The dominant discourse of central bank independence

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July 2017

A thesis submitted for the degree of Doctor of Philosophy of the Australian National University

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I state that this thesis is my own original work.

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31 July 2017

This thesis comprises 61,000 words.

Acknowledgements

I acknowledge the assistance of my supervisory panel, Dr Shawn Treier, Dr Timo Henkel, and in particular Professor Keith Dowding (Chair).

I also thank the organisations and individuals who provided data, helped me replicate their data, or posted their data on the Internet. This includes Professor Martin Ellison, Adam Posen, Professor Robert Franzese, Peter Tulip, and Professor Mark Keyser.

This research is supported by an Australian Research Training Program (RTP) Scholarship.

Finally, I acknowledge study assistance provided by my previous employer, the Department of the House of Representatives. This document does not necessarily represent the views of my past or current employers in any way.

Abstract

The period from 1960 to 2000 saw a major evolution in monetary policy and institutions. This dissertation makes the claim that there is a better explanation of these events than the typical narrative, or dominant discourse.

The typical narrative is that a relationship between inflation and unemployment (the Phillips Curve) was proposed around 1960. One interpretation of the relationship was that increasing aggregate demand would reduce unemployment with some acceptable inflation. Milton Friedman then stated in 1968 that, in the long run, this practice would entrench inflationary expectations and there would be no useful employment benefits. This was accepted by the economics profession, especially by the mid-1970s, around the time of the first oil shock. This period also saw the rise of stagflation and the countries that managed the inflationary outbreak best were those where independent central banks were able to withstand politicians' short term instincts. Economists attributed this to a commitment concept; if governments could override their central bank only at the cost of legislation or constitutional change, then monetary policy would focus more on long term expectations, rather than the political short term. Empirical work in the 1990s established this relationship and many countries made their central banks more independent during this decade.

A better view acknowledges some features of this narrative. For example, Milton Friedman's theory of expectations was very influential. (Chapter 2). But there is reduced evidence for the rest of this narrative. For example, the Federal Reserve did tighten monetary policy after 1982 compared with the period before 1979, but this appears to have been through placing less emphasis on output instead of being more inflation averse. Further, policymakers in the late 1960s and 1970s underestimated the level of unemployment at which inflation started increasing. (Chapter 3). Politicians were generally involved in disinflations, but their role and visibility decreased as legal inflation and central bank independence (CBI) increased. This suggests that, in practice, legal independence bestows the disinflation role on the central bank (Chapter 4). The role of politicians, however, is not fully clear because the proportion of elections where a voter backlash against inflation occurred was small. Therefore, the political dynamic against inflation may have occurred through elites, rather than popular opinion (Chapter 5). Finally, there was not a strong correlation between CBI in developed countries because the literature made errors of omitted variable bias and not examining whether CBI was endogenous. Inflation in the 1970s and 1980s was more clearly related to economic factors such as currency performance, output, past inflation, oil prices, and a time trend (Chapter 6).

The weakness of CBI theory is that, by excluding politics, it overstates the costs of overriding a central bank. If there is little popular support for disinflation, then the costs of overriding the central bank will be low, regardless of the legal arrangements in place. Central banks perceive this and deliver policy within the politically palatable decision set.

Contents

1 – Introduction

Overview

This thesis examines the theory of central bank independence (CBI) and the statistical work used to support it. The CBI argument is that politicians face the wrong incentives to make optimal decisions about monetary policy, and this problem can be largely overcome by delegating responsibility to an inflation averse central banker. The theory developed as a consequence of the Great Inflation, a period of high inflation that started in the late 1960s. It concluded in most developed countries at the cost of higher unemployment and lower growth during the 1980s. CBI theory came about because political scientists, and particularly economists, drew two conclusions about the Great Inflation: that political leaders had no appetite to control inflation; and that countries with central banks that were legally independent from government, especially Germany and the United States, had lower inflation.

Economists have clear ideas about how economies should be managed, based on principles that include the free market, manageable debt, and low inflation. However, political leaders regularly disappoint economists, by being tempted to protect popular industries and to spend with less regard for paying it back, or what this may do to price stability. CBI theory represents a major chance for economists to gain control of economic policy. However, the theory has little to say about politics or power. It is really a picture of Utopia, where politicians and the public all do what economists tell them to. How this might occur, or what might change to get everyone on board, is not explained.

There is no particular problem with economists' preferred policies. Undoubtedly, they have the capacity to raise living standards. A country that can implement good economic policy will increase its output and influence. It will be able to better protect its interests and reduce the chances of invasion by a hostile power. The difficulty is to convince voters that the policies are worth it in the long run, especially during the transition phase.

There are various approaches to improve economic policy. One involves political debate and the passage of time. If certain policies are worthwhile, they stand a chance in the long run, even if they are abolished and need to be re-introduced. The advantage of this method is that political debate gives leaders a chance to influence public opinion and bring it closer to economists' preferred point. A second approach is to establish an institution that embodies these policies. Institutions have the appearance of permanence, but they can be wound up,

especially in systems with less division of power. This thesis argues that the institutional approach offers no improvement because the preferences and incentives that determine how politicians might conduct monetary policy also apply to the extent to which politicians delegate monetary policy and the extent to which it is maintained.

Riker put this in general terms in 1980. He argued that policies will tend to reflect the public's preferences, but that institutions can slow down this process. However, they cannot prevent it occurring because the losers from the institution's decisions will lobby to produce outcomes more to their liking. I would also suggest that it does not progress policy attitudes; the lack of debate and politicians' evasion of responsibility merely parks the issue for later.

Two central banks that played a key role in disinflating in the 1980s were in the United States and Germany. Although they had a fair degree of legal independence, these central banks also operated in environments with a large division of power. For example, both countries had strong bicameralism, where the legislature's upper house has similar powers to the lower house, but a different electoral system. The US Federal Reserve system is, financially, very much a creature of the private sector. Its twelve constituent banks are owned by private banks and they do not appear in the financial statements of the US Government. The banks are also represented on the Federal Open Markets Committee, the main policy-setting body of the Board of Governors. During the Great Inflation, the Bundesbank's policy-setting body was dominated by the Presidents of the central banks of the Länder (German states), who were appointed by the provincial governments. This was descended from a structure imposed on Germany by the US after World War II.

A key argument of this thesis is that the central banks in these countries took on a more visible role during disinflation due to their legal independence. Practically, they played a key role through monetary policy. And in economic policy terms, politicians took a step back. But politically, leaders such as Reagan and Kohl contributed to central banks' success by giving them policy space in which to work. Politicians can combine leadership and delegation.

This chapter outlines the thesis and discusses the literature, both for and against CBI.

Literature on central bank independence to the 1970s

There was a literature on central banks prior to the Great Inflation and there were three main ideas. The first idea was the precursor to CBI theory, namely that central banks should be free of political direction because politicians will otherwise print money and generate inflation or push for easy money prior to elections. Woolley (1977) quotes some authors making these

arguments, including: David Grove in 1952 in a memorandum for the International Monetary Fund; Karl Blessing, who was President of the German Bundesbank between 1958 and 1969, quoted in 1970; and Nordhaus's famous theory about the political business cycle (1975). The League of Nations was an early advocate for CBI. A post-war conference in 1920 resolved that central banks should be "free of political pressure" in managing domestic credit (Davis 1920).

Southard (1969) made the argument about financing the deficit and stated that he supported a "high degree of central bank independence." However, he clarified how this might work in practice. He suggested that a central bank would have to accept that it was part of the broader framework of government and that it had to acknowledge government objectives. Therefore, the central bank would need to be a "full-fledged partner" in economic policy and that governments could not create situations of *fait accompli* where the central bank had no choices.

The second idea was that central banks should work with treasury departments as equal partners. This approach was more supportive of political influence. Goldenweiser (1936) argued that central banks cannot ever be independent of the government of the day and that treasury departments and central banks needed to cooperate. Over time, a competent central bank would develop public trust and confidence. Kriz (1948) also made the cooperation argument and said that the quality of cooperation would depend on political and business conditions, the quality of political and business leadership, and the "political education of the people". Taking the example of the Federal Reserve, Robinson (1949) noted that some political influence on a central bank is justified because a President should be able to implement their economic policy.

The third idea was promoted by Milton Friedman (1968a). Friedman was concerned about the democratic problems with CBI. On the one hand, central banks have a great deal of power. Concentrating a large amount of power within a single entity is contrary to traditional liberal ideas. On the other hand, he argued that governments have had a poor track record in managing currencies. Examples are clipping coins, printing cash when convenient, or using book entries to balance a budget. Friedman sought an approach that gave governments a measure of responsibility for monetary policy. Therefore, he supported a legislated policy outcome for central banks, in particular targets for growth of the money supply. This would be more achievable for a central bank than an inflation target.

Friedman (1968a) used democratic principles to produce conservative conclusions. Strictly adhering to a monetary target would be a strong policy for price stability. Some countries

have experimented with it, but many did not keep it. The Federal Reserve had strict targets from 1979 to 1982, as did the Bundesbank from 1974. The Bank of England had "soft" targets from 1976 to 1987. More countries have preferred to increase CBI instead.

So while there were opinions for and against CBI, papers were published rarely. Inflation was not a major issue until the 1970s.

The development of CBI theory

This section covers the key papers in support of CBI. Although they are well-known, they are summarised here for completeness. They are critiqued later in the chapter.

Kydland and Prescott (1977)

This paper had two key definitions: policy is "consistent" where it maximises social utility now and at each future point in time, given economic agents' past decisions; and policy is "optimal" where is maximises social utility subject to the constraints of agents' decisions. The paper argued that the changing nature of agents' expectations meant that deciding policy at each point in time leads to sub-optimal policy. The problem is that there is no link from *future* policy decisions back to the *current* decisions of agents. A decision-making rule is preferable because it leads to credible policy and is a means of managing agents' expectations.

An example of the problem is building on flood plains. A government may state that it will not compensate home owners and residents for building on a flood plain. But if people do not believe the government and build, and a flood occurs, then the risk is that the general feeling of sympathy will induce the government to compensate the victims. Society would be better off if no-one built on the flood plains.

In the language of Kydland and Prescott (1977), the government cannot use the later compensation decision to influence agents not to build on the flood plain. The government might announce that it will not compensate people in future, but people's actions will depend on whether this statement is credible. A commonly proposed example of credibility is where the policy is enshrined in the constitution. Another example of credibility would be where a policy has bipartisan support.

Barro and Gordon (1983a)

In this paper, the authors state that their goal was to develop a model that demonstrates some features of public policy at the time: higher rates of inflation and money growth; and activist monetary policies.

The paper constructs a model of the economy where unemployment depends on inflation surprises. Society's loss function depends on the square of inflation (zero inflation being the target) plus the square of the extent to which unemployment deviates from the non-accelerating inflation rate of unemployment (NAIRU, U_n). Unemployment at or above the NAIRU will not lead to increased inflation. Below this point, inflation will start to increase due to higher wages caused by labour shortages.

The paper gives the inflation and unemployment components a relative weight. Another weighting is applied for the way in which unemployment deviates from the NAIRU. This weighting, "k," (a number between 0 and 1) is important. If no weighting were applied, then deviations either side of the NAIRU would be equally penalised. The weighting serves to penalise unemployment above the NAIRU more than unemployment below it. The authors state that they make the assumption to generate activist policy. It implies that policy makers are happy to drive unemployment below the NAIRU and wish to achieve a target unemployment rate of kU_n.

Economic agents base their inflationary expectations in a period on information from the last period. In equilibrium, expected inflation equals actual inflation. Therefore, there are no inflation surprises and unemployment is at the NAIRU. Policy makers are not bound by decision rules and therefore have an incentive to implement inflation surprises, leading to expectations of inflation, which leads to actual inflation. Its value is given by the relative importance of unemployment above inflation and k. Although there is some discussion of Kydland and Prescott (1977), this paper is also a more technical version of Friedman's famous paper (1968b) with the assumption of a drive to lower unemployment below the NAIRU. The authors conclude by raising the question of what mechanisms can restrict future money growth, such as a commodity standard or legal restrictions.

Rogoff (1985) and Lohmann (1992)

The later paper generalised the earlier paper. Lohmann develops a model of the economy with a supply function that is affected by the expectations of wage setters. Policy makers seek to minimise a loss function similar to that in Barro and Gordon (1983a). The model produces the same sort of inflation bias, which can be changed by an economic shock. Delegating monetary policy to an independent, conservative central banker reduces both the inflation bias and the inflationary effect of the shocks. However, this also increases output distortions in response to the shocks. The paper can be seen as a way of modelling shock responses.

Delegating to the central banker has two components. Firstly, the extent of independence is determined by the cost to the policy maker of overriding the central bank. Secondly, there is the question of the level of conservativeness of the central banker. Combining these two leads to two types of responses to economic shocks. For small shocks, the central bank is allowed to implement conservative policy. For large shocks, the policy maker is better off overriding the central bank. For example, it will implement easier policy in the case of a large negative shock, rather than letting the central bank implement tighter policy. A larger cost means that a shock must be larger for the policy maker to override the central bank. Greater central bank conservatism increases the distortionary effects of its response to the economic shock. Lohmann (1992) argues that increasing the cost of overriding the central bank is a more efficient approach than increasing central bank conservatism.

Walsh (1995)

This is a refinement of the previous two papers. He proposed that the output distortions of CBI could be addressed through an appropriately structured contract between the central bank and the government. Using a model similar to the previous papers, he argued that a transfer payment from the government to the bank could be introduced. In its simplest version, it would decrease with the size of the effect of the inflation surprise on output, growth in the money supply (or deviation from a growth target), and the extent to which target output exceeds equilibrium output. This approach is preferable to delegating monetary policy to an independent central bank (as modelled in Lohmann 1992) because it implicitly includes both a linear and quadratic response to inflation, and delegating only has a quadratic response. This more sophisticated response removes the last components of inflation bias and output distortion.

