectives listed above without making that decision public. Now, while the government still has the ultimate control over the Reserve Bank, it must publicise any decision to execute that control. The transparency of any government action to create short term inflation will reduce their incentive to do so, as the "surprise" element is lost.

Previously, the Secretary of the New Zealand Treasury was a member of the Reserve Bank Board. The new legislation does not permit any public servant or member of government to sit on the board, thus removing an avenue for covert political in-

\(^{11}\)Section 8 (2) Reserve Bank Act 1964.
fluence on monetary policy. The Board is appointed by the government for five year terms, longer than the political cycle (three years). Furthermore, the terms of the Board members are overlapping. The Board chooses the Governor who sits on the Board with either one or two Deputy Governors. These factors make it difficult for the government to stack the Board with people with similar preferences to itself. Thus, the value of $\mu$ should only evolve slowly and should be somewhat divorced from political manipulation.

Targets for inflation are agreed upon by the Governor of the Reserve Bank and the Minister of Finance. Following the enactment of the legislation, a specific timetable for the deflationary process was laid out: inflation as measured by the CPI was to be between 3 and 5 per cent for the year to December 1990, 1.5 and 3.5 per cent for the year to December 1991, and 0 and 2 per cent for the year to December 1992 - the last target is defined as price stability. As the targets are to be contingent on any economic developments, the targets specify the effects of shocks (eg terms of trade, commodity prices) on the attainment of the targets and the level of the targets themselves. The assumptions underlying the targets must also be disclosed. Any changes to the targets must be agreed upon by both the Bank and the government and must be made public. Finally, the Governor must publish a semi-annual report, detailing whether the targets have been achieved and outlining the Bank’s strategy for the next six monthly period, and must also publish a statement of his service performance in the Annual Report of the Bank.

The contingent targets are in keeping with the optimal central bank design suggested by Lohmann (1992) where a conservative central banker is appointed but the government has the power of override in times of large shocks. This override does not compromise the credibility of the central bank as it is made explicit that it is the government’s decision to inflate.

The burden of responsibility for achieving these targets rests with the Governor, who may be dismissed if they are not achieved. Once again, this serves to enhance the credibility of the zero inflation target. Persson and Tabellini (1993) argue that such targets serve to “create a standard against which policymakers can subsequently
be held accountable.”¹² The “simplicity of monitoring [such targets] may raise the precommitment value of independence and allow credibility to be won and sustained more easily.”¹³

The current Governor, Donald Brash has served since September 1988. The terms of his first contract (the first such contract) were the above targets.¹⁴ Having successfully completed his first term, Brash commenced a new five year contract in September 1993 where the terms of employment were that inflation be maintained between 0 and 2 percent, that is, that price stability be maintained.

The above reforms are in keeping with the general spirit of the economic reform movement in New Zealand of corporatisation and increased accountability in the public sector. The Governor can be held completely accountable for failure to achieve his objective (the inflation targets) and as a chief executive, may be fired for the company’s (that is the Bank’s) failure.

In summary, in terms of the model in section 2.2, New Zealand did not regard it as sufficient to simply legislate $\mu = 0$, i.e. focus only on price stability. It believed that extra measures were needed to enhance credibility. Brash considers that there are four pillars crucial to the accountability of the Reserve Bank: “the objective of price stability, a clear policy targets agreement, the personal responsibility of the governor, and the publication of a regular monetary policy statement.”¹⁵ He concludes that the Reserve Bank of New Zealand has now achieved a high level of credibility: “regardless of whether people agree with the policy, they know that miserable bloke in the Reserve Bank is going to keep pursuing it.”¹⁶

¹³Roll et al 1993 p22.
¹⁴The folk lore that the Governor's salary is tied to the inflation rate is not true, although the concept was considered. However, it was rejected on the grounds that it would seem inappropriate for the Governor to receive a pay rise while the country may have high unemployment as the result of a successful disinflation.
¹⁵Brittan 1993
¹⁶Financial Times 14/6/93
2.3.2 Australia

It is the duty of the Board, within the limits of its powers, to ensure that the monetary and banking policy of the Bank is directed to the greatest advantage of the Australian people and ... [to] best contribute to the stability of the currency of Australia; the maintenance of full employment in Australia; and the economic prosperity and welfare of the people of Australia.

Reserve Bank Act 1959

The Governor of the Reserve Bank and the Reserve Bank Board are appointed by the government, where the Board consists of the Governor and the two Deputy Governors and seven other members including the Secretary of the Treasury. The Governor's term is for seven years. Thus there is a role for more direct influence of the government on monetary policy, than in New Zealand. While the ability of the government to appoint people with its own preferences to the Board is as difficult as in New Zealand, the presence of a government official opens the door for covert influence on policy.

The ultimate responsibility for monetary policy lies with the government; however in the event of disagreement between the Reserve Bank and the government, the government must table its directive to the Bank and the reasons for it in parliament. In practice, this has never eventuated as differences have been resolved in private before this point. Differences are likely to arise as to the relative weight on the objectives contained in the above quotation. The avoidance of conflict suggests that the true value of \( \mu \) is a compromise, somewhere on the interval between the Bank's desired value and the government's.

The only major change in the Reserve Bank over the period examined here came when Bob Johnston retired as Governor in 1989 and was replaced by Bernie Fraser. Fraser had been the Secretary of the Australian Treasury since 1984. Known to be

\footnote{Currently the Board also includes Bill Kelty, Secretary of the ACTU, the main union body in Australia.}

\footnote{The electoral term is also three years in Australia.}
a close confidant of the then Treasurer (and now Prime Minister) Paul Keating,¹⁹ it was suggested that “the bank might be weakened as a source of independent advice under an outsider so closely associated with Mr Keating’s economic policies.”²⁰ The opposition party consistently levelled the accusation that Fraser used monetary policy for political purposes; not so much with respect to the direction of policy but rather the timing of interest rate reductions and their effect on the politically sensitive housing loan rate.²¹ In terms of the model described in section 2.2, on appointment Fraser was not perceived as a conservative central banker, and lacked anti-inflation credibility. The value of 𝜇 potentially rose, which should result in a higher equilibrium inflation rate, and increase the cost of the disinflation.

In later statements, Governor Fraser distanced himself from the government’s policy and appeared to be harder on inflation.²²

The abandonment of monetary targeting in 1985 made monitoring of monetary policy actions difficult as there was no clear indicator of the stance of monetary policy.²³ Over the latter part of the 1980s, changes in the stance of monetary policy were often masked by the Treasurer and the Governor. It was rarely announced that monetary policy had been tightened at the time of tightening (in some cases it was actually denied), and generally changes were confirmed only several months later.²⁴ In the 1991-92 budget, it was conceded that “as early tightenings were not highlighted by formal announcements by the authorities, the announcement effects ... were not as pronounced as they might have been.”²⁵ This uncertainty about the stance of monetary policy ought to have reduced its impact, and also increased the costs of the disinflation.

¹⁹See Australian Financial Review (AFR) 8/6/93, where Fraser is described as an “intimate advisor” to Keating, and also AFR 10/8/93, Financial Times 6/4/89.
²⁰Financial Times, 6/7/89
²¹See AFR 2/11/93
²²See for example Fraser’s comments reported in the AFR 1/4/93 p1
²³The monetary aggregates were of little use because substantial financial deregulation resulted in structural breaks in the series, as non-bank financial intermediaries converted to banks and individuals substituted among financial assets. Short term interest rates were some guide but were difficult to use on a day-to-day basis or even weekly basis, as the small increments with which policy was tightened were often masked in general seasonal cash movements.
²⁴For further evidence of this see Financial Times 12/2/91, 16/3/90, 3/2/89, Australian 8/8/93.
²⁵Budget Statement No.2 1991-92 p2.31
Furthermore, for some period of time, monetary policy was directed to the large current account deficit, rather than to inflation. This did not pose a policy conflict, because the monetary tightening needed to address the current account was consistent with disinflation. However, this meant that there was no direct impact on inflationary expectations which might have resulted if explicit announcements of disinflation had been made.

Fraser rejects the adoption of inflation targets, arguing that a narrow target of 0-2% "would do more harm than good", particularly in limiting the ability of monetary policy to respond to shocks. However, he agrees that the accountability of the Reserve Bank (in terms of openness to the public), particularly appearances before parliament, could be increased in line with an increase in independence.\(^{26}\)

### 2.3.3 Canada

There are no explicit goals for the Bank of Canada in the legislation but in the preamble to the Bank of Canada Act it is stated that it should

\[
\text{regulate credit and currency in the best interests of the economic life of the nation, to control and protect the external value of the national monetary unit and to mitigate by its influence fluctuations in the general level of production, trade, prices and employment ... and generally to promotethe economic and financial welfare of the Dominion.}^{27}\]

These goals of the Bank of Canada are of similar nature to those in Australia.

In 1991 it was proposed to include explicit goals (notably the goal of price stability) in the Act as part of a general reform of the Canadian constitution. Governor John Crow went before a parliamentary committee to argue for the inclusion of such a provision.\(^{28}\)\(^{29}\) However, the proposal was not adopted.

\(^{26}\)AFR 1/4/93 p2
\(^{27}\)Preamble to Bank of Canada Act reproduced in Courchene 1976 p8
\(^{28}\)In the aftermath of 1961 where Governor Coyne resigned, Governor Rasminsky successfully had the legislation changed to describe the exact division of responsibility for monetary policy. Thus there is a precedent for Governor Crow's efforts. See Courchene 1976.
\(^{29}\)See Crow 1992(a) and (b) for his testimony before the committee and also Wall Street Journal 25/9/91.
The Board of the Bank of Canada consists of the Governor and Senior Deputy Governor who are appointed by the Board for seven year terms, and 12 other members who are appointed by the government for three year terms. The Deputy Minister of Finance sits on the board but has no vote. The Governor is also obligated to report to the Minister of Finance each year (in the form of an annual report.) Once again, this is a similar structure to that in Australia with the potential for covert government influence on monetary policy.

The responsibility for monetary policy lies with the Bank of Canada, after an amendment to the Bank of Canada Act in 1967. However, the government can order the Bank to pursue a different policy if it issues a public statement to that effect. Therefore, at least in theory, there exists some transparency in the Bank’s actions.

Thus in terms of independence, the Bank of Canada is marginally more independent than the Reserve Bank of Australia, but less so than the Reserve Bank of New Zealand. The equilibrium inflation rate should be lowest in New Zealand while being about the same in Australia and Canada.

In February 1987, John Crow was appointed Governor of the Bank of Canada. In his first public speech as Governor, he outlined his views of the goals of the Bank: “The objective to which monetary policy should give central attention is maintaining confidence in the value of the money we use in Canada - in other words, the goal of price stability.”30 So while there was no explicit change in the institution over this period, Governor Crow indicated through a series of public statements that the focus of the Bank of Canada was solely on “pursuing a policy aimed at achieving and maintaining stable prices.”31 The goal was reiterated in the Hanson lecture32 in January 1988 which attracted the attention of the Canadian economics profession33 and was reinforced in subsequent public speeches and the annual reports of the Bank of Canada.34

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30 Crow (1987)
31 Crow (1988) p 5
32 reprinted in Crow 1988
33 For instance, the volume edited by Lipsey (1990) bases itself on discussing the implications of this speech. See also Lucas (1989), Johnson (1990).
Crow's actions can be interpreted in the Rogoff framework as an attempt to establish a reputation as a "conservative" anti-inflation fighter. Crow tried to lower the public's perception of μ by signalling his type. How successful he was is somewhat reflected in the lengthy time that interest rates were kept high in pursuing the disinflation, although as discussed below, other influences were at work. The greater the cost of the disinflation, the greater the gap between the actual value of μ and the public's perception of it.

In his Hanson speech, Crow rejected a high (non-zero) rate of inflation as not credible because it "depends on strong public confidence that the authorities would not accept a further acceleration in the rate of inflation." Implicitly, this argument also applies to a zero rate of inflation, so that the only goal compatible with this statement is in fact total price stability. Lucas (1989) rejects the logic of this argument: If the Bank targets a level of inflation of (say) 4% and there is a price shock, and the public believes that the Bank will accommodate the price shock, this raises inflationary expectations. There is a rise in inflation as inflationary expectations feed into wage claims but if the Bank does not accommodate, then money balances fall and aggregate demand weakens, thus causing inflation to decline. In the long run, the Bank will have achieved credibility at 4% inflation.

The initial focus on price stability created debate as to what was actually meant by price stability in practice. A strict interpretation means that after any price rise, monetary policy should be set to return the price level to its previous level. A less stringent interpretation is zero inflation, where a one-off rise in the price level is tolerated but the central bank prevents this rise in the price level from feeding into even higher wages and prices.

Crow's effort to increase credibility was reinforced by the publication of inflation targets in February 1991 by the Bank of Canada and the Minister of Finance. As Crow noted, "it pays to advertise." The inflation goals were to reach 3% by the end of 1992, 2.5% by mid 1994, 2% by end 1995 and to keep inflation below this level.

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35Crow (1988) p5  
36AFR, 2/11/93
thereafter, i.e. price stability. These targets were the midpoint of a 2 percentage point target band. While not explicitly a target, the goal was to reduce inflation to 5% by end 1991. Included in the statement was the following justification for inflation targets: "to encourage Canadians to base their economic decisions on this downward path for inflation so that the lower inflation will be more readily achieved."\textsuperscript{37}

2.4 Other Institutions and Reforms

This section describes the institutions and reforms focusing on those having an impact on the inflation performance. The model in section 2.2 assumes that all other aspects of the economy remain unchanged. The effect of the institutions described in this section on the inflation and output performance will be discussed in section 2.6.