Comment

These theories are successors to Friedman's work. Much of his research revolved around implementing long run, stable policy, compared with short term, output-first policy (see, for example, his 1948 paper). In the US, this identified him with the right of politics. In other countries, for example Germany, these policies had bipartisan support, at least after the Gurzenich affair in 1956 and the SPD's adoption of the social market economy in 1959 at Bad Godesberg (Mierzejewski 2004; Nicholls 1994).

Statistical work on CBI

Early regression studies

The main early papers were Grilli et al (1991), Cukierman et al (1992) and Alesina and Summers (1993). The first paper developed an index of CBI based on political and financial indicators of central bank legislation for eighteen OECD countries. This included appointments to the central bank, the financial relationship between the bank and the government, whether the government needed to approve monetary policy, whether the central bank also supervised commercial banks, and whether procedures were set down for resolving conflicts between the central bank and the government.

The authors then ran regressions on inflation, measured by decades for 1950-1989, using these indices, as well as some political instability variables. The CBI variables had statistically significant coefficients for some decades and for the overall period as well. However, CBI variables were not correlated with output growth. The authors described these results as a "free lunch" in that CBI could control inflation without output effects (375).

Cukierman et al (1992) built on this with their own index, but for developing countries as well. Their sample comprised seventy-two countries, but again the time periods were decades based on 1950-1989. They found that their index of legal CBI was negatively correlated with inflation in industrial countries, but not in developing countries, and not in the total sample. They used the turnover of central bank governors as an alternative, de facto indicator of CBI. The higher the turnover, the lower the CBI. They found this turnover variable to be positively correlated with inflation. They also explored the relationship between CBI and inflation and concluded that sustained high inflation erodes CBI, which then produces more inflation.

Alesina and Summers (1993) examined the relationship between CBI and real economic variables such as real growth, the variance in real growth, unemployment, the variance in unemployment, the real interest rate, and its variance. For CBI, they averaged the indices from Grilli et al (1991) and Alesina (1988). The study covered sixteen countries using averaged data from the mid-1950s to the late 1980s. The authors confirmed the inverse relationship between CBI and inflation and found no relationship between CBI and real economic variables. They suggested that CBI reforms would have inflation benefits that would outweigh output costs. They also noted that CBI could be endogenous, but considered this would not be an issue in the time frame of their study.

These papers led to a strong literature on CBI and in particular its relationship with inflation. One of the weaknesses of the early papers was they used few other economic or political variables, if at all. Later papers were able to still find a CBI effect with the inclusion of other variables, such as Brumm (2000) and Franzese (1999). Other papers proposed refinements to CBI theory. For example, Keefer and Stasavage (2003) concluded that delegation to increase CBI has a greater effect on inflation when political leaders are subject to greater constraints, or veto players. They explain the results of Cukierman et al (1992) that legal CBI was correlated with inflation in industrial countries, but not developing ones. Stasavage (2003) presented data to argue that more transparent central banks would find it easier to acquire a reputation, be more credible, and have a lower sacrifice ratio. Way (2000) concluded that the left/right partisanship of the government of the day interacted with CBI. Under left governments, high CBI produces lower inflation and higher unemployment. Under right governments, it produces little change in inflation and lower unemployment.

The recent literature

Later CBI papers have been more circumspect. The idea that turnover represents de facto CBI was challenged in Dreher et al (2008). This paper examined data for one hundred and thirty-seven countries from 1970 to 2004. The authors found that high inflation tended to trigger a change in a central bank governor. In other words, turnover of central bank governor is endogenous, rather than a causal variable. Klomp and de Haan (2010a) conducted a large-scale study of over a hundred countries for the period from 1980 to 2005. Pooled OLS for both legal CBI and turnover CBI shows the expected correlations. However, when the authors use a random coefficient model to take into account dynamic change, the coefficients are no longer statistically significant across the sample. The coefficients are statistically significant for no more than a quarter of the sample. The authors suggest that the future task is to determine the conditions upon which CBI coefficients might be statistically significant.

The reforms to legal CBI in the 1990s could either be interpreted as politicians accepting the wisdom of CBI, or, as Bell (2002) put it, managing their risks by distancing themselves from high interest rates. Nonetheless, the reforms presented a new opportunity to test CBI theory. Studies of the 1970s and 1980s always have some uncertainty about them because CBI variables were largely constant. But such a concern is not present for 1990s data. Acemoglu et al (2008) examine fifty-two countries from 1972 to 2005 and divide their sample into countries with high, medium and low levels of constraints. They found the CBI/inflation relationship strongest in countries with a medium level of constraints. The authors suggested

this occurs because in countries with high or low constraints, CBI reform "does not alter the underlying political economy" (351). A contrasting paper is Crowe and Meade (2008). The authors there compare two periods for sixty-six countries: an initial period around the late 1980s and early 1990s; and a current period around the early 2000s. The analysis took account of endogeneity by using the rule of law and accountability as instruments and found consistent results supporting an inflation effect from CBI reforms.

Klomp and de Haan (2010b) analysed the literature through a meta-analysis. In other words, the statistical results of regressions in individual studies themselves became observations for a study that encompassed multiple papers. The authors examined fifty-nine studies published between 1991 and 2006. On average, the meta-regressions in the paper had ninety-one observations covering twenty-eight countries. The dependent variable was the t-statistic of the CBI coefficient. In the meta-regression, the constant term represented publication bias (if statistically significant). The inverse of the standard error of the CBI coefficient in a regression was the key variable; if statistically significant, it would represent whether the CBI/inflation relationship was robust.

The authors found strong evidence of publication bias in the literature. They also found that, although there was a CBI/inflation relationship, it was conditional on the features of the study in question. In particular, it was more likely to occur where the study covered the OECD, in the 1970s, and included labour market variables (for example corporatism).

Comment

This short review of the empirical literature has shown that there is nagging uncertainty about the CBI/inflation relationship. Over time, studies have included more countries, longer time periods, more variables, and more sophisticated techniques, but uncertainty remains. There is also the issue of whether CBI reflects another, underlying variable. In a review article, Fernandez-Albertos (2015) has stated that the question of endogeneity "remains ultimately unsolved in the empirical literature."

One approach would be for the literature to focus on the weaknesses revealed in the theory to date. For example, there are more studies on the CBI/inflation relationship than on what factors might cause CBI. Better knowledge on what factors cause CBI would progress work on endogeneity. Further, by highlighting the OECD in the 1970s, Klomp and de Haan (2010b) have indicated that it would be worth going back to the data covered in the early CBI studies to determine if there is something that was initially missed. Chapter 6 specifically considers this question.

Counter theories and counter-perspectives

There are four main counter-arguments to CBI. Many of these have been made by multiple authors. A discussion about CBI in the Australian context is in Chapter 6 of Bell (2004).

CBI is endogenous

A commonly made argument about CBI is that it is not they key driver of inflation performance. Rather, CBI is endogenous and it is correlated with other variables that are more important, such as inflation aversion, but which have not been included in statistical studies. This argument has been made in general terms by Hayo (1998), Hayo and Hefeker (2002), McNamara (2002), and Pollard (1993).

There have been some statistical treatments of this theory. Posen (1996) proposed that the underlying variable was financial sector opposition to inflation. His study covered seventeen OECD countries from 1950 to 1989. His indicator for effective financial opposition to inflation (FOI) comprised four parts: universal banking; the central bank not supervising banks; federal political structure; and decreasing in the fractionalisation of the legislature. Posen found that FOI was positively correlated with CBI and negatively correlated with inflation. CBI was not correlated with inflation.

Scheve (2004) used social survey data to examine the likely determinants of inflation aversion; inflation and unemployment history were key variables. He then developed an estimated inflation aversion index for twenty OECD countries controlling for economic context. This was better correlated than CBI with a country's inflation performance in the 1990s.

A counter-paper is Crowe (2008), who argues that taking endogeneity into account makes the CBI/inflation correlation more robust. His underlying variable is the diversity of political coalitions. The more diverse the coalition, the more likely that the central bank will be goal independent. The intuition is that if the political coalition cannot resolve issues around monetary policy, then the problems will be left to the central bank. Crowe finds that policy correlation is inversely related to CBI and that the CBI/inflation relationship is strong once this is taken into account through instrumental variables. His study covers thirty five countries in the late 1990s.

Wider empirics are inconsistent

A second common counter-argument about CBI is that wider empirical observations are not consistent with it, or at least are not explained by it. For example, Daunfeldt and de Luna (2008) and Pollard (1993) have observed that countries managed to bring inflation under

control in the 1980s without a change in CBI. The observation suggests that another factor was driving inflation performance.

Posen (1998) conducted a statistical study of other possible implications of CBI, in addition to lower inflation. The study covered seventeen OECD countries from 1950 to 1989. The implications were derived from the idea that CBI increases price certainty over the longer term, increases credibility about monetary policy, and is a stronger constraint on government. The implications tested were that higher CBI is correlated with: a lower sacrifice ratio; greater nominal wage rigidity; lower costs of disinflation (holding nominal wages constant); quicker disinflations; lower government seigniorage revenue; and a smaller relationship between the electoral cycle and fiscal and monetary policy.

Posen (1998) found no evidence at the 5 per cent level for any of these implications. The one possible finding from the study was that higher CBI is correlated with a *higher* sacrifice ratio. This result is consistent with the idea that a more inflation averse country is prepared to forego more output than other countries to achieve price stability. The study is indirect support for the endogeneity theory. Posen put this in terms of the financial sector, but other sources of endogeneity are possible.

Monetary and fiscal policy should be co-ordinated

This revives an idea made prior to CBI theory. If monetary and fiscal policy both have effects on the economy, then they should work together. Conflict may lead to sub-optimal results. Forder (1998) has made this argument in general terms. Andersen and Schneider (1986), Pollard (1993) and Blake and Westaway (1993) developed this argument in mathematical models. They found that, all else being equal, outcomes were superior when the fiscal and monetary authorities co-ordinated.

If the central bank is not independent, the possibility of extended conflict is reduced. However, the chances are greater if the bank is independent. Another issue is whether, in the face of possible conflict, an independent central bank decides to follow the government's lead, the government follows the bank's lead, or conflict is sustained.

Germany, the US and the UK had varying degrees of policy co-ordination during the Great Inflation. Studies of Germany have demonstrated that monetary policy there tended to follow fiscal policy (Frey and Schneider 1981; Berger and Schneider 2000). However, during the second oil shock, the Bundesbank considered that fiscal policy was too loose. It engaged in the public debate and, when the SPD and the Liberal Party could not agree on reducing the deficit,

the Liberal Party switched to the CDU. The new government reduced the deficit and policy was coordinated (Kennedy 1991).

In the UK in the 1970s, there were few signs that macroeconomic policy was not co-ordinated. This is not unexpected, given that the government had direct influence over the central bank. Fiscal policy was sometimes used as stabilisation, for example Denis Healey's austerity budgets of 1975 and 1976. In the 1979 election, however, Thatcher promised to implement the Clegg Commission's recommendations on public sector pay while at the same time implementing tight monetary policy and introducing a VAT. In terms of inflation, this was contradictory policy. However, the 1981 Budget had significant spending cuts and inflation started to drop from this point on (Derbyshire and Derbyshire 1988; Tomlinson 2012).

In the US, Presidents Nixon and Carter disliked high interest rates and sought to soften monetary policy where they could. They were typically interested in price controls, credit controls, or "jawboning" to manage inflation. Fiscal policy was soft and monetary policy only developed a harder edge with the appointment of Paul Volcker as Chair of the Federal Reserve. Under Carter and Volcker, policy was not coordinated, but the conflict was not extreme. But after the 1980 election, the Federal Reserve sharply increased interest rates. Reagan also obtained Congressional support for very loose fiscal policy. The result in the early 1980s was high unemployment, high and unstable interest rates, decreasing inflation and a high deficit (Hargrove 1988; Neikirk 1987; Walker 2011).

This brief summary suggests that inflation was best brought under control once monetary and fiscal policies were co-ordinated. Monetary policy alone can achieve the result, but at a greater cost.

Time inconsistency does not override common sense

Some authors have suggested that society is often able to work around the time inconsistency problem for some issues (McCallum 1995; 1997). Kydland and Prescott (1977) briefly mentioned patent law. Here, there is an incentive for policy makers to renege on their commitment; technology is developed on the premise of patent protection and government can withdraw the protection, if it wishes, to secure short term advantage. Taylor (1983) and Forder (2001) have observed that continuing with patent law appears to be common sense to everyone, and so there is no question of it being discontinued.

Constraints on government are also relevant. The higher they are, the less scope there is for cheating. For example, to raise funds, James I sold the hereditary title of baronet for £1,095

each and promised that only a fixed number would be sold. By 1614 this generated £90,000. But he then reneged on the commitment to only sell a limited number and by 1622 their price was £220 (North and Weingast 1989).

A different example was the abrogation of gold clauses by the United States in 1933 in its long term bonds. These clauses gave the bearer the right to demand payment in gold coin of certain specification. The US government converted these debts to paper money by law. This decision, combined with other legislative changes, survived Supreme Court challenge and with little effect on financial markets. In the court cases, much turned on the fact that bondholders were still being paid (Green 1986).

A critique of CBI theory

Earlier in the chapter, these papers were described and put in the context. Their conceptual and analytical problems are now discussed.

Kydland and Prescott

In some ways, the paper is very general. It has a breadth of applications beyond the relationship between inflation and unemployment. However, it describes a problem which depends on certain conditions, namely an incentive to cheat by policy makers and a lack of effective punishment by stakeholders or voters. This then affects credibility. Something that would override the time inconsistency problem is where there is bipartisan support for the optimal policy. Then a policy maker's statement about future policy would be credible and the optimal policy would be consistent. A political process of debate, or shifting interests, might result in bipartisanship so that the time inconsistency problem no longer applies.

Kydland and Prescott (1977) might be better seen as a step in the maturity of a policy problem where the technical solution is known, but it does not have wider acceptance. This information asymmetry would optimise the scope for government "cheating". Another factor would be a lack of constraints on the government. This decreases the chances that stakeholders or the government could punish a cheating government.

Barro and Gordon (1983a)

This paper makes the key assumption that $k<1$, i.e. that policy makers have an unemployment goal below the NAIRU. This then leads policy to try to push unemployment below the NAIRU, which is futile in the long run (Phelps 1967 and Friedman 1968b). In 1983, the idea of setting $k<1$ was a valid assumption for most countries, including the United States.

However, Orphanides (2003) has given an alternative explanation. He has argued that, during the 1970s, policy makers in the United States under-estimated the level of the NAIRU. For example, unemployment of 6 per cent might have convinced policy makers to continue with monetary ease to reduce it to 4 per cent when the NAIRU may have been 6 per cent. Tulip (2004) used minimum wages to estimate the NAIRU during the 1970s and found they averaged over 6 per cent. The Economic Report of the President had the NAIRU (often termed "potential output") around 4 per cent in the first half of the 1970s and around 5 per cent in the second half. It is likely that this caused policy mistakes.

This author argues that errors around the output gap is a more complete explanation for activist policy in the 1970s than the assumption that k<1. The lack of attention in the literature to this crucial assumption has been noted previously (Blackburn and Christensen 1989).

Rogoff (1985) and Lohmann (1992)

I do not query the idea around a central banker being more conservative than a policy maker or the general population. The issue I would like to raise with these papers is the concept of a cost for a politician of overriding the more conservative central bank. If the population does not value price stability, and the political leadership does not want it, then the question is what happens if the central bank dis-inflates. The likely response is that there will be a public outcry and political pressure brought to bear. The central bank then has a choice: it can either continue with its policy and run the risk of being replaced, or it can soften its policy so that it is at the margin of what is politically acceptable. Volcker (1990) himself stated that he was able to disinflate due to greater public support for it.

There are some precedents for unpopular central banks. The second and third central banks in the United States did not have their charter renewed partly because they encouraged the return of banknotes to the originating banks for redemption (Smith 1936). In the 1920s, the membership of the Australian Note Issue Board was replaced because it applied a strict quantity of money approach to issuing notes and coins, which worked against the interests of farmers and the financial sector (Coleman 2001). An example keeping a close eye on the politics is the Federal Reserve in the 1970s, which was subject to intense scrutiny by Congress. Although the Fed did respond to inflation, it did not break the back of inflationary expectations. This did not occur until the appointment of Paul Volcker in response to a run on the dollar and the building of a coalition of support for tight money around 1980 (De Long 1997). The Fed kept within the margin of political acceptability.

In theoretical terms, the cost of overriding an independent central bank will decrease if there is less political support for what it is trying to do. Riker (1980) has already made this argument. He noted that institutions only slow down the link between preferences and policy outcomes. If an institution consistently creates a set of losers from its actions, they will lobby to remake that institution. In the long run, institutions will be shaped to support preferences. Woolley (1985) said something similar. Flood and Garber (1984) discussed this basic idea using a mathematical model of an economy adopting the gold standard. They conclude that shifting to gold would only be "a mask obscuring the forces that drive the global dynamic money creation process" (104). In 1989, the Treasurer of Australia, Paul Keating, used this argument to describe CBI as "straight quackery" (Bell 2004, 138).

A related idea is that there is a great difference between voters and the political elites. Voters are accustomed to a vast, authoritative hierarchy above them. If they do not comply with the law, the consequences can be swift and severe. However, political elites create the rules and there is scope for them to change the rules to suit their purposes, especially if the political opposition is not strong. The concept of the immutable cost of overriding a central bank ignores this reality.

Moore (1995) analysed this problem from the perspective of public sector managers generally, using the concept of the authorising environment. He argued that the political environment determined what public sector managers could and should do. He also argued that they could shape this environment through techniques such as advocacy, policy development, negotiation, public deliberation, and marketing. These techniques all had their benefits and risks, but they show that public sector managers, such as central bank governors, often have multiple ways for engaging with politicians and the public to create their preferred environment for monetary policy. Moore's ideas are powerful because they extend beyond the cost of overriding a central bank, but also give the central bank scope to increase the political value of stable prices.

Writers sometimes suggest that a constitutional amendment may be a way of ensuring that the cost of overriding a central bank is maintained (e.g. Coleman 2001). Admittedly, this would make a legislative override more difficult and negate the threat of one. But a substantial process must occur in order to make the constitutional change in the first place. This often involves the legislature passing a law, a referendum, the involvement of the states/provinces in federal systems, and supermajorities in any or all of these processes. If a central bank were given constitutional status in a country, then it would be fair to conclude

that its role, and the importance of tight money, had bipartisan support and the policy had matured. If this were the case, the problem in Kydland and Prescott (1977) would no longer apply because policy makers' statements about future policy would support tight money and be credible.

Walsh (1995)

This paper is an elaboration on Rogoff (1985) and Lohmann (1992). The central bank is fully independent, but a more sophisticated method is used to drive the central bank's behaviour and produce better economic outcomes. However, it suffers from the same problems as the other two papers by assuming that the central bank can be separated from government. Having the central bank and the government enter into a contract for monetary policy assumes they are equal parties. In most cases when a government purchases supplies or services, this assumption is appropriate. But where the procurement has political implications, then voters would apply pressure for it to be politically managed.

The structure of the thesis

The five core chapters of the thesis and their findings are outlined below.

Chapter 2 – The Phillips Curve literature

The key papers in the inflation/unemployment literature are well-known. In 1958, Phillips presented his general finding that there appeared to be an inverse relationship between the two variables. This idea was reinforced by Samuelson and Solow (1960). However, Phelps (1967) and Friedman (1968b) disproved this on a theoretical level using agents' expectations. Although there is still a debate about the short run real effects of policy, it is now a consensus that policy cannot have permanent, long run real effects. This basic understanding means that the risk of prolonged episodes of inflation, such as in the Great Inflation, are much reduced.

The problem with focussing on these articles is that it is selective and may not have represented the views of the majority of economists. Chapter 2 seeks to objectively measure the views of the profession on the long run Phillips Curve from 1947 to 2006. This is assessed through examining articles in the top ten economic journals based in the United States. The aim is to determine whether the profession either became substantially less conservative after Samuelson and Solow (1960), or became substantially more conservative after Friedman (1968). By examining what economists actually thought at various points in time, it will be possible to obtain greater insight on whether economic thought contributed to the Great Inflation.

Chapter 2 finds that the economic literature was less conservative during the 1960s and became more conservative after Friedman (1968b). By 1975, inflation first policy and the vertical long run Phillips Curve became the majority view of economists in the literature, and by 2000 it was the consensus view. The data suggests that the economic literature was largely influenced by theory. It also suggests that economic ideas did not directly influence economic policy, but may have done so indirectly through other channels, such as by influencing politicians, advisers and others in the "political game."

Chapter 3 – The Federal Reserve's reaction function

The activities of the Federal Reserve in monetary policy have been much studied. The early papers were Havrilesky (1967) and Christian (1968) and these found that monetary policy was correlated with inflation and unemployment. In 1992, Bernanke and Blinder found that the Fed responded to the money supply during the Volcker disinflation between October 1979 and October 1982. Clarida et al (2000) and Sims and Zha (2006) have argued that the Federal Reserve placed a higher priority on fighting inflation after this time; that is, it became more conservative. Sargent et al (2006) argue in favour of a learning process, with the Fed being least responsive to inflation in the mid-1970s. Orphanides (2003) proposed that the Fed under-estimated the NAIRU, producing a bias towards expansive monetary policy in the 1970s.

The claims about unemployment, inflation and the Volcker disinflation appear irrefutable. However, the claims about a shift in priorities and learning operate at the margins and are more contestable.

The chapter examines the reaction functions on four types of data from 1953 to 2012; a GARCH model of quarterly data for the federal funds rate; an OLS model of annual data for the federal funds rate; and logit models of the ease and tightening decisions of the FOMC. The variables that are statistically significant across these models, and are robust, are prices, output, the Volcker disinflation, presidential signalling, and the deficit. There was support for Orphanides' (2003) theory; the real time output gap generally fits the data better than the unemployment rate. Various conservatism and learning variables were tested, but almost none of them behaved as expected. The only conservatism variable to perform in line with theory was the real time output gap for the period after 1982. The coefficient for this variable tended to be lower in size than before, or operate at a longer lag, suggesting that the Fed was less responsive to it.

The Fed cannot ignore output. It is legally required to pursue full employment. However, the evidence suggests that it has changed the weight it places on it. After all, if the Federal Reserve has one policy instrument (interest rates, or versions thereof), it will be most effective if it pursues just one policy goal (stable prices). After correcting for errors in measuring the real time gap, the Fed appears to have shifted as close as it reasonably can towards this approach. This is one of its key findings from the Great Inflation.

Chapter 4 – Historical case studies of Germany, the US and the UK

CBI theory says little about political behaviour, apart from predicting a positive correlation between inflation and political involvement in monetary policy. This suggests that CBI theory is narrow; political behaviour is complex and if CBI theory cannot explain much of it then it is vulnerable to other theories.

This chapter gives a historical narrative of three countries that had different institutional arrangements and inflation histories: Germany had a high degree of legal CBI and an inflation history; the UK had a low degree of legal CBI and no inflation history; and the United States had a high degree of legal CBI and no inflation history. However, all countries had political leaders who played an important role in promoting stable prices: Germany had Ludwig Erhard; the UK had Margaret Thatcher and the United States had Ronald Reagan.

There are two competing theories: CBI, which is a legal constraints theory; and the political constraints theory of Riker (1980). The aim of Chapter 4 is to conduct process tracing to determine which theory can better explain these events. It does find that CBI theory has some explanatory power. For example, inflation was lowest in Germany and highest in the UK. Consistent with Lohmann (1992), the Bundesbank did not accommodate the first oil price shock in 1974.

But the political constraints theory can explain these events and more. In 1956, Adenauer was universally condemned in Germany for criticising the Bank deutscher Lander's (BdL's) pursuit of sound money (the Gurzenich Affair). This sent an ongoing signal to politicians that the BdL and then the Bundesbank had widespread support for their goal of sound money. It can also explain why Helmut Schmidt as Finance Minister put out a joint press release with the Bundesbank in early 1974, stating that inflation would not reach 10 per cent. This did not occur in either of the other two countries.

In the US, the Federal Reserve received more support from Reagan than Carter; the latter had his own version of the Gurzenich Affair in the 1980 election campaign. Reagan's support may

not have been in the quality and quantity that economists were hoping for, but it was politically sufficient. Both Burns (1979) and Volcker (1990) stated that public opinion shaped their actions. The UK was a strong example of politics influencing economic policy. Thatcher came to power on a platform of fighting inflation and curbing union power and she took the lead in this. Once fiscal and monetary policy were aligned to this goal, inflation started to drop. In summary, the political constraints theory can explain not only the differences in inflation levels across the three countries, but also the timing of their disinflations.

The chapter uses this analysis to propose a new theory about CBI, namely that the higher a central bank's legal independence, the more likely it is to conduct a disinflation. Achieving stable prices is not always a vote winner; the direct benefits of stable prices tend to concentrate in a share of the population (savers) and the indirect macroeconomic benefits are not obvious. Therefore, more political risk is involved and it makes sense for a politician to let the central bank disinflate, where appropriate. This is most easily done when there is CBI. It may be that the established literature on CBI was observing this process but drawing the wrong inference.

Chapter 5 – Inflation and the economic vote

Conventional political wisdom in the 1970s was that voters cared more about employment than inflation. However, a number of political leaders who oversaw disinflations had long, successful careers. Examples are Ronald Reagan, Margaret Thatcher, Francois Mitterand, Felipe Gonzalez (Spain), and Aníbal Cavaco Silva (Portugal). A reverse example was the SPD in Germany, which lost power in 1982 when it could not deliver a sufficiently conservative fiscal policy. This raises the question of whether voters placed substantial weight on inflation performance. Early studies on the economic vote suggested this was the case, but later studies do not (Lewis-Beck and Stegmaier 2013).

Chapter 5 further explains the issues in Chapter 4 by examining the link between inflation and a political activity (elections). If there were a widespread political reaction to inflation, then it would show up in voting behaviour. If not, the political constraints theory can still apply, but it would be through other political channels, such as elites or powerful interests such as the finance sector (e.g. Posen 1996). It should be noted that economic growth and inflation have different patterns of winners and losers. Almost everyone gains from economic growth, but the effects of inflation can change, depending on whether someone is a saver or borrower. This paper tests the hypothesis that disinflations were related to widespread political concerns about inflation.

Much of the economic vote literature revolves around conditioning variables relating to clarity of responsibility. For example, if a government is in coalition (Powell and Whitten 1993), or the domestic economy is driven by international events (Hellwig 2001), then it makes less sense to punish or reward the government over the economy. Chapter 5 introduces a new conditioning variable, namely the preferences that a country's voters may have about the economy. This is based on "linguistic relativity," the idea that the characteristics of a person's language can influence their decisions (Wolff and Holmes 2011).