In response to the problems of stubbornly high inflation and unemployment, as well as large external imbalances, all three governments embarked on similar strategies of reform,\textsuperscript{38} despite coming from different sides of the political fence. The goals of the reforms were to enhance international competitiveness through supply-side restructuring and inflation reduction, and to address the high levels of public debt (particularly in New Zealand and Canada) through fiscal reform.

The Hawke and Lange Labour (left-wing) governments were elected in Australia in 1983 and New Zealand in '84, respectively, and embarked on programs of structural and economic reform at odds with the traditional platforms of their parties.\textsuperscript{39} In Canada, the conservative Mulroney government elected in September 1984, detailed the economic reform program in the Agenda for Economic Renewal, which was generally not as extensive in scope as the reform program in the other two countries.

The speed of reform was generally fastest and most wide-spread in New Zealand, so that New Zealand is now ranked as having the economic environment most conducive

\textsuperscript{37}From the joint statement of Governor Crow and the Minister of Finance reprinted in Bank of Canada Annual Report 1990 p61.
\textsuperscript{38}Appendix B provides more details of the economic background to these reforms.
\textsuperscript{39}The initial priority of the Hawke government was employment creation but did also include significant financial deregulation, including the floating of the $A.
to competitiveness.\textsuperscript{40} The pace of reform in New Zealand slowed somewhat in 1989 when Prime Minister Lange clashed with his Finance Minister Douglas who was arguing for an even faster pace of reform.\textsuperscript{41} When the conservative National party was elected to power in October 1990, it once again increased the speed of reform, particularly in the labour market. New Zealand now has the most deregulated labour market in the OECD.\textsuperscript{42} In Australia, there was significant financial reform, but labour market reform and privitisation was slower.

### 2.4.1 Fiscal Policy

Table 2.2 and Graph 2.10 shows the recent fiscal performance and level of debt in the three countries.

There was a significant improvement in New Zealand's fiscal position after 1984, as the deficit fell from 6.5\% of GDP to just over 1\% of GDP in 1990. The reduction in the deficit was achieved by a combination of spending cuts and a program of privatisation which had netted $NZ 6 billion by 1992 (see 4.3 below).\textsuperscript{43} The speed of deficit reduction stalled in 1987-88 but in 1990 the newly elected National government immediately proposed to re-accelerate the pace of fiscal reform with the target being a balanced budget by 1993-94. This was to be achieved by further cuts in spending, particularly cuts in welfare payments. However, a combination of low tax revenues due to the weak economy and moderation of the welfare cuts in the face of public opposition has meant that the target of a balanced budget by 1993-94 will not be met.

The level of net public debt has grown rapidly over the 1980s to its current level of over 50\% of GDP (gross debt is around 60\% of GDP). Consequently debt servicing, amounting to 5\frac{1}{2}\% of GDP, is a large reason for the continuing deficits.

In Australia, the budget moved from a deficit of over 4\% of GDP in 1983-84 to a

\textsuperscript{40}World Economic Forum/IMD World Competitiveness Report as reported in the Times 22/6/91.
\textsuperscript{41}These clashes lead to the resignation of Douglas and eventually cost Lange the leadership of the party when he was successfully challenged by Geoffrey Palmer in August 1989.
\textsuperscript{42}OECD Survey of New Zealand 1993 p9.
\textsuperscript{43}The actual proceeds from the privatisation was below the line revenue in the budget but the privatisation took several agencies off the governments books.
<table>
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<th>Fiscal Year*</th>
<th>Australia Budget deficit</th>
<th>Australia Public debt</th>
<th>New Zealand Budget deficit</th>
<th>New Zealand Public debt Gross</th>
<th>New Zealand Public debt Net</th>
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*: Fiscal year ends June 30 in Australia and New Zealand after 1989, March 31 in New Zealand up to 1989 and Canada. Canadian debt is year-end.

**Sources:**
- New Zealand: Deficit excludes proceeds of asset sales. New Zealand Treasury.
surplus of over 2% in 1989-90. This was achieved principally by spending cuts: in the 5 years to 1988-89, spending was cut by 5 percentage points of GDP. The surpluses of this period enabled the federal government to reduce public debt to levels lower in comparison to other OECD countries. However, in the last two years the budget has moved back into deficit as the weak economy has reduced tax receipts and increased unemployment benefit expenditure. The cuts in personal taxes as part of the incomes policy (see below) have also increased the deficit. The deficit is forecast to remain at just under 4% of GDP in 1993-94 but is then projected to decline to around 1% of GDP by 1996-97.\textsuperscript{44}

Canada experienced a rapid growth in public debt over the 1980s, putting a floor under attempts to control the budget deficit as interest payments accounted for over 30% of government revenue. However, the deficit was reduced from 8.1% of GDP to 4.3% of GDP by 1990-91, due principally to spending cuts. The weak state of the economy saw the deficit increase again through the early 1990s. In 1992, emergency measures, including a freeze on government salaries and discretionary spending, were adopted to prevent a further increase in the deficit.\textsuperscript{45} The overall budgetary position is exacerbated by the additional deficits of the province/local/hospital sectors which amount to over 2% of GDP.

In summary, Australia had a significantly lower public debt level than Canada and New Zealand, whose debt positions bordered on unsustainable. The stance of fiscal policy was also generally tighter in Australia than in the other two countries throughout the period.

\subsection*{2.4.2 Wage Determination}

Until the early 1980s, both Australia and New Zealand had a very centralised wage system with an above average degree of unionisation (around 53\% of the workforce in Australia and over 40\% in New Zealand, while in Canada unionisation is around

\textsuperscript{44} Budget Statement No.2 1993-94.
Furthermore in both countries, over 85% of employees were covered by awards which were also determined centrally. Unions had historically been craft-based, meaning that an individual business had to conduct separate wage negotiations with a number of different unions. As a result, a pattern of wage leap-frogging was the norm in both countries: for example, in Australia wage claims would often simply follow the National Wage Case decisions set by the Industrial Relations Commission (a national body) for the Metal Workers union whose membership spanned a significant part of Australian industry, without taking into account potentially differing microeconomic conditions across industries. Furthermore, the tradition was for firms and unions to rely on the arbitration system to resolve differences in wage claims rather than settle them through bilateral bargaining.

The goal of labour market reform in both countries was to encourage a move towards a decentralised system of enterprise bargaining, while rationalising the number and structure of unions. In New Zealand compulsory arbitration was abolished in 1984, and the Labour Relations Act of 1987 continued the decentralisation program by instituting an occupation-based national award scheme and eliminating unions with membership under 1000. The major New Zealand labour market reform was the Employment Contracts Act in May 1991, which allowed firms and workers to choose the bargaining and contract structure. It also abolished compulsory unionism but established a code of basic employment conditions. The OECD estimates that by early 1993 a majority of wage bargaining was taken place at the enterprise level.48

Since 1983, labour market reform in Australia has been conducted through a series of Prices and Incomes Accords (currently Accord VII is in place), which are agreements between the government and the union movement, covering not only wages but general welfare issues. Progressively the Accords have focussed more attention on tying wage increases to productivity improvements at the enterprise level, however,

47Awards set out, in detail, the rights of employees to certain employment conditions and the obligation of firms to provide them. They cover such issues as hours of work, overtime, leave, redundancy. (See OECD Survey of Australia 1990 p59 and footnote 46.)
they have still generally also included nation-wide wage increases.

Accord VI negotiated in February 1990 and Accord VII in March 1993 focussed explicitly on achieving low inflation with wage indexation based on future rather than past inflation increases. Accord VI was renegotiated in November 1990 after an unexpectedly low inflation outcome in September 1990. It restricted the growth of wages to a 2.5% wage increase in return for a cut in personal tax rates.

In Canada, the labour market was more decentralised than those in Australia and New Zealand. The main labour market reform of the period was a reduction in the unemployment benefit which was to be offset by increased spending on retraining unemployed workers.

2.4.3 Other Reforms

Privatisation and particularly corporatisation of government enterprises was carried out in all three countries. The largest reforms in this area were once again in New Zealand. The management of all government enterprises in New Zealand was put on a private sector (ie profit and loss) basis (including the Reserve Bank of New Zealand, as noted above) with the department heads (renamed chief executives) directly accountable for the performance of their departments and employed under short term contracts. Consequently, there was a large amount of labour shedding in the public sector. In December 1991, the level of employment had fallen to 7.4% below the 1985 level.

By 1992, over $NZ 12 billion dollars (20% of 1988 GDP) had been raised through the sale of government enterprises in New Zealand including $NZ 4.25 billion from the sale of New Zealand Telecom and $NZ 850 million from the sale of the Bank of New Zealand. In Australia, in the period 1986 to 1992, around $A 4 billion (1% of GDP in 1990) was raised from privatisation including the sale of 30% of the Commonwealth

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50 For more details see OECD Survey of New Zealand 1990-91 pp 66-69.
52 See OECD Survey of New Zealand 1993 Table A.1 p132-133.
Bank.\textsuperscript{53} In Canada, 23 public enterprises were sold from 1984 to 1992 which reduced public employment by around 80,000.\textsuperscript{54}

A program of trade liberalisation was phased in in all three countries. In Canada, the Free Trade Agreement was signed with the US in 1987, while the Closer Economic Relations agreement was implemented between Australia and New Zealand. Tariff levels were reduced in both Australia and New Zealand, down to an average of around 5\%, except in the motor vehicle industry and the textiles industry, where the goals were levels of around 15-25\% by 2000. However, in these latter industries, this entails a significant reduction from the previous levels of protection of over 100\%. New Zealand and Australia have the lowest level of agricultural assistance in the OECD.\textsuperscript{55}

A rapid and substantial process of financial deregulation occurred. In Canada, the distinction between the "four pillars" of the financial industry was removed. That is, restrictions on what type of business banks and non-bank financial intermediaries could do were abolished in December 1991. Reserve requirements for banks were phased out from June 1992.

In Australia and New Zealand, most quantitative controls were removed from the banking industry. Foreign-owned banks were allowed entry and interest rate ceilings were abolished. Both exchange rates were floated\textsuperscript{56} and foreign exchange controls were removed.

The conduct of monetary policy was altered in both Australia and New Zealand, as the relevance of monetary supply indicators broke down, under the impact of financial deregulation. Previously monetary policy was conducted through changes in the amount of government securities that banks were required to hold on their balance sheet (the Liquid Government Securities (LGS) and Statutory Reserve Deposit ratios in Australia) but banks were increasingly able to circumvent these constraints through off-balance sheet business.

Policy is now implemented through open market operations in the overnight cash

\textsuperscript{53}OECD Survey of Australia 1991-92 p95.
\textsuperscript{54}OECD Survey of Canada 1991-92 p49.
\textsuperscript{55}OECD Survey of Australia 1991-92 p74.
\textsuperscript{56}Australia floated in March 1983 and New Zealand in March 1985.
market rather than through quantitative controls and interest ceilings. The instrument of policy is the interest rate in the overnight cash market which the Reserve Banks control by altering the amount of liquidity they provide to this market. There is no one explicit intermediate target for policy, but rather in all three countries, attention is paid to a number of variables, including the exchange rate, the term structure, growth in money and credit aggregates, and inflationary expectations.

2.5 Measuring the Effects of Central Bank Independence

This section measures the effects of the changes in central bank independence on the three economies. The behaviour of inflationary expectations, Phillips curves, the movement of interest rates, and sacrifice ratios are all examined. The data on inflationary expectations indicates that there may be a "credibility premium" in New Zealand and Canada. However, there was no discernible shift in the New Zealand Phillips curve, nor is there much evidence of a "credibility premium" in interest rates. Estimates of the sacrifice ratio indicate that the disinflation was most costly in Canada and least costly in Australia, which is contrary to the predictions of the model in section 2.2.

2.5.1 Inflationary Expectations

Graphs 2.2, 2.3 and 2.4 compare actual inflation and inflationary expectations in Australia, New Zealand and Canada. The inflationary expectations series are surveys of business' inflationary expectations for the coming twelve months (six months in the case of Canada).

The drop in New Zealand inflationary expectations in the recent disinflationary period does not occur until one year after the new legislation was passed in early 1990. Nevertheless, New Zealand expectations have fallen rapidly subsequently and are now around the upper end of the price stability range (0-2%). This may reflect the fact
that the inflationary targets have been consistently attained. In fact, inflation was at the lower edge of the target band throughout the disinflation. However, inflationary expectations have generally been above the upper edge of the band.

In Canada, inflationary expectations have been at the lower end of the inflationary target bands. By March 1992, over two-thirds of those surveyed believed that inflation would be 2% or less in the coming six months and by September 1993 this number had risen to 87% of those surveyed.

Australian inflationary expectations were entrenched around 10% for most of the 1980s. The downturn in inflationary expectations lags the downturn in inflation by three quarters and the overall decline in inflationary expectations has been considerably less than the fall in inflation. One explanation for this, is that there was a large loss of credibility as a result of the experience in the 1970s. The resulting inflationary premium then persisted through the 1980s, as there were no reforms of the type in Canada and New Zealand to remove this premium.

New Zealand and Canadian inflationary expectations are considerably below those in Australia despite the comparable rates of actual inflation, suggesting that there may be a credibility bonus in the two countries. The lower inflationary expectations in New Zealand and Canada mean that the probability of maintaining price stability as the two economies recover should be higher.