Inflation is a measure of the stability of a currency over time. Someone who preferred greater stability, or who discounted the future less, would be expected to prefer lower inflation. Linguistic relativity has been shown to influence individuals' decisions about the future through how a language represents the future tense, or its "future time reference." For example, Japanese, most Germanic, and all Scandinavian languages represent the future through context, without a marker such as "will". Speakers of these languages (which has a weak future time reference) literally say "It rains tomorrow." On the other hand, Romance languages and English have the explicit marker "will" and are considered to have a strong future time reference. The inference is that, where the majority of voters in a country speak a language with weak future time reference, they are more likely to punish the government for inflation. The chapter examines whether combining future time reference with clarity of responsibility creates useful categories for analysing elections.

The approach is to determine what variables are correlated with the vote share of the main government party of twenty two OECD countries at legislative elections from 1956 to 2009. Chapter 5 finds that splitting the elections in four categories (strong/weak future time reference, and whether the lead government party is in coalition) generally provides sufficient return for the extra variables. For the strong and clear category, the chapter finds that the vote is correlated with the real economy, a variable that combines unemployment and growth. For the clear and weak category, which occurred most often in Norway, Sweden and Japan, the chapter finds that the vote is correlated with benchmarked inflation. This is a concept used in Kayser and Peress (2012), who argue that voters compare a country's economic performance against an international benchmark. This chapter uses the median. An economic vote was absent in the two categories without clarity of responsibility. The other key variable in these categories is whether elections are held six or more months early, which could be interpreted as a reflection on the governing coalition.

The chapter shows that a simple electoral accountability model can only explain the incentives politicians faced in dealing with inflation for a small number of countries. Indeed, the clarity of responsibility idea means that only about half of governments in developed democracies face a direct political incentive to manage the economy. This may indicate that there are alternative ways, such as elites working behind the scenes, by which countries secure economic outcomes. It also suggests that lead government parties in coalitions have other issues to manage, in particular that very coalition itself.

Chapter 6 – The correlation between inflation and CBI

This is the key chapter in the thesis. The validity of CBI theory rests on whether it is reflected in the data. Chapter 6 examines the classic case of CBI effectiveness, i.e. developed countries in the 1970s. This follows on from Klomp and de Haan (2010b), who found that the statistical results for CBI are strongest for papers covering OECD countries in the 1970s.

Chapter 6 has annual data for twenty one OECD countries from 1973 to 1990, along similar lines to Franzese (1999). To address the issue of endogeneity, it also includes an analysis of which factors are correlated with CBI, the two main ones being strong bicameralism and a hyperinflation history. These are then used as instrumental variables in two-stage least squares regressions. The chapter seeks to test the strength of CBI theory by determining if and when CBI and inflation are correlated in this important case study.

The chapter finds that one particular measure of CBI was correlated with inflation and has the right sign in some simple models, such as OLS or 2SLS with lagged inflation, or OLS with lagged inflation and economic variables. However, adding institutional variables meant the correlation was no longer statistically significant. In a 2SLS regression with lagged inflation and economic variables, the coefficient for CBI changed its sign from the OLS model. Other variables representing CBI did worse. The variables that were consistently correlated with inflation were lagged inflation, currency performance, growth, oil inflation, and a time trend (with a negative coefficient). These variables are self-explanatory, apart perhaps from the time trend, which could be interpreted as policy learning or changing expectations.

These results place serious doubt on CBI theory. The previous literature has taken a risk by often focussing on the period before the 1990s, which meant that CBI measures largely stayed constant over time. Without some temporal variation, it was difficult to be sure that CBI variables were measuring just that, rather than other features of a country. This placed greater reliance on selecting the correct instrument and an effective range of variables. If CBI

cannot help explain the Great Inflation, then this raises a question of whether another key institutional or cultural variable can instead.

A new narrative?

Economists and political scientists have a strong narrative to tell about the development of CBI theory. It starts with the Phillips Curve in 1958, which meant there was theoretical support for full employment as a legitimate policy outcome. This displaced the traditional focus on inflation. But then Phelps (1967) and Friedman (1968b) foresaw the problems behind using demand management to increase employment. Stagflation occurred in the 1970s due to the oil price shocks and economic agents' anticipation of easier economic policy. Mainstream CBI theory argues that developed countries that had higher levels of CBI withstood these problems better because the central banks could resist political and popular demands for increased public spending. In the 1990s, many countries learnt from this and implemented central bank reforms, producing stable prices.

The point of this thesis is that this narrative misses the point. A better narrative is that the collapse of Bretton Woods, plus the oil shocks, led to an outbreak of inflation that policy makers gradually addressed throughout the 1970s and 1980s. Although central banks were involved in disinflations, so were politicians. Politicians sometimes gave central banks political space in which to operate, but could simultaneously expose them as scapegoats for disinflating. Politicians' decisions were aimed at maximising political returns, which were often similar to optimal policy, but not always. Higher CBI did not cause lower inflation, although it may have indicated that the central bank was more likely to take a lead role in disinflating through monetary policy.

2 – Theoretical underpinnings of macroeconomic policy in the United States, 1947-2006

Abstract

This paper examines the conservativeness of the academic economics literature. Conservativeness is defined as either arguing that the long run Phillips Curve is vertical, or that economic policy should focus on inflation first. Data was collected through articles published in the top 10 academic economics journals in the United States.

The paper finds strong evidence of a shift to a less conservative literature between the publication of Phillips (1958) and Phelps (1967) and Friedman (1968b).

There is only modest evidence that the literature became more conservative after stagflation (through demonstrating that the long run Phillips Curve is vertical). Rather, after stagflation, papers were likely to be less conservative following an increase in unemployment. This more liberal approach may have been affordable once the Fed broke the back of inflation by 1983.

Introduction

To some economists and policy makers, the Phillips Curve suggested there was a long run causal relationship between inflation and unemployment. During the 1960s and 1970s, it was used in support of economic policies that tolerated higher inflation on the basis that lower unemployment would result. After all, economic policies are meant to ultimately produce beneficial real outcomes.

Phelps (1967) and Friedman (1968b) launched a major theoretical attack on the Phillips Curve. Their argument was that levels of output and employment could not be shifted from their natural, or steady state, levels in the long run. If governments consistently attempted to decrease unemployment through increased inflation, then actors in the economy would look backwards. Based on historical evidence, actors would eventually expect higher inflation, which would of itself raise prices. In other words, the Phillips Curve only existed in the short run. Although Phelps and Friedman were not the first to endogenise inflation expectations (e.g. Cagan 1956 and Lutz 1952), they were the first to do so in the context of the long run Phillips Curve.

The Phillips Curve has since undergone further development. The rational expectations ideas in the papers of Lucas (1972) and Sargent and Wallace (1975) argue that economic actors do not need to look backwards to form inflation expectations. Actors can also use information currently available to look forward to set their expectations, implying there is no short run Phillips Curve. Further, the 'forcing variable' in the Phillips Curve is now usually defined on a cyclical basis, such as the output gap or the non-accelerating inflation rate of unemployment (NAIRU). Other forcing variables, such as marginal cost and labour income share, are also being proposed.

The relative effect size of forward looking and backward looking expectations, and how to define the forcing variable, are current debates in macroeconomics. Resolving these issues will improve economic policy in many countries. However, it is the claim of this paper that recognising that a Phillips Curve does not exist in the long run is sufficient to prevent another episode such as the "Great Inflation," or stagflation of the 1970s. In other words, if a policy maker accepts the concepts in Phelps (1967) and Friedman (1968b), then this would greatly reduce the chances of a major outbreak of inflation and the associated negative effects in their economy.

The “Great Inflation” was the greatest economic problem in developed economies in the second half of the twentieth century and economists have acknowledged that the long run Phillips Curve contributed to it (Sargent 1999; Meltzer 2006; Orphanides 2006). There have been studies that have analysed the importance that the Federal Reserve placed on fighting inflation, including an appreciation that the long run Phillips Curve affected Federal Reserve actions (Sargent 1999; Orphanides 2006). A range of explanations have been proposed, including that Federal Reserve policy underwent a fundamental change in the mid-1970s to be more inflation averse (Primiceri 2006 and Sargent et al 2006).

However, what these papers lack is being able to provide a robust explanation as to why these actions occurred. This paper attempts to provide the basis for such an explanation by directly measuring, in the academic literature, the extent of conservatism. This is defined as either support for inflation-first policies or opposition to the long run Phillips Curve. This type of analysis has not been conducted before. The longer term aim is to identify whether there is a direct link between academic ideas and economic policy.

The paper focusses on the United States literature because this is where the most highly regarded economics journals have been published (Laband and Piette 1994) and have had a majority of American authors. These publications were the academic battle ground for much of the debate over the long run Phillips Curve and economic policy. Further, by concentrating on one country, it is possible to determine the extent to which local economic factors such as inflation and unemployment influenced the literature.

Literature review

Economists have made historical observations about support for the long run Phillips Curve. The matter about which there is the most consensus is that it was no longer credible by the mid-1970s. For example, Gordon (1990) stated that economists abandoned the Phillips Curve within five years of Friedman’s famous 1968 speech, and Blinder (1986) took a similar view. Weintraub (1978) quoted a Congressional committee report in 1975 that argued that there was no meaningful trade-off between inflation and unemployment. Clarida et al (2000) observed that, by the mid to late 1970s, economics textbooks were more conservative. Hasbrouck (1984) found, from 1945 to 1973, that forecasters’ predictions of inflation and growth in the Industrial Production Index were almost always positively correlated, whereas from 1974 to 1983 there was no correlation.

In 1979, Kearl et al published a paper that specially focussed on the views of economists and the extent to which they had formed a consensus on particular parts of economics. Their questionnaire implicitly adopted the views of Phelps and Friedman by asking economists' support for the statement, "In the short run, unemployment can be reduced by increasing the rate of inflation." The implication is that the authors would have expected a unanimous response if they framed the question in terms of the long run.

The majority view about how economists came to reject the Phillips Curve is that it was on theoretical grounds. Blinder (1988) makes this assertion, as does Prescott (1995), who states that theory predicted stagflation. Blanchard (1990) argued that the debates in the 1970s, including whether there was a long run trade-off between unemployment and inflation, were "partly triggered by events" but were also a response to previous research that had been strongly empirical, but atheoretical. These views suggest that the work of Friedman and Phelps in the late 1960s would be central to the rejection of the Phillips Curve, especially since Blaug (1997) referred to Friedman's 1968 paper as "easily the most influential paper on macroeconomics published in the post-war era".

Interestingly, Friedman himself did not support this view. Rather, in his Nobel Prize speech, he stated that, "experience contradicted tentatively held hypotheses" (1977). In other words, stagflation disproved the long run Phillips Curve.

Hypotheses

The paper tests the question of what convinced economists to reject the long run Phillips Curve and to support inflation first policies. The two leading theories are: the papers of Phelps and Friedman in the late 1960s; and stagflation in the US economy. Was it theory, or was it empirics? They are not necessarily mutually exclusive, but it should be possible to isolate their individual effects. A change in academic attitudes to the Phillips Curve during or shortly after 1968 would be consistent with a change in theory, whereas a change related to the misery index, for example, would be more consistent with empirics. Some papers have argued that the long run Phillips Curve was disproved simply by noting that both unemployment and inflation increased, contrary to the theory's predictions (Wallich 1978; Bental and Eckstein 1997) or that it at least presented a puzzle (Abel et al 2008; Kettl 1986). Other authors have noted that Friedman and Phelps predicted the stagflation of the 1970s (Blanchard and Sheen 2004; Prescott 1995).

A link with stagflation would be consistent with the work of Karl Popper, an eminent philosopher of science. One of his key arguments was that scientists improve their theories by

attempting to disprove or falsify them. In his words, “we can learn from our mistakes” (Popper 1972, vii). Where there are two competing theories A and B, and B matches the results from a range of experiments better than A, then B can be regarded as more likely to be correct and A regarded as more likely to be falsified. Developing a theory that can explain a wider range of phenomena will be more general and preferred over its predecessor (Popper 1972). Economists often note that they cannot subject their theories to empirical testing (e.g. Sims 1996; Friedman 1984). The Phillips Curve was a special case because it was a politically attractive idea, which meant that it influenced policy in the 1960s and 1970s and generated real-life data. Before this time, economists had real-life data on inflation-first policies, or at least policies that placed a greater weight on inflation. This means that economists had the opportunity to compare the two theories in the Popperian tradition.

In testing this hypothesis, it is worth bearing in mind the work of Thomas Kuhn (1970), who sought to explain the human interactions that occur when a major dispute develops in a field. He argued that experts, like the general population, take time to adjust to new ideas, and that often some never make this “paradigm shift”. Therefore, adopting a new theory can be a slow and complicated process. New major theories tend to be introduced by researchers who are young or new to a field and less wedded to familiar ideas.

Further, new theories that in future will be superior to current theories can be rejected at the time if there is not sufficient empirical data or other techniques to support them. For example, this occurred after the publication of Newton’s laws of motion, which were criticised on relativistic grounds. However, there was not sufficient empirical evidence to support these criticisms and Newton’s laws remained the accepted theory until the late nineteenth century (Kuhn 1970). At this point, improved instruments measuring light generated anomalies that could not be explained by Newtonian mechanics, leading to a crisis and Einstein publishing his theory of relativity in 1905. Kuhn’s basic point is that experts such as scientists behave much like ordinary people; it is more natural and efficient for them to continue with established ideas until extreme events push them to do something new (Kuhn 1970).