The downward movement in inflationary expectations in all three countries has paralleled the downward movement in inflation. In fact inflationary expectations in all three countries are better approximated by current inflation than models of adaptive expectations where expectations are a weighted average of past inflation rates.

Inflationary expectations were regressed against current inflation and lags of inflation, and on a weighted average of past inflation where the weights decline exponentially. Table 2.3 shows the results of estimating inflationary expectations equations. Current inflation was found to explain inflationary expectations best in each country. Further, additional lags of inflation in a regression of expectations on current inflation were not significant.

The samples for New Zealand and Australia were split at the start of the disinf-
flation in Australia and the change in central bank independence in New Zealand. Chow tests for structural change were run to determine if there was a change in the formation of expectations. Ex ante one would expect there to be such a change in New Zealand but not in Australia, given the changes that occurred in New Zealand. However, the estimates for both countries exhibited structural change. In Australia, a possible explanation is the Prices and Incomes Accord which may have generated more forward looking expectations.

The equations below also show that the weight on current inflation is highest in New Zealand, perhaps suggesting some degree of forward looking expectations or perhaps due to the influence of the inflation targets in expectation formation.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>5.26</td>
<td>4.03</td>
<td>2.61</td>
<td>1.79</td>
<td>1.15</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.44)</td>
<td>(0.43)</td>
<td>(0.37)</td>
<td>(0.17)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.58</td>
<td>0.71</td>
<td>0.90</td>
<td>0.97</td>
<td>0.64</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.063)</td>
<td>(0.078)</td>
<td>(0.045)</td>
<td>(0.050)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>$\bar{R}^2$</td>
<td>0.68</td>
<td>0.83</td>
<td>0.91</td>
<td>0.96</td>
<td>0.71</td>
</tr>
</tbody>
</table>

To compare the outlook for inflation in the three economies, table 2.4 shows the inflation forecasts of the OECD and the IMF for the next two years.

This table suggests that the IMF and the OECD are expecting the low inflation
Table 2.4: OECD and IMF forecasts of inflation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>2.3</td>
<td>2.0</td>
<td>2.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Australia</td>
<td>2.6</td>
<td>2.7</td>
<td>2.6</td>
<td>3.1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1.4</td>
<td>1.5</td>
<td>1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: OECD Economic Outlook June 1993
IMF World Economic Outlook May 1993

to be more permanent in New Zealand and Canada than in Australia as the three economies climb out of recession. This confirms the implications of the expectations data, that the likelihood of maintaining low inflation as the recoveries progress is less in Australia.

Thus, it appears that credibility has been established in Canada and New Zealand, that is that the public believes the new lower (zero) value of $\mu$.

2.5.2 Phillips Curves

Simple Phillips curves similar to Blanchard (1984) were estimated for New Zealand and Australia\(^{57}\) to determine whether there was a shift in the Phillips curve due to the disinflation. The change in the wage was estimated against inflation lagged one period, inflationary expectations and the log of the unemployment rate.

The Phillips curve estimated without inflationary expectations should shift after the change in central bank structure if the change were credible. Furthermore, if the disinflation were not credible, wage changes should be above that predicted by the Phillips curve estimated using the pre-disinflationary data and without inflationary expectations, as workers do not believe the current level of inflation when setting their wages. That is, wages would be set higher than inflation, as workers anticipate a higher inflation next period.

\(^{57}\)The inflationary expectations data was not available over a long enough time horizon for Canada.
Table 2.5 shows the results of estimating Phillips curves for Australia and New Zealand.

<table>
<thead>
<tr>
<th>Estimation period</th>
<th>Australia</th>
<th>New Zealand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mar 80 - Mar 93</td>
<td>Mar 86 - Mar 93</td>
</tr>
<tr>
<td>Const</td>
<td>0.12 (0.06)</td>
<td>-0.098 (6.86)</td>
</tr>
<tr>
<td></td>
<td>0.14 (0.04)</td>
<td>4.66 (5.72)</td>
</tr>
<tr>
<td>INF(-1)</td>
<td>0.51 (0.23)</td>
<td>-0.016 (0.72)</td>
</tr>
<tr>
<td></td>
<td>0.60 (0.14)</td>
<td>0.79 (0.32)</td>
</tr>
<tr>
<td>INFEXP</td>
<td>0.0019 (0.0032)</td>
<td>1.00 (0.82)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNEMP</td>
<td>-0.050 (0.020)</td>
<td>-0.20 (0.57)</td>
</tr>
<tr>
<td></td>
<td>-0.054 (0.017)</td>
<td>-0.49 (0.53)</td>
</tr>
<tr>
<td>$\bar{R}^2$</td>
<td>0.48 0.49</td>
<td>0.72 0.71</td>
</tr>
<tr>
<td>No. of obs</td>
<td>53 53</td>
<td>29 29</td>
</tr>
</tbody>
</table>

Notes: standard errors in brackets.

In Australia, the variables enter with the expected signs: a negative coefficient on unemployment and a positive coefficient on lagged inflation and inflationary expectations. In New Zealand, lagged inflation enters with a positive sign but unemployment is negative but insignificant. When inflationary expectations are included in New Zealand, they have the expected positive sign (although insignificant) but lagged inflation now has a negative sign and is insignificant.

These Phillips curves were then re-estimated for the period up to the start of the disinflation (December 1989) and then were used to predict wage growth over the disinflationary period. In both Australia and New Zealand and using either specification of the Phillips curve, predicted wage growth lay within one standard deviation of actual wage growth, suggesting there was no movement in the Phillips curve in either country. In New Zealand, predicted wage growth was generally greater than actual wage growth while in Australia, the reverse was true possibly reflecting the impact of Accord VI (discussed in section 2.4.2). The Accord may have generated a structural shift in the Australian Phillips curve.

The Phillips curves were then tested for structural change. The sample was split.
at December 1989 and a Chow test was conducted. There was no structural change in either of the Phillips curves in New Zealand. This may be because the period of estimation only covers disinflation in New Zealand, but nevertheless, there should be a shift after the major restructuring of the central bank.

In Australia, the hypothesis of no structural change was rejected at the 10% confidence level for the Phillips curve without inflationary expectations. This could once again reflect the impact of Accord VI. However, the Phillips curve with inflationary expectations showed no sign of structural change. For both countries, tests for structural change were also run splitting the series at December 1990 and December 1991 in case the effect of increased credibility entered with a lag, but no structural change was detected.

2.5.3 Interest Rates

The change in credibility and the lower inflation should be reflected in a downward movement in long term interest rates in New Zealand and Canada relative to Australia. To achieve the same low level of inflation, Australian interest rates should increase more due to the lack of credibility and similarly rates should be higher in Canada than New Zealand. Of course, such movements may also reflect other changes such as a change in overall country risk, or changes in the expectations of future exchange rate movements.

Graphs 2.5, 2.6 and 2.7 show the relative movements in real interest rates (using both actual and expected inflation), and movements in interest rates relative to the US long interest rate. The interest rate used is the yield on a five year government bond.

Real interest rates measured using inflationary expectations fell from around 8% to below 5% in New Zealand, but have been consistently lower in Australia. In Canada real rates have not moved appreciably despite the rhetoric of Crow. New Zealand real rates using realised inflation rates declined from a peak of 9% in December 1988 to 6% in June 1993 consistent with an increase in credibility; however, there is a similar movement in the rates of Australia and generally the real rates of the two countries
have tracked each other over the period shown.

Comparing the long interest rates in each country with the US, there has been a convergence to a premium of 2% above the US rate in all three countries. The large fall in the New Zealand rate relative to the US rate occurred mostly in the first part of the disinflation, before the legislative changes in late 1989. There is however, a further 2% narrowing after the reforms of 1989.

These interest rates movements do not show much evidence of a credibility bonus. There is no sign of sharp movements in interest rates at the time of announcements of changes in central bank structure or at the announcements of inflation targets.

2.5.4 Sacrifice Ratios

Graph 2.8 shows the growth rates of real GDP in the three countries since 1980. All three economies experienced similar declines in growth during the 1982-83 recession. New Zealand growth started to fall in 1985 when the economic reforms were introduced and the focus of monetary policy was directed towards inflation. The New Zealand economy has been stagnant since 1988 and has only recently begun to grow. Canadian growth began to decline in 1988 as Crow began his price stability program. Australian growth declined around the middle of 1990, some time after the disinflationary process commenced. The decline in growth in Australia was significantly less than in the other two countries.

The recent output performances of the economies are compared in Graph 2.9. The Canadian economy has only recently recovered its output level of March 1989. Once again, the relatively better growth performance of the Australian economy is apparent. Yet, the fall in inflation in Australia was greater than that in Canada and the same as that in New Zealand over the same period.

A means of quantifying this more precisely is the sacrifice ratio. The sacrifice ratio is the loss in output below trend during the disinflation divided by the reduction in inflation.

Previous attempts to measure the sacrifice ratio have generally used versions of a
Phillips curve estimated over long time series. As Ball (1993) notes this “constrains the output-inflation tradeoff to be the same during disinflations as during increases in trend inflation or temporary fluctuations in demand.” When institutional changes such as occurred in New Zealand happen, it is also possible that the Phillips curve shifts (although no evidence of this was found in the previous section). Any change in inflationary expectations such as that due to an increase in credibility, will change the structural relationship.

I will adopt a method similar to that used by Ball. To identify the periods of disinflation, a centred moving average of inflation was constructed. The start of a disinflation was identified by a peak in this series, where a peak is defined as a quarter whose inflation rate is greater than that in the previous and following four quarters. Similarly, the end of the disinflation was identified as a trough in the smoothed inflation series, where a trough is a quarter whose inflation rate is lower than that in the previous and following four quarters. This method corresponds well to a simple examination of the inflation graph, but avoids the confusion of short term fluctuations around the trend.

The denominator of the sacrifice ratio is the change in inflation from peak to trough. The numerator of the sacrifice ratio is the loss in output below trend during the disinflation. This requires the calculation of trend output. Two methods were adopted to calculate trend output. Firstly, using the same method as Ball, output was assumed to be at trend at the inflation peak and was assumed to be back at trend four quarters after the inflation trough. Joining these two points with a log linear trend defined trend output. Secondly, a simple trend line was fitted to the log of quarterly GDP for each country for the post 1973 period, and the loss in output is simply the sum of the deviations in output from this trend line during the disinflation.

Table 2.6 shows the sacrifice ratios calculated in Ball (1993) for the three countries in question here and three other industrialised countries. New Zealand had the most costly disinflation after the first oil price shock while the cost in Canada and Australia

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58 See Gordon 1982 and 1985, Okun 1978
59 Ball 1993 p3
was about the same, consistent with the similar structures of the central banks. The costs of the disinflations after the second oil price shock were higher in Canada and Australia but significantly lower in New Zealand. The country with highest sacrifice ratio after the two oil shocks was Germany with the most independent central bank, whilst the country with the smallest sacrifice ratio was Japan where there is substantial interaction between the Bank of Japan and the Ministry of Finance.

Table 2.6: Ball’s Estimates of the Sacrifice Ratio

<table>
<thead>
<tr>
<th>Country</th>
<th>Disinflation</th>
<th>Length (Quarters)</th>
<th>Initial Inflation</th>
<th>Change in Inflation</th>
<th>Sacrifice Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>2:74-1:78</td>
<td>15</td>
<td>14.6</td>
<td>6.57</td>
<td>0.8</td>
</tr>
<tr>
<td>Australia</td>
<td>1:82-1:84</td>
<td>8</td>
<td>10.5</td>
<td>4.98</td>
<td>1.3</td>
</tr>
<tr>
<td>Canada</td>
<td>2:74-4:76</td>
<td>10</td>
<td>10.6</td>
<td>3.14</td>
<td>0.6</td>
</tr>
<tr>
<td>Canada</td>
<td>2:81-2:85</td>
<td>16</td>
<td>11.6</td>
<td>7.83</td>
<td>2.4</td>
</tr>
<tr>
<td>New Zealand</td>
<td>75-78</td>
<td>3 yrs</td>
<td>13.2</td>
<td>3.73</td>
<td>1.3</td>
</tr>
<tr>
<td>New Zealand</td>
<td>80-83</td>
<td>3 yrs</td>
<td>13.5</td>
<td>8.19</td>
<td>0.2</td>
</tr>
<tr>
<td>New Zealand</td>
<td>86-88</td>
<td>2 yrs</td>
<td>12.3</td>
<td>7.62</td>
<td>0.1</td>
</tr>
<tr>
<td>Germany</td>
<td>1:73-3:77</td>
<td>18</td>
<td>6.92</td>
<td>4.23</td>
<td>2.6</td>
</tr>
<tr>
<td>Germany</td>
<td>1:80-3:86</td>
<td>26</td>
<td>5.86</td>
<td>5.95</td>
<td>3.6</td>
</tr>
<tr>
<td>US</td>
<td>1:74-4:76</td>
<td>11</td>
<td>9.70</td>
<td>4.00</td>
<td>2.4</td>
</tr>
<tr>
<td>US</td>
<td>1:80-4:83</td>
<td>15</td>
<td>12.10</td>
<td>8.83</td>
<td>1.8</td>
</tr>
<tr>
<td>Japan</td>
<td>1:74-3:78</td>
<td>18</td>
<td>17.10</td>
<td>13.21</td>
<td>0.6</td>
</tr>
<tr>
<td>Japan</td>
<td>2:80-4:83</td>
<td>14</td>
<td>6.68</td>
<td>5.07</td>
<td>0.02</td>
</tr>
<tr>
<td>Japan</td>
<td>2:84-1:87</td>
<td>11</td>
<td>2.29</td>
<td>2.11</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: Ball (1993).
Sacrifice ratios differ by a factor of 4 from those in the original source on Ball’s recommendation, to express them in annual terms.
*: New Zealand calculated using annual data.

The upper half of Table 2.7 shows my calculations of the sacrifice ratio using a direct application of Ball’s method. Given that the identified end of the recent disinflations were in mid-late 1992 for New Zealand and Canada, there was not four
quarters of subsequent data with which to identify trend output. For New Zealand, the last quarter for which output data was available (March 1993) was used as a proxy, and so the sacrifice ratio may be a little understated. For Canada, the average growth of output in the eight quarters before the disinflation was used. When the denominator was estimated using trend output, the results were little changed except that the sacrifice ratio for Canada in the most recent disinflation was around 2.5.

The recent disinflation in New Zealand can either be dated from the last quarter of 1985 or it can be split into two periods of disinflation: from 4:85 to 1:89 and 4:89 to 2:92. If the latter method is used, there is no net output loss for the earlier disinflation. This is because output declines within one year of the end of the first disinflation as the second disinflation commences, thus output never returns to trend. Hence the sacrifice ratio is only shown for the second part of the disinflation and for the disinflation as a whole.

<table>
<thead>
<tr>
<th>Country</th>
<th>Disinflation</th>
<th>Length (Quarters)</th>
<th>Initial Inflation</th>
<th>Change in Inflation</th>
<th>Sacrifice Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>2:74-1:78</td>
<td>16</td>
<td>14.6</td>
<td>6.41</td>
<td>0.6</td>
</tr>
<tr>
<td>Australia</td>
<td>1:82-1:84</td>
<td>9</td>
<td>10.6</td>
<td>4.76</td>
<td>1.4</td>
</tr>
<tr>
<td>Australia</td>
<td>4:89-1:92</td>
<td>10</td>
<td>7.8</td>
<td>6.13</td>
<td>0.3</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2:80-4:83</td>
<td>15</td>
<td>18.0</td>
<td>14.4</td>
<td>0.3</td>
</tr>
<tr>
<td>New Zealand</td>
<td>4:85-2:92</td>
<td>27</td>
<td>15.3</td>
<td>14.4</td>
<td>0.1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>4:89-2:92</td>
<td>11</td>
<td>7.20</td>
<td>6.23</td>
<td>0.7</td>
</tr>
<tr>
<td>Canada</td>
<td>3:74-1:77</td>
<td>11</td>
<td>11.0</td>
<td>4.20</td>
<td>0.3</td>
</tr>
<tr>
<td>Canada</td>
<td>2:81-2:85</td>
<td>17</td>
<td>12.6</td>
<td>8.64</td>
<td>2.2</td>
</tr>
<tr>
<td>Canada</td>
<td>1:90-4:92</td>
<td>12</td>
<td>5.41</td>
<td>3.62</td>
<td>4.6</td>
</tr>
</tbody>
</table>

In the recent disinflations, all three countries had around the same initial inflation, and the lengths of the disinflation were approximately the same. However, the costs of disinflation are clearly greatest in Canada. Not only was the cost greater than in Australia and New Zealand but it was also significantly larger than in previous
Canadian disinflations.\textsuperscript{60}

Other studies have reported lower sacrifice ratios for Canada. Cozier and Wilkinson (1991) use an expectations augmented Phillips curve over the period 1964-1988 (thus excluding the recent disinflation) and calculate a sacrifice ratio of around 2. Their estimate varies depending on the assumption used to generate trend output. If a linear trend is used (as described above), their estimate is as high as 6.3. Further, the objections raised above in discussing the use of Phillips curves apply here, that is they should be estimated over the disinflation, not the whole period.

Howitt (1990) estimated a sacrifice ratio for the 1981-82 disinflation of 4.7, assuming a natural rate of unemployment of 7.5\% and an Okun coefficient of 2. He also discounted the output losses.

Thus the sacrifice ratio suggests that there was no gain in terms of minimising the output loss from the increased central bank independence in New Zealand. The loss in Canada suggests that there may be a larger cost where there is no supporting institutional change, in that the Bank of Canada had to signal its true (anti-inflation) type with an aggressively tight monetary policy.

This conclusion of central bank independence not reducing the costs of disinflation is supported by examining all the countries in Table 2.6. Table 2.8 shows regressions of Ball's sacrifice ratios on the indices of central bank independence developed by Alesina (1988) and Grilli, Masciandaro and Tabellini (1991). The regression was first run using only the central bank indices. It was then rerun using country and disinflation dummies. Both the annual and the quarterly sacrifice ratios reported in Ball were used.

The results of these regressions suggest that central bank independence has a positive effect on the sacrifice ratio. That is, that disinflations are more costly when the central bank is more independent. This result is robust to the inclusion of the dummies. It is stronger for the Grilli et al index than the Alesina index. This is contrary to the theory in equation 2.4. Apparently there is no gain from credibility in disinflations. It potentially casts doubt as to the strength of the influence of

\textsuperscript{60}In fact, it is the highest sacrifice ratio of any of the 19 industrialised countries in Ball's sample.
the actions of the central bank on inflationary expectations, which is one of the cornerstones of the central bank independence literature.

However, the costs of disinflation are not solely dependent on the relative degrees of central bank independence. Section 2.6 will discuss the likely influence of other factors such as the stance of fiscal policy and the impact of the structural reform programs.

2.6 Summary of Results

The results of the previous section suggest that there was no gain from the increased independence in New Zealand and Canada in terms of a less costly disinflation. The sacrifice ratio was higher in New Zealand and Canada than in Australia and also higher than in previous disinflations in the two countries.

However, in New Zealand the other structural reforms discussed in section 2.4 are likely to have added to the severity of the fall in output, particularly the loss of employment from the public sector reforms and privatization. Further, the slower pace of the fiscal reform may have ameliorated the effects of the central bank reform. Using Australia as a comparison, the cost of disinflation was not significantly greater
in New Zealand.

The reform program in Canada was considerably less extensive than that in New Zealand (and was certainly no more extensive than that in Australia), and thus can be ruled out as a cause of the high disinflation cost. There are two other possible explanations for the high cost of the disinflation in Canada.

Firstly, rhetoric was not enough to generate the increase in credibility in Canada that the major legislative reform achieved in New Zealand. “For policy credibility to work, the authorities must first have you believe the announced disinflation, and second convince you to act upon this belief ... even if you think the governor is very sincere ... model uncertainty, parameter uncertainty, and shock uncertainty, will lead you to believe only what you see.”\textsuperscript{61} The changes in New Zealand explicitly changed the parameter $\mu$ in the model in section 2.2, which implies a lower disinflation cost. Uncertainty over the value of $\mu$ was reduced with the stipulation of the price stability goal along with the supporting pillars of accountability and removal of covert government interference. However, in Canada, the Bank of Canada had to support their rhetoric with a vigorous application of tight monetary policy. That is, to signal their true type and reduce the uncertainty, the Bank may have been overly conservative, thus increasing the disinflation cost.

Secondly, as discussed in section 2.2, fiscal policy plays a key role in determining the costs of disinflation as stressed by Sargent (1982). The looser stance of fiscal policy and potential unsustainability of the public debt situation in Canada may have increased the cost of disinflation by reducing credibility. Budget projections in Canada actually relied on forecasts of 3% inflation over the early 1990s to generate additional tax revenues thus undermining the rhetorical efforts of Crow.\textsuperscript{62}

On the other hand, in Australia the fiscal surpluses and stable public debt position had a two-fold bonus. Firstly they removed the threat of future needs for seigniorage revenue and secondly they provided the revenue for the wage-tax tradeoff. Thus the incomes policy assisted the disinflation process, particularly if it re-re-oriented

\textsuperscript{61}Fortin (1991) p783
\textsuperscript{62}See Johnson (1990)
the focus of inflation expectations to the future rather than the past. However, the potential for further application of such a policy of obtaining a lower wage rise in exchange for tax cuts is limited by the budgetary position. This policy was useful in achieving a once-off relatively costless disinflation but without the reform of the central bank, the prospect remains for inflationary surprises in the future.

This proposition is supported by the inflationary expectations data which shows more evidence of a credibility gain in New Zealand and Canada in that low inflation may be locked in, in the future in New Zealand and Canada as the economy recovers but this appears not to be so in Australia. However, the interest rate data does not indicate an obvious “credibility premium.” Nor is there any obvious shift in the Phillips curve in New Zealand consistent with a downward shift in inflationary expectations.

2.7 Conclusion

The increase in the independence of the Reserve Bank of New Zealand provides a natural experiment to test the theoretical implications of the central bank independence literature. The similar inflationary experiences of Australia and Canada provide a rare set of controls to determine whether the disinflation was more or less costly.

This chapter shows that in the short term, the costs of disinflation have not been less in New Zealand than in Australia, and that in Canada where increased credibility was only supported by rhetoric and not legislation, the costs were higher. However, other concurrent reforms in New Zealand may have clouded the picture. Furthermore, the lack of fiscal reform in New Zealand and Canada comparable to the monetary reform, may have undermined the increased credibility.

The true test may be the path of inflation in the three countries as the economies recover. Inflationary expectations indicate that New Zealand, and to some extent Canada, are more likely to maintain their low level of inflation in the longer term. However, the recent threats by the newly elected Canadian government to use monetary policy to revive the economy show how fragile the concept of policy credibility
can be.

The results of section 2.5 also pose something of a dilemma: while central bank independence is useful in maintaining a low inflation environment, it may *increase* the costs of achieving low inflation.

The other conclusion to draw is that actions speak louder than words. The cost of the Canadian disinflation was higher than that in New Zealand in part because of the actions of the New Zealand government in providing an environment conducive to enhancing the credibility of the Reserve Bank of New Zealand. However, even in New Zealand, it required a few years of stringent monetary policy before credibility was fully established.
Graph 2.10: Budget Deficits
Percentage of GDP

- Australia
- New Zealand
- Canada
Chapter 3

A History of Central Bank Independence

When the use to which we are putting an old thing is a new use, in common sense we should think whether the old thing is quite fit for the use which we are setting it. 'Putting new wine into old bottles' is safe only when you watch the condition of the bottle, and adapt its structure most carefully.

- Bagehot on the constitution of the Bank of England, 1873.¹

Lack of agreement among experts on the subject of central banking has gone far beyond the bounds of desirable and stimulating intellectual controversy. It approaches an intellectual scandal, with shocking effects of the gravest import upon the formulation of public opinions.²

3.1 Introduction

The issue of central bank independence has been discussed since the beginnings of the first modern central banks in Sweden in 1668 and England in 1694. Many of the greatest writers in monetary economics have discussed the issue, from Adam Smith through Thornton, Bagehot, Fisher, Hawtrey, Hayek, Keynes and Friedman. As in many other areas of economics, some part of the current debate solely consists of

¹Bagehot (1873) p118
²Riefler (1936) p707.
reinventing the wheel, that is rediscovering the issues that have been raised before. The purpose of this chapter is to provide the historical underpinnings of the discussion of the other two chapters, by summarising the historical literature on central bank independence.\(^3\) In doing so, the hope is to shed light on the current debate including the desire in some parts of the United States government to change the structure of the Federal Reserve, and the discussion about increasing the independence of the Bank of England.

Writing in 1936, Winfield Riefler, in the above quotation, lamented the state of the debate, while reviewing five recently published books on the subject of central banking, including Hawtrey's *Art of Central Banking*. Then, as now, there were conflicting opinions as to the appropriate objectives for the central bank (in particular, whether there should be a return to the gold standard) and the role of, and need for discretionary policy. The same issues are at the centre of the debate today with perhaps a similar degree of "intellectual scandal" still persisting.

The recent rise in the intensity of the debate appears attributable to the rise in inflation in the seventies. However, this is really only due to the fact that the debate on central bank independence was in a lull in the immediate post-war era. Most other periods of history have exhibited a similar outpouring of opinion. Generally, the actions of the central bank and its degree of independence become an issue in times of crisis. For instance, Bagehot's *Lombard Street* was written in response to the consequences of the Bank Act of 1844 and its subsequent suspensions in 1847, 1857 and 1866.\(^4\)

It is also useful to examine the recent inflationary experience in a longer historical perspective. Graphs 3.1 and 3.2 show the consumer price index in England and the United States since the 18th century.\(^5\) The graphs show that the remarkable feature of the experience of the second half of the twentieth century is the persistence of positive inflation rates in the two countries. In the post-War period the price level

\(^3\) Other literature examining the history of central bank independence includes de Kock (1974), the volume edited by Toniolo (1988), Goodhart (1988) and Capie, Goodhart and Schmidt (1994).

\(^4\) See the discussion below.