This provides an explanation as to why the long run Phillips Curve gained some acceptance, despite previous research that was inconsistent with it. Cagan (1956) used data on hyperinflations and Lutz (1952) used models to argue that a history of high inflation could change expectations or make economic actors “inflation conscious” and change the effect of economic policies. Another example is Felix (1956), who used long run historical data for Britain and France to show that profit inflation was not an industrial stimulus and that there was no

correlation between inflation and economic growth. This paper was a particularly strong rejection of the vertical long run Phillips Curve.

Data

Scope

The data for this paper are collected from ten of the top ranked journals published in the United States between 1947 and 2006. Journal rankings were sourced from Laband and Piette (1994) and Kalaitzidakis et al (2003). The start date of 1947 is designed to give some comparative years before Phillips' paper, which was published in 1958. The 2006 end date captures the period where researchers started to have sufficient distance and perspective to consider stagflation in the 1970s and the Volcker deflation. This self-reflection commenced around 2000 with the publication of Sargent (1999) and Clarida et al (2000).

United States journals were selected because most of the top ranked journals were published there, especially as time progressed. Further, selecting one country means it is possible to compare the literature with domestic economic events of the time to determine if they were correlated with the literature. Some articles in these journals covered other countries or were written by overseas authors. These were retained in the analysis because the act of publishing them in an American journal is a signal that they were relevant to an American audience.

The selected journals were: the *American Economic Review* (AER); the *Journal of Political Economy* (JPE); the *Quarterly Journal of Economics* (QJE); the *Journal of Economic Theory* (JET); the *Journal of Monetary Economics* (JME); the *Journal of Economic Literature* (JEL); the *Journal of Economic Perspectives* (JEP); *Papers and Proceedings* (P&P) of the annual meetings of the American Economic Association, which are published as a special issue of the *American Economic Review*; the *Journal of Finance* (JOF) and the *Journal of Money, Credit and Banking* (MCB). One criterion for selection were that the journals needed to maintain a reasonably high rating over time. For example, this requirement excluded the *Brookings Papers on Economic Activity,* the rating of which has declined markedly. A journal also needed to have at least eight articles to be included in the dataset, which excluded highly ranked publications including *Econometrica.* The *Papers and Proceedings* and the *Journal of Finance* were partly selected to improve the coverage of earlier years.

Database searches of the journals were conducted to select potential articles, which were included if they met one of several criteria. The first was whether an article had the word "Phillips" in the title. Also included were articles that had the word "inflation" in the text and

either “Keynesian” or “unemployment” in the title. The last group was all articles that had “unemployment” in the text and either “monetary” or “inflation” in the title. An article’s title included the title of the conference session where the article was a conference paper, which mainly applied to the *Papers and Proceedings*. This search produced 919 articles. Of these, 255 did not express any opinion on the relationship between inflation and unemployment and were excluded. This left 664 articles. A small number of these were conference discussions where several individuals discussed papers presented under a single conference topic. These were separated and only those that expressed an inflation/unemployment relationship were retained. This process added another ten papers, meaning the dataset comprised 674 articles in the first instance. A breakdown of the papers by journal is given in Table 1.

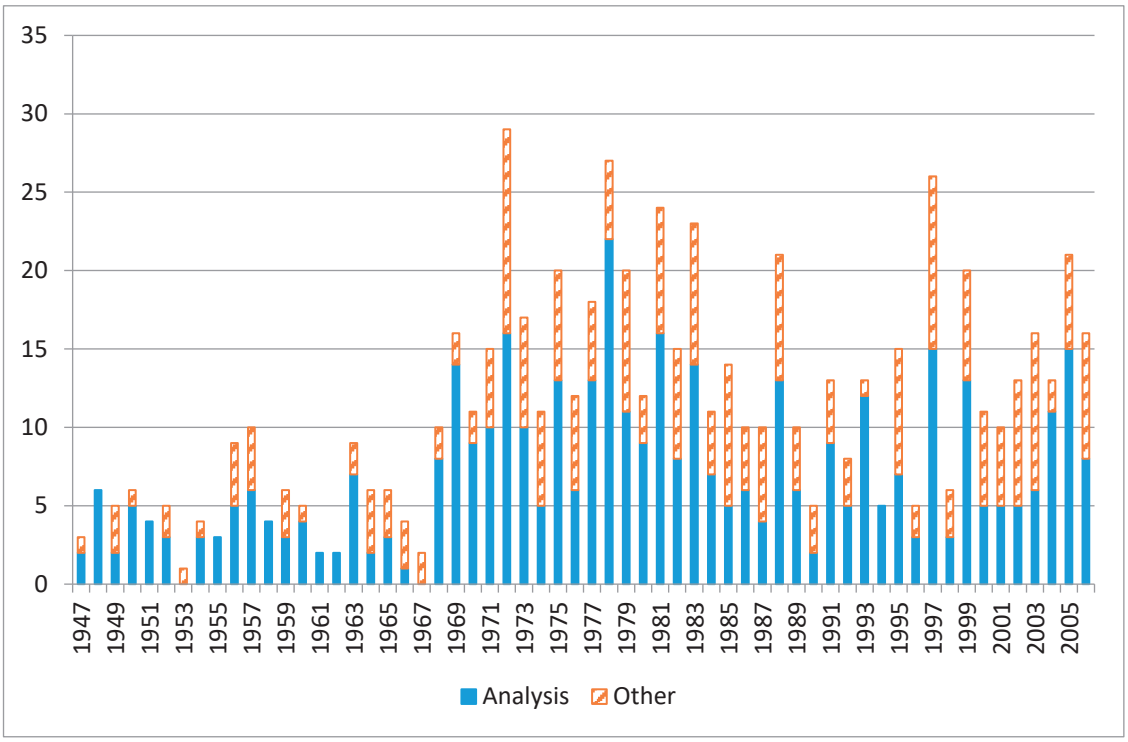
Table 1: Contribution of articles by the journals used in the study

Journal	Total search	Rejected	Split extras	Dataset	Start year
AER	148	42	0	106	1947
P&P	181	37	7	151	1947
JPE	98	37	0	61	1947
QJE	51	19	0	32	1947
JEL	18	8	0	10	1969
JOF	57	24	2	35	1947
JEP	26	6	0	20	1987
JME	137	35	0	102	1975
JET	14	5	0	9	1969
MCB	189	42	1	148	1969
Total	**919**	**255**	**10**	**674**	**NA**

One of the features of the table is that five of the journals were established during the study period. It would be possible to select only journals that operated during the whole period. However, this would only be valid if it were assumed that the release of new journals did not affect how established journals operated and that established journals did not of themselves change over time. This assumption does not appear to apply because the *Journal of Finance* published almost no articles on the inflation/unemployment relationship in the later part of the study period. This drop coincided with the start of the *Journal of Monetary Economics* and, to a lesser extent, the *Journal of Money, Credit and Banking*. As Table 1 shows, these became high volume journals in the field. The reality is that new journals were established during the period

that published extensively on the topic and that including them will present a fuller picture of the literature.

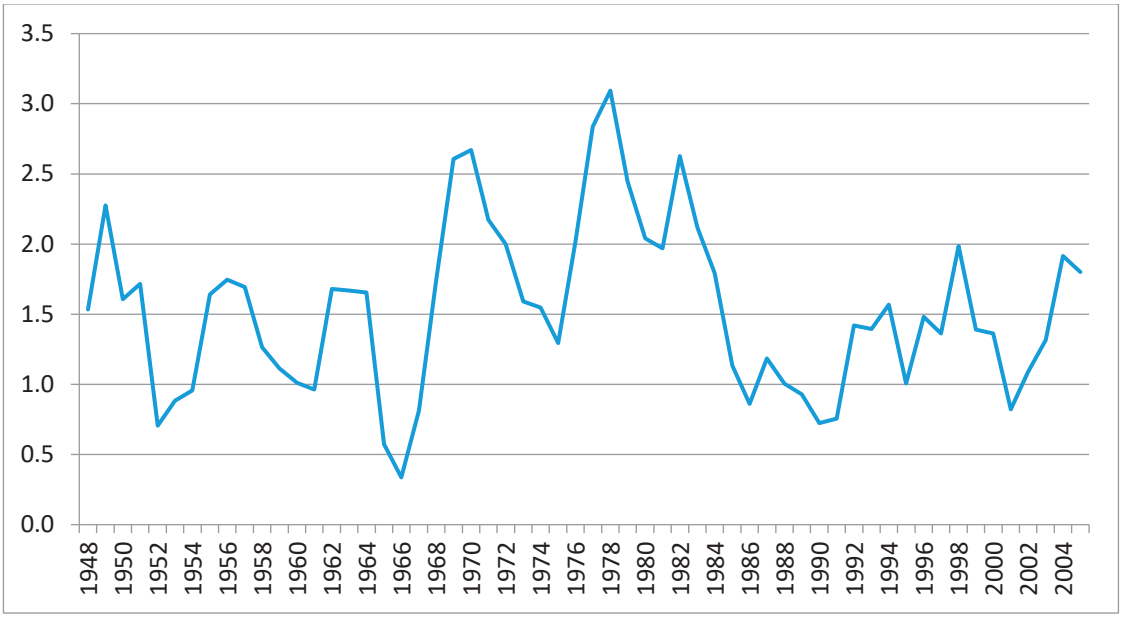
Figure 1: Occurrence of papers commenting on the relationship between unemployment and inflation or their relative policy priority, 10 top economic journals, 1947-2006



The figure shows the occurrence of articles in the dataset. It divides articles into two types; "analysis" articles are those that use some analysis or reasoning in order to come to a view about the long run Phillips Curve. The "other" category express a view simply through assertions or assumptions. As might be expected, there is a growth in the number of articles around 1970, reflecting the deteriorating economy in the United States and the increased number of journals from this time. The number of articles tapered off in the 1990s, probably reflecting improved economic conditions.

In addition to the absolute number of articles that expressed a view on the long run Phillips Curve and economic policy, Figure 2 on the next page shows the volume of analysis articles in the literature as a proportion of total literature in the ten journals. These articles analysed the issues, rather than simply expressing a view. The number of typed characters for each analysis article for each year was calculated using the method in Laband and Piette (1994). This was divided by the total number of characters in each journal for the year. A three year centred average of this statistic is shown below.

Figure 2: Proportion of economic literature that focusses on the relationship between unemployment and inflation or their policy priority, 10 top economic journals, 1948-2005 (%)



Note: Each yearly score is a three-year centred average, weighted by year.

This figure shows the proportion of literature focussing on the Phillips Curve, whereas Figure 1 shows absolute numbers. One of the main features of Figure 2 is that there was a spike in the literature in the late 1940s, when annual inflation peaked at 14 per cent. The other was a peak from the late 1960s to the mid-1980s, which covered the stagflation and disinflation periods, and the gradual consensus among economists that inflation was under control (e.g. Blanchard 1984; Brimmer 1983). This is corroborated by Goodfriend (2007, 51), who states that the costs of disinflation was an academic controversy up until this time and which was resolved by the actions of the Federal Reserve.

Dependent variable – relationship between inflation and unemployment

The articles were coded on a binary scale to determine whether they were conservative or not. Articles that prioritised unemployment, thought that inflation and unemployment were equal economic goals, or supported a long run Phillips Curve, were rated a "zero". Those that prioritised fighting inflation or did not support a long run Phillips Curve were rated a "one". This included articles that supported the non-accelerating inflation rate of unemployment (NAIRU), as well as those that supported the expectations-augmented Phillips Curve (EAPC). Articles that used the concepts of prices and output, instead of inflation and unemployment, were also included.

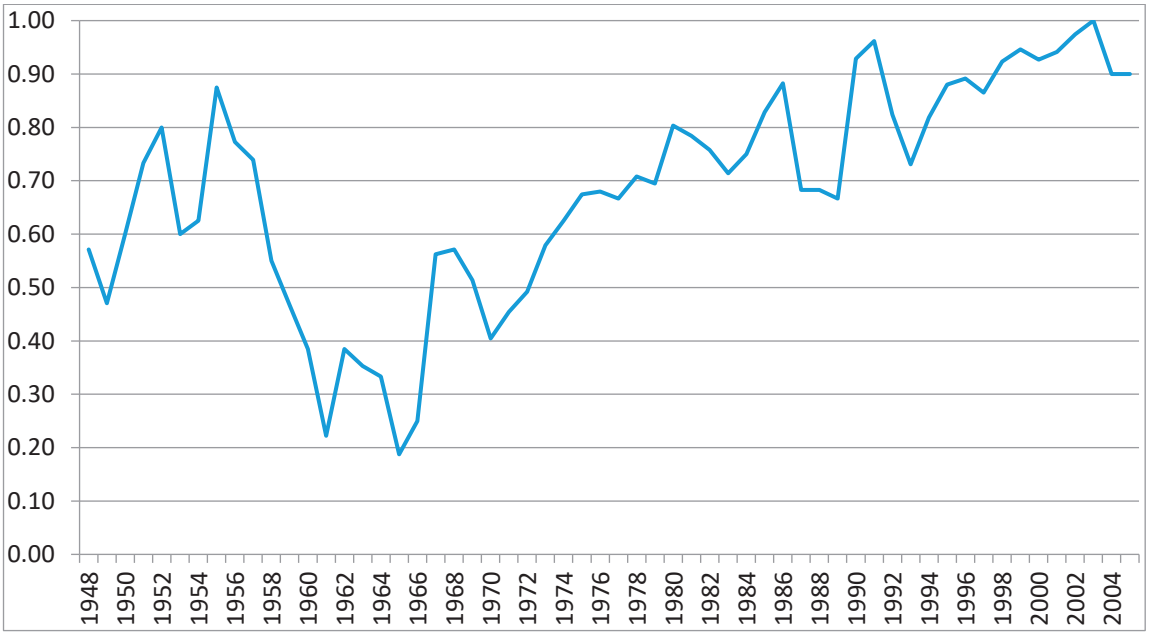
The approach in coding the dependent variable was to differentiate between economic theory and policies that either do or do not represent a significant inflation risk. The coding does not

relate to current economic debates, but seeks to measure when cutting edge economic theory and research could prevent a major policy mistake such as the stagflation of the 1970s.