\(^5\) The data is from Mitchell (1992) and (1993).
Table 3.1: UK and US Inflation: Historical Series

<table>
<thead>
<tr>
<th>Period</th>
<th>UK Average</th>
<th>UK Variance</th>
<th>US Average</th>
<th>US Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1782-1831*</td>
<td>0.8</td>
<td>94.0</td>
<td>-1.3</td>
<td>39.2</td>
</tr>
<tr>
<td>1832-1879</td>
<td>-0.3</td>
<td>38.8</td>
<td>-0.1</td>
<td>45.5</td>
</tr>
<tr>
<td>1880-1914**</td>
<td>0.0</td>
<td>6.3</td>
<td>0.2</td>
<td>7.5</td>
</tr>
<tr>
<td>1915-1945</td>
<td>2.7</td>
<td>84.6</td>
<td>2.2</td>
<td>53.4</td>
</tr>
<tr>
<td>1946-1993</td>
<td>6.3</td>
<td>26.5</td>
<td>4.5</td>
<td>12.6</td>
</tr>
</tbody>
</table>

* US: 1801-1831
**: Gold Standard

Sources: Mitchell (1992) and (1993), IMF: International Financial Statistics

has rarely declined (on an annual basis) in either country. However, focussing on the price level masks interesting behaviour in the inflation rates.

Graphs 3.3 and 3.4 show the inflation rates over the same period. The only period of obvious price stability was the gold standard period of 1880-1914. Table 3.1 shows the average level of inflation and the variance of the inflation rate over long time periods. It shows that inflation is no more variable now than it was in other periods of history, with the exception of the Gold Standard period. The significant difference is the higher average level of inflation which has generated the trend upwards in the price level. In other periods of history, rises in the price level were just as sharp but were followed by periods of deflation.

The focus of this chapter will be on three aspects of central bank independence: the proper objectives for a central bank; accountability; and the relationship between the central bank and the government. The next section will discuss the first of these. Initially the need for objectives was moot, given that the central bank was a private company with a profit motive. However, over time, as it was realised that the central bank (bank of issue) was not like other commercial banks, debate arose as to the appropriate objectives for it. The profit motive evolved into the stable rule of the gold standard. As the effects of the actions of central banks on the economy were understood, and after the demise of the gold standard created an objectives vacuum,
the objectives of economic stabilisation filled the breach. Section 3.3 will discuss the accountability of central banks. The fourth section will examine the relationship with government, including the role of the government in the management of the central bank. Central banks were often founded when the government granted them special privileges in return for loans. However, this relationship has evolved to the point where the central bank no longer relies on the government as much for its preeminent position in the economy. The final section concludes and links the historical debate to the current one.

3.2 What Should the Objectives be?

This section traces the discussion about the appropriate objectives for a central bank. The discussion has evolved from the role of the profit motive for the early central banks, through Bagehot and Thornton and the "lender of last resort", to the Gold standard era and the "rules of the game", to Hawtrey, Fisher, Hayek and Keynes and the explicit acknowledgement of a role for discretionary policy to Friedman and the non-discretionary monetary growth rule. Hayek (1984) characterises this progression of the role of the central bank as one from crisis prevention to activist intervention. Irving Fisher describes the evolution as from chaotic paper to the gold standard, then from a chaotic gold standard back to paper.\(^6\)

The first central bank of the modern era was the Riksbank in Sweden, founded in 1668. However, the Bank of England, founded soon after in 1694, is generally regarded as defining the concept and art of central banking.\(^7\) The Bank of England was formed in 1694 when William Patterson approached William III (who was then experiencing serious difficulty in raising funds due to the debts of his predecessor Charles II), with the proposition that he and his fellow subscribers would provide a loan to the government in return for the right to set up a bank which could issue loans and print banknotes.

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\(^6\) "Future of the Gold Standard" in Young (1925) pp 95-98.

\(^7\) Sayers (1976) p1-2 notes that it is surprising that it was the Bank of England that became the role model rather than the European banks.
Thus the first central bank, the *Governor and Company of the Bank of England* was set up as a private company. Consequently the issue of objectives for the central bank was moot: the Bank of England's goal, like that of any other private company, was to maximise profits. The effect that the actions of the Bank could have on the economy were not seriously considered. Fetter (1965) cites evidence that "although never stated in unequivocal terms, the Bank was considered an essentially private business except for the obligation to make loans to Government."\(^8\)

One of the first clear statements of the actions of the Bank of England and its role in the economy was provided in 1802 by Henry Thornton in his treatise *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*.\(^9\) This treatise considered the effects of money and credit on the macro-economy, and examined such concepts as the velocity of circulation, the motives for holding money and liquidity preference. In Hayek's words, it provided the underpinnings for the renewed debate on monetary theory, and also was "the most important single contribution" to the debate which included Ricardo and Tooke.\(^10\)

However, Thornton paid little attention to what the objectives of the Bank should be, but only to its relationship with the government and the rest of the banking sector. The objectives were still assumed to be that of a profit-maximising company but now there was recognition of the effect of the Bank's actions on the rest of the economy. Public doubt arose as to whether the Bank should consider the effects of its actions, rather than focus on its own profitability.

The Bank Act of 1844, which granted monopoly of the note issue to the Bank of England, appeared to remove this doubt from the minds of the directors of the Bank.\(^11\) The Act also separated the Bank of England into two distinct parts: the Issue Department and the Banking Department. The Issue Department was responsible for issuing the notes, on which there was placed a upper limit (unless backed fully by

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\(^8\)Fetter (1965) p61

\(^9\)Thornton (1802). Thornton was a descendant of two of the early directors of the Bank of England, and was second cousin and a close friend of William Wilberforce. He entered parliament at the age of 22. Hayek provides a detailed biography in the introduction to this reference.

\(^10\)ibid p37

gold). The Banking Department was to act like a normal commercial bank. Thus the Act could be interpreted as a halfway house between the profit motive and the gold standard. The Banking Department pursued profit goals while the Issue Department had some regard to the macro-economy and gold.

After the passing of the Act, the Bank lowered its discount rate in 1845 to increase its discount business. Credit increased rapidly in late 1845 and 1846 and the reserves of the Bank fell dramatically, finally culminating in the suspension of the Bank Act in 1847 which suspended the distinction between the two departments. Subsequently, the Bank continued to maintain its discount rate below the market rate. Consequently given the excess demand, the Bank rationed credit, resulting in a credit crunch. In rationing credit the Bank had ignored the possibility of acting as a lender of last resort. Rather, in conducting its discount rate policy, it had sought to expand business and profit (although it was not overly successful at the latter). That is the operations of the Banking Department were considered more important.

As a result of the 1847 suspension and the subsequent suspensions of the Act in 1857 and 1866, in *Lombard Street* (1873), Walter Bagehot provided one of the first discussions of the appropriate objectives for the Bank.\(^{12}\) His complaint was that the state had not recognised that the Bank of England was not like any other private bank. Bagehot desired a complete transition which had not been made possible by the Bank Act. Palgrave, in reviewing *Lombard Street* concurred: “the Bank of England is far more than a great trading company, ... it is a great public institution charged with public duties.”\(^{13}\) However, despite these exhortations, Sayers argued “the Bank’s conduct continued to be inhibited ... by its status as a private company.”\(^{14}\)

Bagehot went on to provide, in his classic treatment of the Bank as lender of last resort, one of the first and most concise statements of the role of the central bank in the greater macro-economy, where a wider vision is required than that of the company’s profits: (Although, he argued that the pursuit of these greater objectives is not inconsistent with the Bank’s own profit motive.) “At present the Board of

\(^{12}\) *Lombard Street* was a summation of Bagehot’s writings as editor of the *Economist* from 1860.

\(^{13}\) Quoted in Fetter (1965) p275.

\(^{14}\) Sayers 1976 p3.
Directors are a sort of *semi*-trustees for the nation. I would have them real trustees, and with a good trust deed."\textsuperscript{15} That is, the deed of a chartered stock company is not appropriate for the Bank of England and should be replaced. Bagehot was not clear as to the form this deed should take beyond vague intimations that it should be in the national interest.

In discussing the performance of the Bank of England and the appropriate objectives for it, Bagehot touched on but then discarded an issue that recurs frequently in the discussion of central bank independence – that of whether such an institution should even exist. If there were no central bank - a "free banking system" - then the issue of the appropriate objectives is not relevant. The argument then turns to the appropriate degree of regulation of the banking sector.

Despite his preference for free trade, Bagehot argued for the maintenance of the status quo of "a monarchy in banking", rather than a return to a free banking world because of the hysteresis of "an instructive confidence generated by use and years ... if some miracle should put it down in Lombard Street, [a free banking system] would seem monstrous there. Nobody would understand it or confide in it."\textsuperscript{16}

The Banking Act of 1844 had given rise to a vocal debate on the continuance of the Bank of England in its current form. The editor of the *Economist* prior to Bagehot, James Wilson, was at the forefront of the movement in favour of free banking, extending his belief in free trade to encompass the banking sector. The movement gained impetus during the 1840s and 1850s with supporters including John Stuart Mill arrayed against the defenders of the Bank of England that included Palgrave and Jevons.

Later writers objected to Bagehot's dismissal of the alternative of free banking, frequently citing the success of the Scottish banking system which did not possess a central bank until Prime Minister Peel in 1845 (one year after the Banking Act of 1844) essentially brought the Scottish banks under the auspices of the Bank of England by cutting off their own note issue. Vera Smith in 1936 advocated a return

\textsuperscript{15}Bagehot (1873) p35.
\textsuperscript{16}ibid p33
to free banking in *The Rationale of Central Banking*. The issue has been revived again in the 1980s by White (1984), Goodhart (1988, who opposes free banking), and Dowd (1989) following on from Friedman (1953).\(^{17}\)

The discussion of free banking was muted during the gold standard era, most likely due to the relative financial stability of the time. Perhaps, the fact that in theory the gold standard reduced the central bank to a machine solely responsible to the dictates of the gold standard - the "rules of the game" - also reduced the intensity of the debate.

### 3.2.1 The Gold Standard

From the later part of the nineteenth century, the profit motive had been subsumed by the adoption of the Gold Standard. Although by this time, the actions of the central bank had been recognised as having effects on the real economy, little attempt had been made to take these into considerations in the banks' objectives in the legislation or in practice. The economic impact of monetary policy was either regarded as completely secondary to the maintenance of the gold standard, or seen as not incompatible with it. While "[c]entral banks retained discretion over when and how to intervene ... [t]here was no question, ... that at the end of the day the authorities ... would take whatever steps were necessary to defend gold convertibility."\(^{18}\) Furthermore, a number of the contributions to Young (1925) argue that the central bank had no control over the internal economy.\(^{19}\)

While theoretically the gold standard obviated the need for policy discretion, the evidence suggests otherwise. Bloomfield (1959) argued that despite the gold standard, there was a large window of discretion for monetary policy, which thus gradually brought the issue of the appropriate objectives for monetary policy back to the forefront. Bordo and Kydland (1990) argue that the "gold standard rule was

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\(^{17}\)The other issues in this literature will not be treated here. For a comprehensive summary and presentation of the debate, see Dowd (1989) and Goodhart (1988). Smith (1936) is an early and authoritative text on the issue.


\(^{19}\)See for instance, Strauss, Canaan.
often used more as a desirable goal than an operational rule."\textsuperscript{20}

Convertibility was undoubtedly the principle concern of central banks during the gold standard period. However, as was the case under the Bretton Woods exchange rate era, convertibility was not necessarily a two way street. Banks were quick to take action to replenish depleting reserves but were sluggish to check rising reserves. The following statement by the Bank of England in testifying before the National Monetary Commission from the United States Senate\textsuperscript{21} in 1910 supports this: "[B]ank rate is raised with the object of preventing gold leaving the country, or of attracting gold to the country, and lowered when it is completely out of touch with market rates."\textsuperscript{22}

Central banks thus had discretion whether to adjust interest rates or reserves. This may suggest goals beyond that of convertibility, but that is not supported by the 1931 Macmillan Report into the Bank of England which stated that "before the war scarcely anyone considered that the price level could or ought to be the care or preoccupation, far less a main objective of policy, on the part of the Bank of England or any other Central Bank."\textsuperscript{23}

Eichengreen (1992) argues that the adoption of the gold standard placed "golden fetters"\textsuperscript{24} on the policy actions of central banks. The maintenance of the gold standard depended on the twin pillars of credibility and convertibility. In turn, the credibility of the gold standard was supported by international cooperation among central banks in times of crisis, and the fact that the convertibility rule was simple, easily pursued and understood and hence credible. Eichengreen attributes the fact that the goal of convertibility was not compromised by pressures to pursue other goals, to two factors. Firstly, the link between unemployment and money was not clearly understood, secondly there was an absence of a political bloc in favour of reducing unemployment.

The gold standard is a fixed exchange rate regime, thus monetary policy is en-

\textsuperscript{20}Bordo and Kydland (1990) p3
\textsuperscript{21}This Commission was established to examine the structure and practices of a number of the existing central banks of the time, in preparation for the establishment of the Federal Reserve.
\textsuperscript{22}National Monetary Commission 1910 p26.
\textsuperscript{24}Eichengreen (1992). The original source of this phrase is Keynes (1932).
dogenous. Hence there was no real room for the pursuit of goals incompatible with the continuance of the gold standard regime, particularly given the concurrent belief in the balanced budget which ruled out fiscal policy. A shift to a floating exchange rate regime was necessary to permit discretionary monetary policy in the pursuit of other goals.

Eichengreen argues that the gold standard broke down as it twin pillars were undermined. The War undermined international cooperation as governments began to pursue "nationalist policies." 25 Secondly, central banks had to compromise their independence in managing the national debt. Most central banks had been founded to assist in the financing of earlier war efforts. Hence it is no great surprise that in the War, central banks again lent money to the government. Thirdly, Eichengreen argues, a political constituency arose for the unemployed which required consideration of employment issues in the conduct of monetary policy, putting pressure on the independence of central banks. The emphasis on independence today may be seen as disenfranchising this constituency.