In a small number of cases, articles had disconnected parts that expressed inconsistent views on the Phillips Curve and economic policy priorities. These articles were coded by taking the view represented in the most substantial part of the article. How this was determined is discussed in the article methodology section below.

Figure 3 gives a time series summary of the dependent variable, titled "conservativeness," using a three-year centred average, based on the number of articles, rather than by year. This approach was used to reduce the variation caused by years that had a small number of articles (generally up to 1970). Figure 3 shows the time series for the full dataset.

Figure 3: Conservativeness of the economic literature in relation to unemployment and inflation, 10 top economic journals, 1948-2005



Note: Articles are rated a 1 if they reject the long run Phillips Curve or advocate inflation first policies, and rated 0 otherwise. Each yearly score is a three-year centred average, weighted by article.

The figure shows three periods. The first runs up until the late 1950s and shows that economists generally took an inflation first approach, but not universally so. The second period is from the late 1950s to the early 1970s and covers the time when the average rating was generally below 0.5. The third period covers the early 1970s to 2006, showing a trend to almost universal rejection of the long run Phillips Curve and support for inflation first policies.

Operationalised twice

The dependent variable of conservativeness will be operationalised as an aggregated, time series variable, and as individual articles. For the time series, this dataset has some earlier years with a low number of articles, leading to increased variance compared with later years. This is addressed by converting the data to biennial (one observation every two years) and weighting by article. With the dataset covering sixty years, this produces thirty observations in the first instance.

For the individual articles, each paper has a 0/1 rating for conservativeness, prompting the use of a logit or probit model. One of the assumptions for these models is that observations are independent. However, many of the papers have the same authors and the conservativeness of papers by the same author is almost always the same. To address this, the first author of each paper was noted, and only their first paper was retained in the dataset. This meant that 214 observations were dropped from the dataset in these regressions.

Publication lags

The time lag between an author submitting a paper and it being published needs to be managed because it is substantial and has increased over time. In 1967, Coe and Weinstock reported that the average submit-accept and publication lead times for economic journals in the United States (including the *American Economic Review* and the *Journal of Finance*) were two and a half months and six months respectively. This is the lag for a researcher who has thought of an avenue of research and written one or more drafts before submitting for publication. Therefore, a lag time of one year could be suitable for the initial period of the study in assessing the effects of the real life economy on the academic literature.

In 2002, Ellison studied the submit-accept period for a number of leading economic journals, including the *American Economic Review,* the *Journal of Political Economy* and the *Quarterly Journal of Economics.* He found that the submit-accept period for these journals was twelve months in 1979, eight months in 1979 and eight months in 1970 respectively. This had increased to twenty four months, eighteen months, and twelve months respectively in 2000. This implies that the one-year lag may not be sufficient for some papers, although it may be appropriate for conference papers, which are shorter term projects. Another factor is that research is often ongoing, so that the parts of the real economy that spark a researcher's interest can change over time and a research project can change with it.

This means that lags could be quite long and there is little value in using monthly or quarterly data. The academic literature in economics evolves at a much slower process than real

economies. Therefore, this study uses annual data with two years averaged to provide a lag. A simple average is used for macroeconomic data. For the lag of the conservativeness of the literature, a weighted average by article is used to manage some of the early years that have a small number of papers.

Macroeconomic data

Annual CPI inflation and unemployment data were collected from the United States Bureau of Labor Statistics. The lags applied to these variables imply that any causal effect will run from them to the independent variable. It is highly unlikely that the content of economic papers will be contemporaneously affecting the economy. Summary data for these variables are in the Appendix.

The long run Phillips Curve implies that a country can have either high inflation or high unemployment, but not both. This paper uses a learning index, representing simultaneous high inflation and high unemployment, to measure the extent to which the long run Phillips Curve is falsified by the economy. The first step in generating this index was to multiply the unemployment and inflation rates together for the period between 1944 and 2006. For 1944, the index was this multiple. For 1945 and each successive year, the index was the higher of two numbers: the index for the previous year; and the multiple for the current year. This produced a statistic that increased over time to reflect the historical maximum of the multiple of inflation and unemployment for any year since 1944. The index started at fifty six in 1947 and then stepped up to sixty two in 1974, seventy eight in 1975 and then ninety seven in 1980. It remained at this level to 2006. The non-declining feature of the index represents learning by economists.

Change points

The idea that theory prompted economists to conclude that the long run Phillips Curve was vertical suggests that there will be a break point shortly after Phelps (1967) and Friedman (1968b). It is recognised that Friedman (1968b) has been widely regarded as a very influential paper. However, Phelps (1967) was potentially the stimulus for Friedman's work. Friedman had always pursued a stabilising approach to monetary policy (e.g. Friedman 1961; Friedman 1948), but this author's contention is that Phelps gave Friedman the theoretical basis for his deep-seated views. Therefore, in the time series and article regressions, 1969 will be used as a possible change point.

It is also possible to apply Bayesian change point analysis to the dependent variables. The higher values are located particularly towards the end of the study period. A Bayesian analysis was

conducted of the placement of a single change point, and calculating the preceding and following average values. Uninformative priors were used, with mid-point initial values. The analysis produced large standard deviations for the change points; the average values were better defined. Nonetheless, the diagnostics were acceptable, including the cusum graphs. The break point in the time series analysis was 1977 and the break point for the articles was 1980.

Article methodology

Using individual papers as the unit of analysis allows an examination of whether methodology or other specific matters were influencing economic thought. In relation to methodology, economics has been criticised for focussing too much on theory at the expense of empirical work that could demonstrate whether the theory applies in practice. An example is Leontief (1982), who noted that over 50 per cent of articles in the *American Economic Review* in the 1970s were mathematical models without data. Blaug has argued that increased empirical work helped resolve the debate between Keynesians and monetarists (1992).

The testing of this hypothesis is complicated by criticisms of economists' empirical work. For example, Blaug (1992) argues that economists fall short of the Popperian ideal of attempting to falsify theories. In particular, he suggests that economists only validate them. Validation is akin to replicating the work that originally developed a theory. Falsifying is using data to make comparisons between theories, such as through different experiments than those that originated them, but where the theories can make predictions about the results.

McCloskey (1998) has also criticised empirical work in economics, but from a different perspective. In particular, she argues that economists take a formulaic approach to statistics that focusses on statistical procedures at the expense of interpreting the results. In regressions, for example, McCloskey would like to see greater emphasis on the size of effect and less emphasis on the t-statistic. One way of achieving this would be more reporting of confidence intervals, for example. Another would be more use of simulations of models to better understand them and to draw better conclusions from them.

Blaug and McCloskey argued that better methods, in particular better statistical methods, would produce better economic research. In effect, they are arguing that better methods have a causal effect on the final product. Assuming that the long run Phillips Curve is invalid, then their argument is that better statistical methods would cause an article to have a higher article rating.

Each paper was coded for the methodology it used in coming to a conclusion about the inflation/unemployment relationship. Since an article can include several layers of reasoning, an article was coded for the highest form of reasoning that it used in coming to its view. Consistent with the critics of analytical work, the highest category was *empirical work* (215 occurrences), which included simulations (seventy), tests of statistical inference (ninety five), and other data (fifty), such as simple comparisons. The next highest category was the use of *argument* (206), which comprised mathematical models (sixty three), simulations based on mathematical models, rather than estimated parameters (eighteen), and logic (125). The last group comprised traditional qualitative work, such as analysing how a change in one economic variable leads to a change in another.

The empirical and argument categories comprised the articles where an author used some reasoning or analysis in order to make a comment on the inflation/unemployment relationship. Of these analytical articles, it is possible to determine the proportion which were empirically based. Commencing with the 1940s, the proportions by decade of empirical articles were 10 per cent between 1947 and 1949; 22 per cent in the 1950s; 35 per cent in the 1960s; 34 per cent in the 1970s; 63 per cent in the 1980s; 69 per cent in the 1990s; and 84 per cent between 2000 and 2006. This corroborates Blaug's comments that there has been greater use of empirics in this field of economics.

There were also articles where an author did not use reasoning or analysis, and were simply *statements* (253) of the author's views on the long run Phillips Curve or inflation first policies. These form the lowest level on the hierarchy. The assumption category (177) applied where an article made an assumption about the relationship, or a statement at the beginning of an article. This also included the cases where an author made a comment and cited a reference for it. The assertion category (seventy six) applied where an article simply asserted a relationship without any reasoning or explanation.

A number of decision rules were used to support the coding. For example, assumptions in papers were often followed by later reasoning that also had implications for the author's view on the inflation/unemployment relationship. A decision rule was applied that mathematical papers that did not have any simulations were entirely driven by their assumptions where the assumption and the final result were consistent in terms of the long run Phillips Curve and policy priorities. Therefore, if a paper assumed a relevant concept, such as the EAPC, and then developed mathematical arguments supporting inflation first policies, it was coded as its method being a statement. An example was the time inconsistency paper by Barro and Gordon

(1983a). This contrasts with Rogoff's successor paper (1985) that made micro foundation assumptions to develop a mathematical model supporting central bank independence, and which was coded as an argument paper.

For the small number of papers where different parts were logically isolated from each other and expressed different views on the long run Phillips Curve, this hierarchy was used to determine which part of the paper was the most substantial. This then helped determine the dependent variable and the methodology coding. The methodology was coded on an exclusive basis and so this variable is a factor, with the reference level being statements.

Article title

In his discussion of the debate between Keynesians and monetarists, Blaug (1992) comments that it reflected deep-seated disagreements. This is to be expected, given that the area of public policy to which this field contributes has strong political divisions. This implies that some researchers had preconceptions, or policy priorities, that caused their research to deliver a certain result. An example in the dataset is Milton Friedman's six papers, five of which had the word "monetary" in their title. To control for this, articles were coded for the words that appeared in their title. A dummy variable was created for the words "inflation", "monetary", "Phillips", "unemployment" and "Keynesian". The expectation would be that the first two words would be associated with a higher rating and the latter two would be associated with a lower rating.

These variables were not mutually exclusive. For example, an article could be titled, "A Monetary Analysis of the Phillips Curve." This meant that article titles were represented through five dummy variables. Further, the variable was adjusted for whether an article was a conference discussion or a comment on a previously published article. For the former, the views of discussants could not be expected to have any particular relationship to the title of the conference topic, which would have been drafted by the conference organisers. Therefore, the codings for the titles were all zero for these articles. Similarly, comments on articles by other authors use the title of the original paper. They would often be rebuttals of the original article, but this may or may not imply that they would take an opposite view on the long run Phillips Curve or economic policy. In these cases, the coding was also changed to 0.

Results

Time series

The sixty annual observations were combined into thirty biennial observations. For the economic variables, a simple average was used. For the conservativeness variable, a weighted average (by article) was used to cater for some of the years earlier in the dataset that had a small number of articles. Visual inspection of some of the time series suggested that they had a unit root. This was confirmed by augmented Dickey-Fuller tests, but removed through first differencing. With lags, this resulted in twenty eight observations.

Diagnostic tests were also conducted for autocorrelation, heteroscedasticity, normality of residuals, autoregressive conditional heteroscedasticity (ARCH), specification (the RESET test), and structural break (CUSUM and CUSUMSQ). The tests are reported in the table where they fail at the 5 per cent level of significance. A nested likelihood ratio test was conducted for the second and later regressions to check whether the extra variables were statistically significant overall compared with the first regression. The p-values are reported for this test. Table 2 on the next page shows the results.

The first regression is a simple time series regression without a break point. The only statistically significant variable is the lag of conservativeness. The regression has the problem that its coefficients are not consistent over time; it breaches the CUSUM and CUSUMSQ tests in the mid-1970s. The next two regressions include break points, namely after Friedman (1968b) and from 1977, the break point in levels selected by the Bayesian analysis. However, neither of them have stable coefficients because they breach the CUSUMSQ tests after their respective break points.

The fourth regression uses two break points to carve out the period from 1959 to 1967 as an exception to the usual literature. This corresponds to the period between Phillips (1958) and Phelps (1967) and Friedman (1968b). This regression has stable coefficients, many of the new coefficients are statistically significant, and the likelihood ratio test has a very low p-value, indicating that 1959 to 1966 is a valid sub-period. The fifth regression adds an additional variable, namely the cross-product between unemployment and the learning variable. This cross-product was suggested by diagnostics for the articles regressions, discussed below.