3.2.2 Monetary Policy and Economic Stabilisation

The demise of the gold standard created something of a vacuum. Monetary policy was no longer endogenous, so to what end was it to be directed? The gold standard had provided a rule which was generally easily adhered to, hence after the War, central banks desired in the first place a return to that rule. Meanwhile, within academia, a growing body of research was advocating the use of monetary policy for economic stabilisation.

The rise of the concept of monetary policy as a tool which could be used for economic stabilisation is often attributed to Keynes in his writings on monetary policy in Essays in Persuasion, the Tract on Monetary Reform, and the Treatise on Monetary Theory. However, this reflects the rhetorical abilities of Keynes and his general influence in the affairs of the day (including particularly his role on the 1931 Macmillan

Committee enquiry into the Bank of England where he expounded parts of the *Treatise*), which enabled him to place discretionary monetary policy directed at economic stabilisation not only on the public agenda, but also in the mindset of the Bank of England.

Hayek attributes the rise of the concept to the work investigating the business cycle of W.C. Mitchell and his colleagues at the National Bureau of Economic Research in the United States, and to the work of European economists including Wicksell, von Mises and Cassel.\textsuperscript{26} He himself opposed stabilisation policy, arguing that “so long as we make use of bank credit as a means of furthering economic development we shall have to put up with the resulting trade cycles.”\textsuperscript{27}

An early statement of the role for discretionary policy can be found in Wicksell’s 1907 article *The Influence of the Rate of Interest on Prices*. Wicksell provided a concise statement detailing how banks could influence prices by varying interest rates. He argued that no single bank had the power to do this, but his conclusion appears to be based on his assumption of a competitive banking system. If a central bank is assumed, Wicksell’s argument is that stabilisation is possible in the short run, although, he argued, not in the long run.

Irving Fisher in 1912 also strongly advocated the stabilisation of the price level. In *The Purchasing Power of Money* he argued that the dependability of the purchasing power of money was an integral part of the economic system. While he regarded the gold standard as a useful standard for the time, he forecast that its usefulness would pass and considered alternatives. Among these were a money growth rule, complete indexation of the economy (Marshall’s tabular standard), and the proposal that he most advocated which was a gold-based fixed exchange rate system, which was essentially the system adopted in the Bretton Woods agreement after World War II (although Fisher’s description had Austria at the core rather than the United States). Fisher rejected a monetary growth rule, arguing that it works while there is confidence in it, but that “sad experience teaches that ... while theoretically capable of steadying

\textsuperscript{26}Chapter 1 of Hayek (1984).
\textsuperscript{27}Hayek (1933) p189.
prices, [it] is apt in practice to be so manipulated as to produce instability.”\textsuperscript{28} All of Fisher’s proposals advocated replacing the gold standard rule with another rule, but the aim of the new rule was internal stability rather than the gold standard’s aim of external stability.

In England, stabilisation policy was being advocated by Hawtrey and Lavington. Hawtrey had influence in the English Treasury after the War and at the International Economic Conference of 1922 in Genoa, called by the Supreme Council of Allies.\textsuperscript{29} In \textit{Currency and Credit}, published in 1919, Hawtrey advocated the replacement of the gold standard with the objective of stabilising a price index and trade indicators. This system was still however supposed to be international. Hawtrey desired the continuation of the gold standard ideal of international policy cooperation, and in fact, his proposals were reflected in the resolutions of the Genoa conference. Thus, stabilisation policy had arrived on central banks’ agendas.

In 1932 Hawtrey argued that while on the gold standard the operations of the central bank were clearly defined, but now they required amendment given the change in the economic environment and the theoretical advances. He argued that it was the government’s responsibility to provide the new objectives:\textsuperscript{30}

\begin{quote}
If the central bank were able and willing to take a wide view of the public interest, it could be left to take measures at its discretion. But it is the business of a Government to take a wide view of the public interest; it is not the business of a chartered company.
\end{quote}

Furthermore, Hawtrey argued that gradual adjustments of monetary policy on a moderate scale would prevent the need for larger adjustments later.\textsuperscript{31} For instance he argued that “the residue of freedom remaining to the central banks was quite sufficient to enable them to prevent the depression and crisis of the past three years [1929-1932]. That it was not used was the result partly of divided responsibility and

\begin{flushleft}
\textsuperscript{28} Fisher (1912) p329.  \\
\textsuperscript{29} This draws on Howson (1985). The Genoa conference was designed to reconstruct the financial system after the War. The United States was notably absent.  \\
\textsuperscript{30} Hawtrey (1932) p284.  \\
\textsuperscript{31} ibid p300
\end{flushleft}
partly of a want of farsightedness."

Lavington writing in 1921, advanced similar proposals to Hawtrey, but without the emphasis on international cooperation. He argued that purchasing power fluctuations undermined the fabric of society. It was thus in the social interest for the Bank of England to direct its actions to stabilising these fluctuations by controlling the supply of money. Lavington acknowledged that the effects of monetary policy on the economy was imprecise, but that within these limitations the central bank should still aim not only to stabilise the current value of purchasing power but also anticipate and counteract future movements. Lavington anticipated the criticism that price stabilisation could have adverse effects on activity in the short run, but he rejected the criticism, arguing in similar fashion to Hawtrey that preemptive price stabilisation avoided the need for a larger crisis later, and the “wasteful application of resources” in the interim.

While stabilisation policy was being considered in academia, it was not being adopted in practice. Mints (1945) argued in his History of Banking Theory that it was not until the 1920s that the concept of the central bank directly controlling the price level through discretionary action was considered by the central banks themselves. Sayers too argues that “for much of its earlier history, the Bank [of England] was not conscious of any responsibility for control over the monetary system nor did the government think in these terms.” Again, de Kock argues that all other goals of monetary policy were subservient to the goal of external stability during the 1920s. However, from 1923, in the United States, the Fed was under pressure from Congress to pursue stabilisation, after it rejected the concept in its Annual Report of 1923. The Fed acknowledged some control over prices but its objective was “the constant exercise of a steadying influence on credit conditions.”

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32 ibid p245-246
33 Lavington (1921) p195.
34 ibid p176.
35 Sayers (1958) p45.
36 De Kock was an early Governor of the Reserve Bank of South Africa
39 Cited in Young (1925) p84-85.
While Keynes was not the originator of the idea of stabilisation, he soon became its most widely heard advocate. Keynes had been present at the Genoa conference as a reporter, at a time when he was writing the *Tract on Monetary Reform*, and agreed with the general thrust of the discussion of stabilisation policy but not with the return to a gold standard. The following traces the development of his ideas.

Keynes devoted one book of the *Treatise* to the appropriate structure of a central bank. He had considered the issue in his role on the 1913 Royal Commission on Indian Financing and Currency responsible for establishing the Central Bank of India. However, there was little evidence in his writings of that time of a role for discretionary monetary policy. By 1930 in the *Treatise* he complained that “the post-war system has substituted a most efficacious ‘management’ for the old ‘automatic’ system – which is all to the good; but, at present, no one knows exactly to what objects the ‘management’ is directed.”

Thus, despite the fact that the Bank of England was now regarded as a national policy institution rather than a commercial bank with some special privileges, nothing had evolved to replace the profit objective. However, Keynes dismissed the need for government to fill this breach: “One would not expect that the rules of wise behaviour by a Central Bank could be conveniently laid down by an Act of Parliament.” He noted that history had in fact evolved such that the government was responsible for determining the objectives rather than the bank because of the predominant use of note issue rather than deposits in the early history of banking. If deposit taking had been the main role of banking in its infancy, then regulation may have been purely seen as a banking matter, particularly in terms of the objectives for the amount of deposits a bank could take. However, the extensive use of note issue implied that the government wanted a larger role in the process, including regulating the objectives to be applied to note issue.

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40 See the discussion in Howson (1985).
41 See Keynes (1973)
42 Keynes (1930) Vol 2 p232.
42 *ibid* p262.
Finally Keynes reached “the crux of the whole matter”.

Can and should the central bank aim for price stability?

The Tract on Monetary Reform presented a clear rejection of the gold standard, and more importantly, distinguished between the external objective of “Stability of the Exchange” and the internal objective of “Stability of Prices.” This distinguishes Keynes from Hawtrey who still desired the maintenance of the gold standard. Keynes acknowledged that these objectives were not always consistent, but that while “the right choice is not necessarily the same for all countries ... there does seem to be in almost every case a presumption in favor of the stability of prices, if only it can be achieved.” Keynes’s justification for this belief was that external stability only affected those involved in external transactions, whereas internal stability was fundamental to society:

Lenin was certainly right. There is no subtler, no surer means of overturning the existing basis of Society than to debauch the currency. The process engages all the hidden forces of economic law on the side of destruction, and does it in a manner which not one man in a million is able to diagnose.

Despite this proclamation, by the time of the Treatise Keynes had tempered his defence of stability of the monetary standard. He argued that while price stability is an appropriate goal in a stable environment, the goal should be long run price stability. If price stability were pursued over a shorter time horizon, the danger would arise that in response to non-monetary shocks, the economy may be “beyond effective [monetary] control,” such that “an interval should elapse before stability can be restored.”

\[ ^{44} \text{ibid} \text{ p339} \]
\[ ^{45} \text{Keynes (1924) p168-169 emphasis added.} \]
\[ ^{46} \text{Keynes (1932) p78. This essay “Inflation” was originally published in 1919. Fetter (1977) casts doubt on whether Lenin said anything of the sort. There is no reference in any of Lenin’s writings, and his documented views on inflation suggest in fact a contrary opinion. Fetter (p77) suggests the likely explanation is that Keynes heard “many stories of what the Soviets were supposed to be saying, and it was then a common practice to attribute all such remarks to either Lenin or Trotsky.”} \]
\[ ^{47} \text{Keynes (1930) Vol 2 p351} \]

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Chapter 31 of the *Treatise* is devoted to “The Problem of the Management of Money.” Herein, lies some of the foundation for the use of discretionary policy to pursue employment goals. Its focus initially is on “the control of prices through the rate of investment” but Keynes is somewhat non-committal as to what the appropriate ultimate objective for monetary policy should be. Later in the chapter, Keynes suggests that it was the practice of central bankers at the time to attempt to pursue two objectives: maintaining the standard of money and adjusting its supply of lending “to the demand for it at the equilibrium rate of interest, i.e. at the natural rate.” This is close to the statement of price and output goals for the central bank. Keynes acknowledges that these goals are sometimes incompatible, but still his ultimate conclusion is that the answer always lies with the first objective - “in the stability or instability of the price-level of output as a whole.”

Thus, while the *Treatise* may provide a case for discretionary policy action to stabilise output in the short run, its conclusion is that price stability should be the ultimate long run objective for a central bank. In the short run, consideration may be paid to the speed with which price stability is re-attained, however, in the long run that goal is dominant. If this is combined with a view that the economy is always in the short run (at least in policy terms), then it is approximately an argument in favour of fine-tuning.

Unlike the *Treatise*, the *General Theory* was written in the context of a closed economy where prices were assumed to be fixed. It is difficult to reconcile these two works to determine what Keynes believed the ultimate objectives for monetary policy should be, given the former’s emphasis on price stability and the latter’s emphasis on full employment.

In discussing the appropriateness of the price stability objective, Keynes noted the objections raised by Benjamin Strong, then Governor of the Federal Reserve Bank of

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48 *ibid* p211  
49 *ibid* p212  
50 *ibid* p215  
51 *ibid* p220  
52 Or that in the long run we are all dead!
New York, to a proposed amendment to restate the objectives of the Federal Reserve solely in terms of price stability. The attempt to include objectives in the Fed's charter dates back to its institution, and relates to the accountability debate today, which is discussed in the next section. As mentioned above, the Fed rejected the goal of price stabilisation in its 1923 annual report. Wheelock investigates empirically the issue of whether the Fed under the leadership of Strong pursued a stabilisation policy.\textsuperscript{53} He concludes that while between 1924 and 1929, the Fed attempted to minimise economic fluctuations, it also sought a return to the gold standard. Further, "Strong believed in the gold standard and would not likely have done anything to jeopardize gold convertibility of the dollar."\textsuperscript{54}

Strong objected to the price stability objective on three grounds:\textsuperscript{55}

- it created the potential for deflation;
- there were many other influences on the price level besides those controlled by the Fed; and
- the conflicting signals and lags in the price level.

Keynes acknowledged that all these three objections were relevant but not sufficient to override the fundamental economic logic of the price stability goal. Interestingly, Irving Fisher argued that while outwardly rejecting price stability, Strong had in fact pursued price stability but "only a few of us knew what he was doing. His colleagues did not understand it."\textsuperscript{56} Strong was probably rejecting the formalisation of the price stability objective not because he disagreed that it was an appropriate goal for monetary policy but rather because it would restrict his freedom of action and the Fed overly accountable.

It is useful to contrast Keynes's writing on the appropriate goal for monetary policy with that of Milton Friedman. In \textit{The Effects of a Full-Employment Policy on}

\textsuperscript{53} Wheelock (1989), (1992a) and (1992b).
\textsuperscript{54} Wheelock (1992a) p27.
\textsuperscript{55} Testimony before the Stabilisation Committee of the US Congress, quoted in Keynes (1930) p340
\textsuperscript{56} Fisher testifying before Congress in 1935 quoted in Wheelock (1992a) p12.
Economic Stability: A Formal Analysis, written in 1951, Friedman’s stated goal for policy is full-employment and economic stability. However, in Comments on Monetary Policy also written in 1951, the focus of monetary policy is the inflation rate. The difference between the two pieces is that the first considers the goal for monetary policy in a world, where all institutions are structured according to Friedman’s ideals while the second considers monetary policy in the second best policy environment (which exists in practice).