Table 2: OLS regressions of differenced, two-year data of conservativeness of economic literature, 1947-2006, N=28

Variable	No break	Break in 1969	Break in 1977	Break, 1959 to 1966	Break, 1959 to 1966
Conservativeness (-1)	-0.67** (0.15)	-0.86** (0.21)	-0.66** (0.18)	-0.71** (0.16)	-0.60** (0.17)
Inflation (-1)	-0.027 (0.015)	-0.050* (0.20)	-0.050* (0.019)	-0.017 (0.015)	-0.008 (0.013)
Unemployment (-1)	-0.068 (0.043)	-0.14 (0.076)	-0.079 (0.068)	-0.026 (0.041)	0.27** (0.086)
Learning (-1)	0.010 (0.011)	0.078 (0.011)	0.12 (0.077)	0.002 (0.008)	0.023 (0.013)
Unemp (-1)*Learning (-1)					-0.0035* (0.0014)
Break		-0.005 (0.27)	0.068 (0.34)	-0.39** (0.069)	-0.54** (0.080)
Break*Conservativeness (-1)		0.38 (0.36)	0.015 (0.40)	1.58** (0.42)	1.15* (0.47)
Break*Inflation (-1)		0.054 (0.028)	0.057 (0.032)	-0.02 (0.037)	0.005 (0.036)
Break*Unemployment (-1)		0.084 (0.089)	0.012 (0.089)	0.51** (0.12)	0.36** (0.11)
Break*Learning (-1)		NA	-0.11 (0.078)	NA	NA
Break*Unemp (-1)*Learn (-1)					NA
Constant	0.005 (0.04)	-0.011 (0.041)	0.001 (0.043)	0.030 (0.034)	0.02 (0.033)
R-square	0.55	0.66	0.65	0.78	0.83
P-value for LR test	NA	0.10	0.19	6e-4	3e-5
Diagnostics	1975-78	1977-88	1981-84, 1991-92	Auto	Auto
Standard errors	Normal	Normal	Normal	Robust	Robust

Note: The dependent variable is a two year average (weighted by article) of the conservativeness of journal articles in relation to their views about the long run Phillips Curve (0 supports, 1 opposes) or economic policy (1 is inflation first and 0 is others). Standard errors are in brackets. Robust errors used if an individual regression demonstrated heteroscedasticity or autocorrelation at the 5 per cent level. * indicates significant at the 5 per cent level and ** significant at 1 per cent. A diagnostic test is listed for the respective model where it is significant at the 5 per cent level. A year refers to a breach of the CUSUM or CUSUMSQ tests at the 5 per cent level. The p-value for the likelihood ratio test compares the statistical significance of the extra variables against the regression in the "no break" column.

Effect sizes were investigated through multiplying variables' standard deviation and their coefficient. The two largest effect sizes were for the cross product between learning and unemployment, and the cross product between the break from 1977 and the learning variable. Other large effect sizes were for the lag of conservativeness, the cross product between the break in 1969 and inflation, the break between 1959 and 1966, and its cross products with

lagged conservativeness and unemployment. In two cases, the coefficients are not statistically significant, namely for the cross product between the break from 1977 and the learning variable, and between the break in 1969 and inflation.

There are two main findings from the time series regressions. The first is that the period between Phillips (1958), and Phelps (1967) and Friedman (1968b), was a time of a less conservative literature in economics. The second is that the correlations involving unemployment worked in a complex way. During the 1950s, the literature became more conservative after an increase in unemployment, and this increased in the 1960s. However, after the oil price shocks, the literature would become less conservative after an increase in unemployment.

Articles

Table 3 shows the results for logit regressions of individual articles. A similar approach was taken as for the time series models, namely testing various break points and applying diagnostic tests. The three tests were Pregibon's link test (1980), the auxiliary regression in Davidson and MacKinnon (1993) to test for heteroscedasticity, and a likelihood ratio test for the stability of the coefficients for a notional break point from 1977, the approximate mid-point of the period covered by the dataset. The results are on the next page.

The first column is a straightforward regression without a break point. It shows that, on average, the literature was less conservative after an increase in unemployment and that it became more conservative after stagflation. Without a break point, this regression fails the stability test at the 5 per cent level. The second column has a break from 1969 and is a somewhat better fit. Although none of the break variables are statistically significant, it does not breach the stability test. The third column has a break in 1980, which was suggested by the Bayesian analysis. This has some statistically significant break variables and it passes the stability test, but this would be expected given that the break point of 1980 is close to the test's break point of 1977.

The fourth column has the break between 1959 and 1966, consistent with the findings of the time series analysis. This is the best fit overall of the three breaks, but it does not have any statistically significant break variables and breaches the stability test at the five per cent level. However, the break dummy has a large coefficient at -9.75. Given that the break between 1959 and 1966 had the best overall fit, and that it performed the best in the time series regressions, its dummy will be used in the remainder of the analysis.

Table 3: Logit regressions of the conservativeness of economic papers, 1948-2006, N=451

Variable	**No break**	**Break, 1969**	**Break, 1980**	**Break, 1959-66**	**Break, 1959-66**	**Break, 1959-66**
Conservativeness (-1)	-0.71 (0.79)	-0.27 (1.04)	0.30 (0.89)	-1.59 (0.90)	-1.16 (0.89)	-1.04 (0.89)
Inflation (-1)	0.018 (0.038)	-0.10 (0.95)	0.013 (0.057)	-0.019 (0.040)	-0.029 (0.043)	-0.036 (0.044)
Unemployment (-1)	-0.30** (0.099)	-0.36 (0.30)	-0.095 (0.19)	-0.28* (0.11)	-0.23 (0.12)	0.85 (0.48)
Learning (-1)	0.056** (0.01)	0.084** (0.017)	0.029 (0.034)	0.057** (0.011)	0.057** (0.013)	0.11** (0.034)
Unemp (-1)*Learning (-1)						-0.013* (0.0057)
Break		1.40 (2.14)	4.32 (5.37)	-9.75 (6.15)	-1.37** (0.51)	-1.57** (0.53)
Break* Conservativeness (-1)		-3.32 (1.75)	-6.94** (2.69)	0.97 (4.73)		
Break*Inflation (-1)		0.18 (0.11)	-0.012 (0.095)	0.43 (0.95)		
Break*Unemployment (-1)		-0.081 (0.33)	-0.52* (0.27)	1.34 (1.05)		
Break*Learning (-1)		NA	0.057 (0.068)	NA		
"Inflation"					0.77** (0.30)	1.20** (0.36)
"Unemployment"					-1.19** (0.32)	-0.62 (0.41)
"Inf"*"Unemp"						-1.58* (0.68)
"Phillips"					0.36 (0.46)	0.59 (0.47)
"Keynesian"					-0.71 (0.47)	-0.59 (0.47)
"Monetary"					0.50 (0.30)	-2.30* (1.06)
"Monetary"* Learning (-1)						0.042** (0.015)
Method, empirical					-0.27 (0.31)	-0.39 (0.32)
Method, statement					0.59* (0.29)	0.53 (0.30)
Constant	-1.28* (0.54)	-2.78 (2.05)	-1.30 (1.14)	-0.67 (0.59)	-1.51* (0.66)	-6.18* (2.53)
Pseudo R-square	0.10	0.11	0.11	0.11	0.18	0.22
Diagnostics	Stability	Hetero	✓	Stability	Spec'n & Stability	✓

Note: The dependent variable is the rating of journal articles for their views about the long run Phillips Curve (0 supports, 1 opposes) or economic policy (1 is inflation first and 0 is others). Robust errors used if a regression demonstrated heteroscedasticity at the 5 per cent level. Standard errors in brackets. * indicates significant at the 5 per cent level and ** significant at 1 per cent. A diagnostic test is listed for each model where it is significant at the 5 per cent level.

The fifth column uses a dummy for 1959 to 1966, and then adds dummies for the keywords in the title of each article. This controls for the possibility that changes in the use of different concepts is driving the overall results. The fifth column also includes the factor variable for the methodology used in each article. This controls for the possibility that better data and better quantitative techniques produced a shift in economic thinking. This regression produced some indicative results, however, it breached both the linktest and stability tests at the 5 per cent level. To address this, three cross-products were added in column 6.

The first of the cross-products was between the lags of unemployment and learning. The negative coefficient indicates that the economic literature became more sensitive to unemployment after stagflation. This result is unexpected, but needs to be considered in the context of a generally conservative literature. The next cross-product was between articles with both “inflation” and “unemployment” in the title. The negative sign meant that articles that had “inflation” in their title would only be conservative if they did not also have “unemployment”. In other words, papers that headlined the relationship between the two concepts were less likely to be conservative. The final cross-product was between papers that had “monetary” in the title and the learning variable. The positive sign indicates that these papers became more conservative after stagflation. Monetarism is reputed to have a conservative philosophy, largely due to one of its most effective advocates, Milton Friedman. However, it is important to note that, although he had conservative views, he was not the only monetarist.

There are other findings from the table. It appears that the learning variable is positively correlated with a more conservative literature, at least for this dataset. However, neither lagged inflation nor lagged unemployment appear to bear any such relationship. The correlation between the statement method and conservatism in the fifth column is not replicated in the sixth column, so it is fair to conclude that methods were not driving the literature. Finally, the idea that there was a uniformly less conservative literature between Phillips (1958) and Phelps (1967) and Friedman (1968b) is supported.

An analysis of effect size was conducted by multiplying the coefficients by the variables’ standard deviation. The largest effect sizes were for the cross product between learning and unemployment, the break from 1980, and its cross products with lagged conservativeness and learning. The first and last of these four variables also had the largest effect size for the time series regressions. The next largest effect sizes were for the learning variable and the cross products between lagged conservativeness and the break from 1969, the break from 1980 and unemployment, and the break from 1959 to 1966 and unemployment. The two variables

relating to articles that had “monetary” in the title also had large effect sizes. Once again, some of these are not statistically significant, such as the cross product between the break from 1959 to 1966 and unemployment.

Conclusions

This paper has shown that the academic literature on the long run Phillips Curve and inflation first policies has gone through a number of phases. Examination of a time series graph suggests that the literature in the 1950s was generally anti-inflationary, but not comprehensively so. This position switched following the publication of Phillips (1958), but over time the literature has become more conservative to the extent that by 1975 it was the majority view and after 2000 it became the consensus view in the leading academic papers.

Two types of quantitative analysis were conducted to help understand the patterns in the literature. Firstly, articles were aggregated to produce time series data, which were first differenced and subject to OLS regressions. Secondly, logit analyses were conducted of individual articles.

There were two results that were consistent across both analyses. For example, papers had a uniformly lower rating between 1959 and 1966, which corresponds to the period between Phillips (1958) and Phelps (1967) and Friedman (1968b). This finding is a refinement of the theory raised earlier in the paper that the literature was more conservative after Phelps and Friedman. It instead states that the literature was less conservative between Phillips (1958) and these two papers. Some commentators have suggested that the influence of Phelps and Friedman took some time to spread through the economics profession, but the results of this study suggest that the effect was abrupt.

The other robust finding was that the cross product between learning and unemployment is correlated with a less conservative literature. In other words, after stagflation, higher unemployment was correlated with less conservative papers. This finding is not consistent with the initial expectation that, after stagflation, the literature would be more conservative. However, this pattern occurred within the context of a more conservative literature generally and the scale of the effect did not jeopardise the general thrust of the literature. It also occurred once inflation started to drop from high levels. In other words, once inflation was no longer a problem, then economists could express concern about employment. Therefore, it could be interpreted as conditional concern over unemployment, rather than absolute.

So we come back to our initial question, namely “What led economists to decide that the long run Phillips Curve was vertical? Was it a battle between theories that reflected fundamental values, or was it empirical evidence that falsified the sloping long run Phillips Curve?” There is strong evidence that theory played a major role in the literature, leading to less conservative papers between Phillips (1958) and Phelps (1967) and Friedman (1968b). The Popperian falsification process did not occur, although Felix (1956) demonstrated there was data available to do this. However, empirics did play a role in other ways. Once inflation was beaten, economists felt they had room to respond in a liberal manner to unemployment. This case study suggests that the development of theories in the social sciences at a macro level can be a complex process. Data is historical and experiments are rare. But it is possible that a theory can be accepted by experts before it is supported by events.

Appendix

Table A1: Summary data for time series regressions, N=28

Variable	Mean	Std. deviation	Minimum	Maximum
Conservativeness	0.014654	0.274394	-0.48889	0.65
Conservativeness (-1)	0.011905	0.276329	-0.48889	0.65
Inflation (-1)	-0.31353	3.245287	-11.2198	5.37746
Unemployment (-1)	0.067857	1.265439	-2.45	2.85
Learning (-1)	1.46536	4.243282	0	18.60531
Unemp*Learning (-1)	12.23668	113.041	-140.926	318.7985
Break, 1969	0.035714	0.188982	0	1
Conservativeness (-1)	0.032143	0.177616	-0.30556	0.65
Inflation (-1)	0.008429	2.012788	-4.47322	5.37746
Unemployment (-1)	0.057143	1.033935	-1.5	2.85
Learning (-1)	1.46536	4.243282	0	118.60531
Unemp*Learning (-1)	11.63496	105.4034	-140.926	318.7985
Break, 1977	0.035714	0.188982	0	1
Conservativeness (-1)	0.012755	0.109667	-0.28571	0.233333
Inflation (-1)	-0.21989	1.674176	-4.47322	5.37746
Unemployment (-1)	0.017857	0.976313	-1.5	2.85
Learning (-1)	1.364614	4.243394	0	18.60531
Unemp*Learning (-1)	8.899759	104.014	-140.926	318.7985
Break, 1959-66	0	0.272166	-1	1
Conservativeness (-1)	-0.02143	0.096111	-0.42857	0.15
Inflation (-1)	0.02698	0.607299	-1.87277	2.517504
Unemployment (-1)	0.041071	0.312118	-.75	1.3
Learning (-1)	0	0	0	0
Unemp*Learning (-1)	2.306571	17.52852	-42.12	73.008

Note: All data is first differenced. Variables listed under a break only have non-zero values during the period in question.