Keynes and Friedman have similar views as to the appropriate goal for monetary policy. The difference between the two lies in the means of achieving that goal. While Keynes advocates discretionary policy action, Friedman desires a central bank that functions as a pre-programmed automaton.

Given the agreement on price stability as the goal of monetary policy, how did the goals of monetary policy develop to the point where the primary emphasis was on full employment with price stability perhaps even beneath exchange rate stability as a goal for monetary policy? Throughout the 1920s it appears that central banks still were desiring a return to the gold standard and that other stabilisation goals were of secondary importance. The reasons Eichengreen (1992) presents for the demise of the gold standard are directly applicable to the rise of new objectives. Firstly, it was realised that the international cooperation necessary for a return to the gold standard was no longer achievable. Secondly, the Depression created a political constituency for the pursuit of employment objectives. Thus at the time when central banks required new goals in the new environment of exogenous monetary policy in a floating exchange rate world, the political considerations favoured the inclusion of employment. As de Kock (1974) notes, the charters of the new central banks formed in this period all explicitly acknowledged an employment objective.57

Arthur Burns, Governor of the Federal Reserve 1970-78, in his lecture on The Anguish of Central Banking provided the following explanation for the change in objectives. Burns argued that the cause was “the persistent inflationary bias that has emerged from the philosophic and political currents that have been transforming

57See for example, the preamble to the Bank of Canada Act 1936.
economic life ... since the 1930s.”\textsuperscript{58} These currents resulted from the increased role of the government in the economy after the Depression which created the expectation that the government could guarantee full employment even in normal times. This was embodied in the “Full Employment Act” of 1946, where the goal of the government was to explicitly to achieve “maximum employment.”

As yet, this argument does not necessarily impart an inflationary bias to monetary policy or mean that the goal of monetary policy is anything but stability of prices, as price stability may be a necessary component of maximum employment. However, Burns argues that central bankers also were caught up in these “worldwide philosophic and political trends.” In the case of the Federal Reserve, it is in fact subject to the conditions of the Employment Act. Nevertheless it could have resisted the demands to inflate on the grounds that inflation was in the longer term deleterious to full employment. However, its actions may have been constrained by its need for self-preservation in the face of a hostile Congress\textsuperscript{59} or the “fact that some members of the Federal Reserve family had themselves been touched by the allurements of the New Economics.”\textsuperscript{60}

Friedman (1969) argues that the evolution of beliefs as to appropriate objectives for monetary policy has meant that we are “in danger of assigning to monetary policy a larger role than it can perform; in danger of asking it to accomplish tasks that it cannot achieve, and, as a result, in danger of preventing it from making the contribution that it is capable of making.”\textsuperscript{61} This contribution would in the long run, according to both Keynes and Friedman, be the maintenance of the monetary standard. The debate today now seems to have returned to this point.

\textsuperscript{58}Burns (1979) p9
\textsuperscript{59}See Woolley (1984) and section 3.3 below
\textsuperscript{60}Burns (1979) p15
\textsuperscript{61}Friedman (1969) p99.
3.3 Accountability

Accountability is intimately linked to the specification of clear and precise objectives for the central bank. In New Zealand, accountability is regarded as the key pillar of the independence of the Reserve Bank of New Zealand, and former Governor of the Bank of Canada, John Crow, has repeatedly stressed the need for it at the Bank of Canada.\(^{62}\) In the United States, the attempts by Representative Gonzalez and his colleagues to alter the structure of the Federal Reserve reflect similar considerations to those around the formation of the Federal Reserve in 1913, as well as the failed attempts to establish a National (central) Bank for the United States in 1790 and 1816 (see below). The current argument by those seeking to reduce the independence of the Federal Reserve is that “power without accountability does not fit the American system of democracy.”\(^{63}\)

However, without clear objectives it is unclear what the central bank is accountable for. With an imprecise mandate for the central bank, the question as to who is accountable for inflation is blurred. The government can always use the central bank as a veil for its inflationary preferences. The central bank is unsure of the line it must tread to maintain its position of influence. That is, it is difficult for the central bank to persistently fight inflation when it does not have a clear mandate to do so. If it does, it runs the risk of losing its independence entirely at the hands of politicians disgruntled by the costs to output and employment.

In this regard, Fetter summarised the features of the gold standard in England which ensured its success: “That the gold standard was inviolate was a decision of Government. The task of maintaining the gold standard was entrusted to the Bank of England, and as long as it carried out this mission the Government left it to the operating details.”\(^{64}\)

Once again, the problems that arise today are in some part due to the historical origins of central banks. While central banks were private institutions, they were

\(^{62}\) See Chapter 2 section 3  
\(^{63}\) Lee Hamilton, Congressional Record 26 January 1993.  
\(^{64}\) Fetter (1965) p282.
accountable to their stockholders. As awareness arose as to the potential effects of central banks on the economy, the desire arose to incorporate the central bank into government.

In England, Bagehot worried about the lack of accountability of the Bank of England, in part because of the "amateurism" he saw in the directors of the Bank. He argued that if the Bank was charged with a particular task which could be monitored (in his case, the custody of the bank reserve), and "bound to deal with it according to admitted principles, then a governor of the Bank could look to those principles. He would know which way criticism was coming. If he was guided by the code, he would have a plain defence." Furthermore he advocated the appointment of a full-time Deputy Governor (the equivalent of today's Governor), who would bear the full brunt of any criticism for monetary policy, and if disaster was incurred, "would be thought a fool in the City for ever."65

In the United States, there has long existed a fundamental distrust of central banks. President Madison opposed the renewal of the charter of the First National Bank (the first US central bank), on the strength of public opinion which regarded the bank as "a monstrosity ... incompatible with the principles of a democratic social order."67 Later, in 1832, President Jackson vetoed the renewal of the Charter for the Second Bank of the United States.68 The Federal Reserve has long been "governed by the principle of undernourishing the inflationary process while still accommodating a good part of [it],"69 in order to preserve its existing level of independence.

The lack of clearly specified goals has been a fundamental reason for this problem. Mints argues that this omission of a concise statement of objectives for the Federal Reserve came about for four reasons:70

1. The idea of discretionary monetary policy was not developed.

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65Bagehot (1873) p35
66ibid p115
67Rowe (1965) p13
68See Rowe (1965) Part 2 for a discussion of these events.
69Burns (1979) p16
70Mints (1945) p284
2. The goal of "the acquisition of bona fide commercial paper" was considered sufficient.

3. The belief that any attempt by the central bank to achieve any objective, even price stability would be unsuccessful.

4. The decisions of the appropriate goals should be left up to the Federal Reserve Board.

Friedman’s approach to accountability in 1982 was “to require by law that the Federal Reserve Governors submit their resignations at the end of any year in which the growth of a specified monetary target aggregate has departed from the advance target by more than a designated amount.”71 Friedman did not believe this to be practical. However, in essence this is the current situation in New Zealand where the employment of the Governor of the Reserve Bank of New Zealand is conditional on achieving inflation targets.

Friedman’s views derive from that of Henry Simons (1948). Simons argued that the central bank in a democratic society must be fully accountable. To achieve this end he argued that the monetary system must be "governed by definite rule." To ensure full accountability, "the monetary rules must be definite, simple (at least in principle), and expressive of strong, abiding, pervasive, and reasonable popular sentiments."72 Sayers, on the other hand regarded working to rule as the "antithesis of central banking."73

Again, one can interpret the reforms in New Zealand as meeting Simons’ criteria. The reforms were bi-partisan, thus reflecting popular sentiment; the inflation targets are definite and simple, and thus easily monitored by the public. As discussed above, the gold standard provided a similar environment. The consensus on establishing a mandate for the Federal Reserve appears to be lacking from the current debate in the United States. The issue has been suppressed behind Congressional efforts to inflate the economy or the agenda of Gonzalez who has in the past expressed a desire for the return of usury laws.

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71 Fried (1982) p118
72 Simons (1948) p181
73 Sayers (1957) p1.
At a deeper level, reflecting a stream of debate which has been present in the American debate for two centuries is the issue of to whom the central bank is responsible. Friedman and Simons argue that in a democratic society, the central bank should either be an automaton as described above or at least responsible for their actions to the public. Sayers (1958) argued that “the authority of the State over the Central Bank is always necessarily absolute. All that is open to question is the extent to which the sovereign body should detail its commands to the central bank.” Thus at some level, the central bank must be held accountable to the government and the public.

In a similar vein, Keynes stated in the General Theory “there is no remedy [for unemployment] but to persuade the public that green cheese is practically the same thing and to have a green cheese factory (i.e. a central bank) under public control.” The only point of contention is the level to which the central bank is independent. This is the distinction highlighted in Debelle and Fischer (1994) between goal independence and instrument independence. The Friedmanite view would allow the central bank neither form of independence while the Keynesian view would allow instrument but not goal independence.

In 1913, Keynes described his ideal central bank in the Indian Royal Commission.

- “To combine ultimate Government responsibility with a high degree of day-to-day independence for the authorities of the Bank.”

- “To preserve unimpaired authority in the executive officers of the Bank, whose duty it would be to take a broad and not always commercial view of policy.”

This opinion was tempered by the time of the Treatise, when he stated “it would be much better to leave the management of the reserves of the Central Bank to its own unfettered discretion than to attempt to lay down by law what it should do or within what limits it should act.”

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74 Sayers (1958) p65  
75 Keynes (1936) p235  
76 Keynes (1973) p152  
77 Keynes (1930) p272
The statement of Keynes is thus supportive of a view that it is optimal to allow the central bank to have instrument independence but not goal independence. The expression of a precise set of goals would create a standard by which the central bank could be held accountable.

3.4 Relationship with government

When the Bank of England was founded in 1694, it obtained its right to issue notes and take deposits in exchange for granting a loan to the government. This established the basis for the relationship between the government and the central bank. Over the years, the Bank of England gained privileges by extending further loans to the government, for instance, the legislation that any other note issuing companies could have no more than six subscribers.

However, despite this close-knit relationship, in 1802 Thornton believed that “the government ... is under little or no temptation either to dictate to the Bank of England, or to lean upon it in any way which is inconvenient or dangerous to the bank itself ... To suppose that bank reserves are issued to excess, with a view to furnish means of lending money to the minister, is, in a high degree, unreasonable.”

In 1930, Paul Warburg considered that a vital role of the central bank, linked with it placing the government debt, was to “warn the government when the country needs a rest from such issues.”

A fundamental linkage was established between the central bank and the government debt from the outset when the Bank of England was created in return for its holding government debt. It was always regarded that the Bank of England would provide whatever finance was necessary in times of war. It appears this belief was reflected again during the First World War. The 1931 Macmillan Committee regarded it as “imperative” that the Bank of England hold government debt to avoid

78 Thornton (1802) p106, emphasis in original.
79 Warburg was involved in drafting the legislation for the creation of the Federal Reserve
80 Warburg (1930) Vol I p642.
“deranging” the market.\textsuperscript{81}

Hawtrey rejected the logic of the Macmillan Committee. He argued that the only time the government wants to borrow from the central bank is at times of economic dislocation, so whether the government’s debt is held by the central bank in normal times is somewhat inconsequential. In normal times, “any country in which the standards of financial prudence and wisdom are not deplorably low will refuse to tolerate”\textsuperscript{82} inflationary finance.

Interpreted differently this statement supports the proposition in Chapter 1 that the degree of central bank independence is endogenous to the country. That is, the degree to which society is financially prudent and wise will determine the structure of their central bank.

Turning to the appropriate structure of the management of a central bank, Mints argued that in the United States, “the qualifications for membership on the Board are utterly at variance with the needs of a monetary agency ... One of the things that monetary policy most emphatically should not involve is the consideration of any special interests.”\textsuperscript{83} Thus the Board should not consist solely of those drawn from the financial sector. The ideal solution may be a balance of a wide range of special interest groups drawn from across the different sectors of the economy.

Mints further argues that the exclusion of the Secretary of the Treasury from the Board is not useful because through his/her actions at the Treasury, the Secretary has important effects on the monetary system. Excluding the Secretary allows him/her to avoid accountability for his/her actions and hide behind the central bank.\textsuperscript{84} However, Warburg argues that it would be a mistake to have the Secretary on the Board due to the “dangerous consequences following from the subordination of the policies of central banks to the domination of finance ministries.”\textsuperscript{85}

Baghot provided some thought to the appropriate choice for Governor of the

\textsuperscript{81}Sec 30 cited in Hawtrey (1932) p266.
\textsuperscript{82}Hawtrey (1932) p268.
\textsuperscript{83}Mints (1945) p283.
\textsuperscript{84}ibid p283-285
\textsuperscript{85}Warburg (1930) Vol I p475.
central bank. Firstly the pay should not be too high! For this would only encourage “vain men”, lazy men” and “men of rank” and “all such men are dangerous” in such a position.\textsuperscript{86} Rather the Governor should have much previous training in financial matters, be patient and with quick judgement. The Governor should be selected by the Bank Board rather than by the public, to avoid “the evils of an American presidential election.”\textsuperscript{87}

Perhaps by following these criteria, one can reach the ideal suggested by Warburg where the public is willing “to follow the men they have placed in charge [of the central bank], to stand by them, and to take it for granted that the obvious is not likely to have escaped their attention, and that the only object in view is to be fair to all and to do the best for their country.”\textsuperscript{88}

3.5 Conclusion

This chapter has provided an historical background to the analysis of the first two chapters. It has shown that throughout the history of monetary theory, the actions of the central bank have been intimately tied with those of the government, as is the case in the model in chapter 1.

The general conclusion of the historical literature is that price stability is the appropriate long run goal for monetary policy. However while there is a consensus on this issue, there is disagreement on the means to achieve it. Friedman argues for an automated central bank while Bagehot, Hawtrey, Lavington and Keynes support discretionary policy action. Furthermore, both Hawtrey and Keynes argue that while price stability is an appropriate long run goal, the speed with which this goal is re-attained after a shock is important. This opens the door to output considerations in the shorter term.

There is little discussion as to what price stability means in practice. Keynes seems to be arguing for a predictable price level which may more closely correspond

\textsuperscript{86} Bagehot (1873) p110
\textsuperscript{87} ibid p111
\textsuperscript{88} Warburg (1930) Vol II p500.
to a zero inflation goal, rather than price level stability.

There is also agreement that a clearly specified set of goals is essential in ensuring that the central bank is accountable for its actions. However, the means by which this is to be achieved should be left to the central bank. That is, the central bank should have instrument independence but not goal independence. This is basically the conclusion of the Roll enquiry into the Bank of England,\textsuperscript{89} and the lesson which can be drawn from the New Zealand experience discussed in Chapter 2. Friedman would dispute the need for instrument independence, in that it opens the door for discretion which may compromise the achievement of price stability, but would support the lack of goal independence.

The current debate in the United States would perhaps benefit by focussing first on the goals of the Federal Reserve. This would then provide the foundation for a debate on accountability. In this regard, the debate is little changed from that at the time of the formation of the Fed.

Thus in conclusion, Riefler's complaint at the beginning of this chapter may be overstated. There is not too great an "intellectual scandal" as a large amount of agreement does exist. However, Bagehot's warning must be borne in mind: thought must be paid to the purpose to which the central bank is being put, and if it differs from that at the time of its conception, consideration should be given to altering its constitution.

\textsuperscript{89}Roll et al (1993)
Appendix A

Appendixes to Chapter 1

A.1 FOCs

FOCs of two-period Nash game:

\[ \pi_2 = \frac{\delta g \mu}{K} (C + rd) \quad \text{(A.1)} \]

\[ \tau_2 = g^* + \frac{\delta g}{K} rd - \frac{\delta z + \delta g \mu}{K} C \quad \text{(A.2)} \]

\[ \pi_1 = \frac{\delta g \mu}{K} (C - d) \quad \text{(A.3)} \]

\[ \tau_1 = g^* - \frac{\delta g}{K} rd - \frac{\delta z + \delta g \mu}{K} C \quad \text{(A.4)} \]

A.2 Standard Barro/Gordon results

This is a version of the Barro-Gordon model which forms the basis of the central bank independence literature, presented in Blanchard and Fischer (1989).

The loss function of the policy maker is given by:

\[ L = a \pi_2 + (y - k \bar{y})^2 a > 0 \quad \text{(A.5)} \]

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\( k > 1 \) reflects the fact that the policymaker wants a higher level of output and employment than that determined in the labour market, due to the presence of some distortion.

There is an expectational Phillips curve:

\[
y = \bar{y} + \beta(\pi - \pi^e) \tag{A.6}
\]

The policymaker chooses \( \pi \) taking \( \pi^e \) as given, which yields:

\[
\pi = (a + \beta^2)^{-1} \beta[(k - 1)\bar{y} + \beta\pi^e] \tag{A.7}
\]

Assuming rational expectations (setting \( \pi = \pi^e \)) yields the solution

\[
\pi = \frac{1}{a} \beta(k - 1)\bar{y} \tag{A.8}
\]

The loss function is then:

\[
L = (k - 1)^2\bar{y}^2(1 + \frac{\beta^2}{a}) \tag{A.9}
\]

If there was a credible commitment to a zero inflation rate then the loss function would be clearly lower:

\[
L_C = (k - 1)^2\bar{y}^2 \tag{A.10}
\]

### A.3 Optimal Central Bank Independence

Differentiating equation (1.19) with respect to \( \mu \) yields:

\[
\frac{\partial EV}{\partial \mu} = 2s_\pi \mu \delta_y^2 \left( \frac{\sigma_a^2}{(\delta_x + \delta_y + 2\mu\delta_y)^2} + \frac{C^2\delta_y^2}{(\delta_x + \delta_y + \mu\delta_y)^2} \right) + \left( s_\pi \mu^2 \delta_y^2 + s_x \delta_y^2 + s_y \delta_x^2 \right) \left( \frac{4\delta_y \sigma_a^2}{(\delta_x + \delta_y + 2\mu\delta_y)^3} + \frac{2C^2\delta_y}{(\delta_x + \delta_y + \mu\delta_y)^3} \right) \tag{A.11}
\]

Setting this equal to zero yields an implicit solution for \( \mu \).

The proposition in the text can be established by implicit differentiation of this equation.
Assuming that the solution for $\mu$ is at a minimum, then $\partial F/\partial \mu > 0$ where $F$ is the above expression. This condition can be shown to be true for certain feasible values of the parameters.

\[
\frac{\partial F}{\partial s_\pi} = 2\mu \delta_g^2 \left[ \frac{\sigma_a^2}{(\delta_x + \delta_g + 2\mu \delta_g)^2} + \frac{C^2 \delta_g^2}{(\delta_x + \delta_g + \mu \delta_g)^2} \right] - \mu^2 \delta_g^2 \left[ \frac{4\delta_g \sigma_a^2}{(\delta_x + \delta_g + 2\mu \delta_g)^3} + \frac{2C^2 \delta_g}{(\delta_x + \delta_g + \mu \delta_g)^3} \right] > 0
\]

(A.13)

(A.14)

(A.15)

\[
\frac{\partial F}{\partial s_x} = -\delta_g^2 \left[ \frac{4\delta_g \sigma_a^2}{(\delta_x + \delta_g + 2\mu \delta_g)^3} + \frac{2C^2 \delta_g}{(\delta_x + \delta_g + \mu \delta_g)^3} \right] < 0
\]

(A.16)

(A.17)

\[
\frac{\partial F}{\partial s_g} = -\delta_g^2 \left[ \frac{4\delta_g \sigma_a^2}{(\delta_x + \delta_g + 2\mu \delta_g)^3} + \frac{2C^2 \delta_g}{(\delta_x + \delta_g + \mu \delta_g)^3} \right] < 0
\]

(A.18)

(A.19)

Thus

\[
\frac{\partial \mu}{\partial s_\pi} = -\frac{\partial F}{\partial s_\pi} \frac{\partial F}{\partial \mu} < 0
\]

(A.20)

(A.21)

\[
\frac{\partial \mu}{\partial s_x} = -\frac{\partial F}{\partial s_x} \frac{\partial F}{\partial \mu} > 0
\]

(A.22)

(A.23)

\[
\frac{\partial \mu}{\partial s_g} = -\frac{\partial F}{\partial s_g} \frac{\partial F}{\partial \mu} > 0
\]

(A.24)

(A.25)

As required.
## A.4 Estimating the Inflation Processes

<table>
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<tr>
<th>Country</th>
<th>1st shock</th>
<th>2nd shock</th>
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<tbody>
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<td>Order of AR</td>
<td>Inflation Peak</td>
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Appendix B

Appendix to Chapter 2

This section summarises the economic history of Australia and New Zealand leading up to the period under discussion.

B.1 Introduction

The Australian and New Zealand economies are archetypal small open economies heavily dependent on their commodity export sectors. Throughout their histories, the economies have been continually subject to the vagaries of the commodity price cycle. The economic development of Australia and New Zealand has further suffered from the problems of a small domestic market combined with large transport costs to the rest of the world.

Both countries continually endeavoured to use restrictive trade policies to develop a broader manufacturing and export base. However, in the main, the policies focussed on industries where there was likely to be little chance of success, given the relatively high level of domestic wages, which resulted from the redistribution of the prosperity flowing from the agricultural and mining sectors. The focus was on import-competing industries such as motor vehicles and textiles, clothing and footwear, rather than, for example, on developing down-stream processing of their raw material endowments for export. The small domestic markets and the lack of focus on export, meant that firms did not gain the advantage of any scale economies and stayed high on their cost.
curves. Despite these failures, a comparison with similar nations in South America such as Argentina casts a more favourable impression on the performance of the two economies over the 20th century.

However, in the early post-War period, both countries had a more than satisfactory economic performance. Inflation was at or below the OECD average and real GDP growth was around 4-5% per year in the 1960s. The supply shocks of the 1970s exposed the structural deficiencies of the two economies, so that by the 1980s, it was clear that major policy initiatives were required.

**B.2 Australia**

Australia, like most economies was buffeted by the oil price shock of the mid 1970s. There was a wage and price explosion in 1974, accommodated by loose monetary policy with inflation reaching about 18%. The (federal) government budget deficit which had been modest during the early part of the 1970s, increased to over 5% of GDP, as expenditure growth outstripped the rise in revenue. Subsequently, unemployment rose sharply from around 1-2% (where it had been for most of the previous decade) to 6%. As a result of the world recession, an overvalued exchange rate and a credit squeeze together with contractionary budgets (which attempted to address the inflationary outburst), the economy remained in a state of stagflation for the next three years, with unemployment remaining around 6% and inflation falling to around 7%.

In 1979-80, Australia experienced a short-lived resources “boom”. Export revenues rose due to the rise in commodity prices. There was substantial investment in the mining sector which was seen by the government as a major contributor to the future growth performance of the country. Wages rose as employers were willing to meet their workers demands, given the high current profitability and their buoyant expectations. However, the euphoria proved to be short-lived as the economy descended in 1982-83 into its deepest recession since the Great Depression as the commodity cycle turned against Australia again. Unemployment rose to over 10%.
Inflation which had peaked at 11%, came down under the influence of the tight fiscal and monetary policy imposed in 1980 and the imposition of a wage and price freeze, but did not fall to the extent that it did in other OECD countries.

The economy began to rebound in 1983 and received a further boost from the initial expansionary fiscal policy stance of the newly elected Hawke Labour government. The budget deficit rose to over 4% of GDP in 1983-84. The trade balance and the current account deficit began to deteriorate as the economy improved. However, unemployment only edged down slowly from its peak in 1983 and appeared to level out at around 8% whilst inflation which had declined briefly to around 5% began to climb back up to 8%.

B.3 New Zealand

The New Zealand experience during the 1970s and early 1980s was one of persistent high inflation but very low unemployment. By 1975, inflation (which had been edging up since the late 1960s) had reached 10% and continued to climb to over 15% in 1977. Despite the stagnant state of the economy throughout the rest of the 1970s, inflation remained well over 10%. However, unemployment was at negligible levels of less than 1% through to 1977 and only edged up slightly to 2% by 1980.

At the end of the decade, New Zealand also enjoyed the benefits of high commodity prices but like Australia, it went through a recession in 1982-83. Unemployment rose to around 5% and inflation fell to just under 6%, under the impact of a wage-price freeze and the low level of activity.

From the mid 1970s to the mid 1980s, the budget was in substantial deficit, reaching as high as 8.7% of GDP in 1976.\(^1\) As a result of the persistently large budget deficits, gross government debt rose from around 40% of GDP in 1972-73 to 51% of GDP in 1980-81 and to 73% in 1984-85 (net debt grew from around 5% to 20% to 40% over the same period). Correspondingly, debt service expenditure accounted

\(^1\)New Zealand fiscal years are based on a April-March financial year until 1989/90 when they moved to a July-June financial year.
for around 20% of government revenue by 1984-85. Foreign debt rose from 20.9% to 47.9% of GDP over the same period.

The current account deficit reached 13% of GDP in 1974-75 due to a large inflow of imports and adverse movements in the terms of trade. However, it improved as the trade balance moved back into surplus. As the level of debt accumulated, the net income deficit moved further into deficit and generally dominated movements in the trade balance so that the current account deficit continued to widen.

B.4 Summary

By around 1985, the problems facing the Australian economy were clear. Unemployment and inflation both appeared to be stuck at around 8%, well above the apparent equilibrium levels of around 2% during the 1960s. The increasing current account deficit reflected the key underlying structural problems: the significant degree of import penetration and low elasticity of import substitution which reappeared every time the economy began to grow and the large effect of commodity price movements on the whole economy combined with the lack of a diversified export base. The current account deficits in turn generated a significant rise in the level of external indebtedness as the capital inflows were predominantly in the form of debt rather than equity. The high interest rates of the 1980s and the increasingly short-term maturity structure of the debt presented a considerable servicing burden for the economy.

Similar problems faced the New Zealand economy. Their success in maintaining a low unemployment rate had come at the cost of high inflation and a large level of indebtedness through loose fiscal policies. By the mid-1980s, even the prospect of continued low unemployment was looking doubtful. The exchange rate policy also generated problems by being adjusted infrequently and only with a lag, resulting in sustained periods of overvaluation.

The misallocation of resources in both economies as a result of decades of protective policies was becoming increasingly apparent. Without policy action, both countries were facing the prospect of continued rising unemployment together with a
relatively high inflation rate, and increasingly large problems in servicing a growing stock of external debt.
Appendix C

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