Table A2: Summary data for the individual article regressions, N=451

Variable	Mean	Std. deviation	Minimum	Maximum
Conservativeness	0.689579	0.46318	0	1
Conservativeness (lag)	0.7105	0.202882	0.1	1
Inflation (lag)	4.699245	3.099734	0.030252	12.42416
Unemployment (lag)	5.819956	1.400306	2.95	9.65
Learning (lag)	78.96534	18.69604	56.16	97.19008
Unemp*Learning (lag)	471.4911	186.4222	165.672	937.8843
Break, 1969	0.807095	0.395017	0	1
Conservativeness (lag)	0.606348	0.334104	0	1
Inflation (lag)	4.250698	3.369123	0	12.42416
Unemployment (lag)	4.900443	2.701709	0	9.65
Learning (lag)	68.13182	36.56366	0	97.19008
Unemp. (lag)*Learning (lag)	419.8513	257.9961	0	937.8843
Break, 1980	0.518847	0.5002	0	1
Conservativeness (lag)	0.438966	0.429859	0	1
Inflation (lag)	2.484854	3.391515	0	12.42416
Unemployment (lag)	3.244568	3.279393	0	9.65
Learning (lag)	49.70957	48.01723	0	97.19008
Unemp.*Learning (lag)	310.8094	315.0116	0	937.8843
Break, 1959-66	0.070953	0.257032	0	1
Conservativeness (lag)	0.027198	0.104335	0	0.6
Inflation (lag)	0.107914	0.425532	0	3.077899
Unemployment (lag)	0.402439	1.462268	0	6.15
Learning (lag)	3.984745	14.43493	0	56.16
Unemp. (lag)*Learning (lag)	22.60098	82.12096	0	345.384
“Inflation”	0.337029	0.47322	0	1
“Unemployment”	0.148559	0.356048	0	1
“Inflation”*”Unemp.”	0.046563	0.210935	0	1
“Phillips”	0.08204	0.27473	0	1
“Keynesian”	0.064302	0.245562	0	1
“Monetary”	0.394679	0.489324	0	1
“Monetary”*Learning (lag)	31.33056	40.68842	0	97.19008
Method				
Empirical	0.321508	0.467574	0	1
Statement	0.374723	0.484589	0	1

Note: Variables listed under a break only have non-zero values during the period in question. A lagged variable is the average value for the previous two years.

3 – Monetary policy during the Great Inflation in the United States

Abstract

This paper compares the performance of two theories of monetary policy in the United States during the Great Inflation. The first of these is Orphanides' (2003) theory that policy mistakes were caused by under-estimating the non-accelerating inflation rate of unemployment and the real time output gap, especially during the 1970s. The second is the conservatism theory, namely that monetary policy became more inflation averse after the Volcker disinflation, as proposed by Clarida et al (2000).

The test is to compare performance of the theories across four sets of dependent variables: quarterly interest rates, annual interest rates, decisions by the Federal Reserve to ease policy, and decisions to tighten policy. The first step was to test the real time gap theory by comparing the performance of unemployment against the real time gap. In decisions to tighten policy the unemployment rate was better, but in the other three cases the real time gap was superior.

Twelve interpretations of the conservatism theory were tested across the four dependent variables. Performance was generally poor. The conservatism theory, when expressed in terms of increased inflation aversion, performed much better if the data were limited to 1996, or if time series analysis was conducted with variables that had unit roots. The conservatism theory is better expressed in as a reduced aversion to the output gap, rather than a heightened aversion to inflation.

This new approach by the Fed can be seen as a compromise between technical recommendations that the Fed focus on inflation rather than output, and its legal duty to maximise employment.

Introduction

The actions of the United States Federal Reserve, and in particular its main monetary policy body, the Federal Open Markets Committee (FOMC), have important economic outcomes. Before the 1970s, the literature on U.S. monetary policy was straightforward, with a focus on standard variables such as inflation and unemployment. However, the stagflation of the 1970s and its resolution led to a more diverse literature. Many subsequent papers have sought to explain the stagflation (Clarida et al 2000; Orphanides 2003; Sargent et al. 2006; Sims and Zha 2006). Wider political dimensions have also been brought into the literature, including Senate influence (Grier 1991; Havrilesky 1995), presidential signalling (Havrilesky 1995), presidential appointments (Chappell et al 1993), and public opinion (Tootell 1999). The research has also found that the Fed behaved in a substantively different way during the Volcker disinflation by attempting to control the money supply (Bernanke and Mihov 1998; Sims and Zha 2006).

The purpose of this paper is to compare two key theories about monetary policy. The first is Orphanides' (2003) argument that the FOMC, and most other policy makers, under-estimated the non-accelerating inflation rate of unemployment (the NAIRU), particularly during the 1970s. Real time estimates of the NAIRU were approximately 4 per cent, whereas it was usually closer to 6 per cent. This meant that the FOMC would continue with loose monetary policy at 6 per cent unemployment when the labour market was already tight. This would put pressure on wages and then general prices.

The second argument is that there was a fundamental misunderstanding by the FOMC and other policy makers about the problems associated with inflation and what a "safe" level of inflation might be. This relative acceptance of inflation led to its outbreak in the 1970s. After the Volcker disinflation between 1979 and 1982, the FOMC and policy makers had learnt from the experience and more inflation-averse policy, or at least more conservative policy, resulted. This argument has been made by Clarida et al (2000); Sargent et al (2006); and Sims and Zha (2006).

This paper acknowledges Leamer (1985), who noted that much economic literature comprises a decentralised sensitivity analysis. In other words, if a theory is proposed that attracts interest, then over time a series of papers subject it to scrutiny, and a literature develops on whether the theory is robust. Leamer's point was that this testing of robustness should be more systematic and coordinated.

Leamer's comments are applicable here. The papers listed above assume there was a policy mistake by the FOMC and attempt to explain its cause. The two explanations are different, but lead to the same policy result. A small number of economic variables have been repeatedly shown to influence the FOMC, in particular output, prices, and the Volcker disinflation. But the status of the competing theories is unclear because they do not reference each other. In other words, researchers have validated their respective theories, rather than trying to falsify them by comparing them against each other.

Science, including social science, can only progress through searching for the weaknesses in theories, which helps produce better ones. Karl Popper (1963; 1972), one of the pre-eminent philosophers of science in the 20th century, developed much of the ideas behind falsifiability. He argued that evidence alone does not falsify or corroborate a theory. Rather, theories are falsified by comparing competing theories against each other to see how they fit or explain the evidence (for a recent discussion of Popper in relation to confirmation theory, see Dowding 2106, ch. 5). Mark Blaug (1992) adopted these ideas and criticised mainstream economics for focussing on validation, rather than attempting falsification. Indeed, it is much more difficult for a theory to survive the blowtorch of falsifiability, and those that do represent a real advance in knowledge.

This paper is an exercise in falsifiability. Often, papers checking the robustness of a literature have used one dependent variable and then conducted a large number of comparative regressions on it (e.g. Sala-i-Martin 1997). This paper takes a broader approach for two reasons. Firstly, Van Evera (1997) suggests that as many implications of a theory as possible should be tested. In particular, the effect of economic and political variables can be revealed in at least two ways, such as through interest rates and FOMC decisions to either tighten or ease policy. The most robust independent variables will be those that are correlated with as many of these expressions of monetary policy as possible. This method is likely to reveal fragile inferences where variables are correlated with monetary policy through some artefact in the data, rather than an underlying relationship. Secondly, including a dependent variable such as meeting decisions will show what the FOMC was trying to do, compared with interest rate data, which shows what it actually did after interacting with the market. A robust independent variable should be correlated with both.

Leamer (1983) discussed the fragility of inferences from a further perspective, namely that regression results for a variable of interest can depend on which other variables are included. He suggested that some sensitivity analysis, through removing various variables, would help

reveal fragile inferences. The analysis is justified by his statement, “If we are to make effective use of our scarce data resource” (43). In other words, since researchers are using just one dependent variable, some variation in the independent variables is required. Implicit in this is that, if a researcher can find more than one dependent variable (effectively conducting more than one experiment), then this will be another way of detecting fragility, or increasing the evidence of robustness.

Literature review

The reaction function literature commenced in the 1960s. Papers such as Havrilesky (1967) and Christian (1968) found that the FOMC reacted to both the inflation rate and the unemployment rate, with more responsiveness to unemployment. In general, this result is to be expected, since both phenomena are detrimental. Much of the movement in monetary policy would be explained by employment and prices.

The research later examined the Federal Reserve’s political dimension. An early result (for example, Belden 1989) was that bank Presidents are more inflation averse than Governors because they are considered to reflect the financial sector’s preference for low inflation. Chappell et al (1993) looked at the dissent records of Governors from 1960 to 1987 to generate their most likely preferred interest rate, given the economic circumstances at the time. They found that Republican appointees were on average the most conservative, except for those appointed by Reagan (“supply-siders”), who were the least conservative. Democrat appointees came in the middle. Keech and Morris (1997) presented an alternative view, arguing that it was too impractical for Presidents to influence monetary policy through appointments. Another political variable which may be correlated with monetary policy is Presidential signalling, that is, public statements by the President or their administration about their monetary policy preferences (Chappell et al 1993; Havrilesky 1988 and 1995). Finally, there is evidence that monetary policy is correlated with the Presidential election cycle (Grier 1989 and Williams 1990, in relation to the money supply).

Around 2000, the reaction function literature moved to a new phase of attempting to explain how the Great Inflation occurred. Clarida et al (2000) developed a model for the FOMC’s interest rate rule from 1960 to 1996, splitting between the tenures of Martin, Burns and Miller on the one hand, and Volcker and Greenspan on the other. Their model incorporated the inflation target, a coefficient for the inflation gap, a coefficient for the output gap, and a lag operator. They found that the inflation target was approximately three quarters of a per cent higher in the earlier period, and that the coefficient for the inflation gap more than doubled in

the later period. They concluded that a more accommodating monetary policy led to increased variation in prices and output.

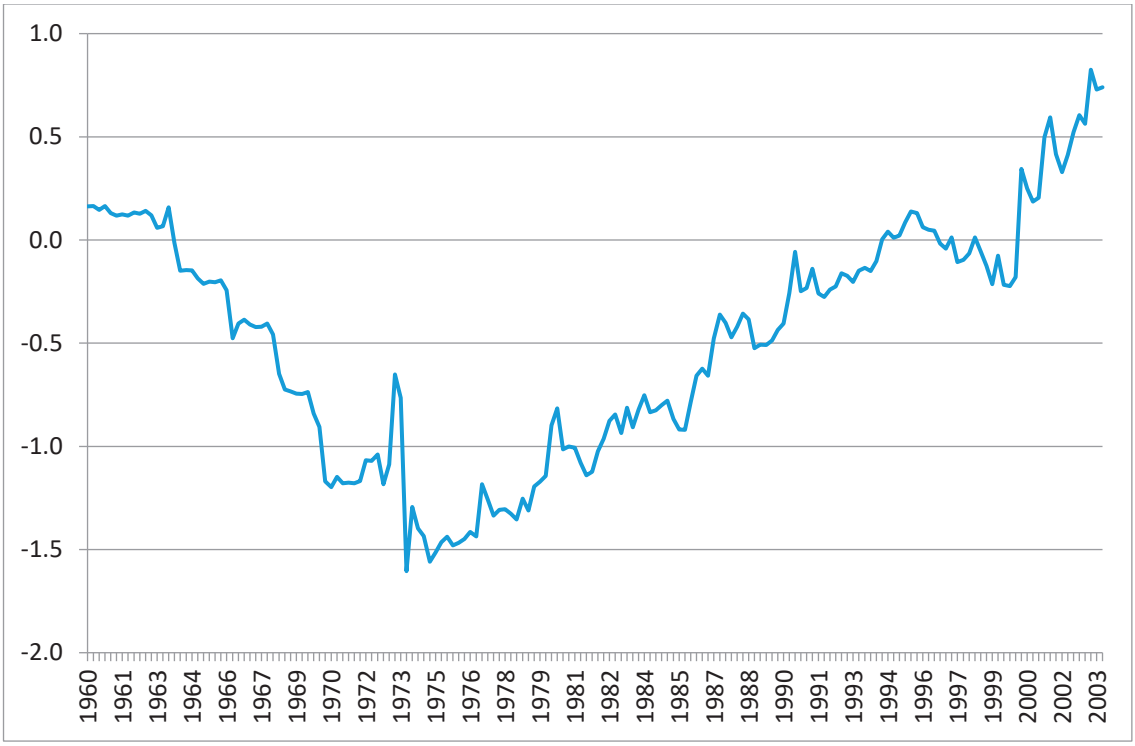
Later papers made similar findings. Sims and Zha (2006) developed a regime switching model from 1959 to 2003 with simultaneous equations featuring commodity prices, M2, the federal funds rate, real GDP, personal consumption, a price index, and unemployment. Allowing for varying coefficients in the monetary policy model, the best fit was obtained with four states, one of which occurred rarely. Of the remaining three, the most conservative state covered the Volcker disinflation, a relatively conservative "Greenspan" state covered most of 1983 to 2003 and half of 1959 to 1979, and the least conservative "Burns" state covered half of 1959 to 1979 and parts of 1983 to 2003.

The authors ran historic counterfactuals with each of the three states applying solely throughout. The Greenspan and Burns rules would have delivered similar outcomes to actual events. The Volcker rule, however, would have delivered half the rate of growth in the money supply, lower inflation (by up to 2 per cent) and lower output (by 1 per cent). However, there would still have been two inflation spikes of over 6 per cent.

Sargent et al (2006) took a different approach by modelling the beliefs of the FOMC between 1960 and 2003, as revealed by inflation and unemployment outcomes. They assumed a Phillips Curve, whereby the gap between the unemployment rate and the NAIRU is explained by the current inflation surprise, the inflation surprise in the previous period, and the unemployment gap in the previous period. They then estimated how this equation changed over time.

The authors used this changing equation to generate two key variables. The first was the sum in inflation coefficients. This variable gives a measure of the extent to which a policy maker believed it could reduce unemployment through an inflation surprise. This is produced in Figure 1.

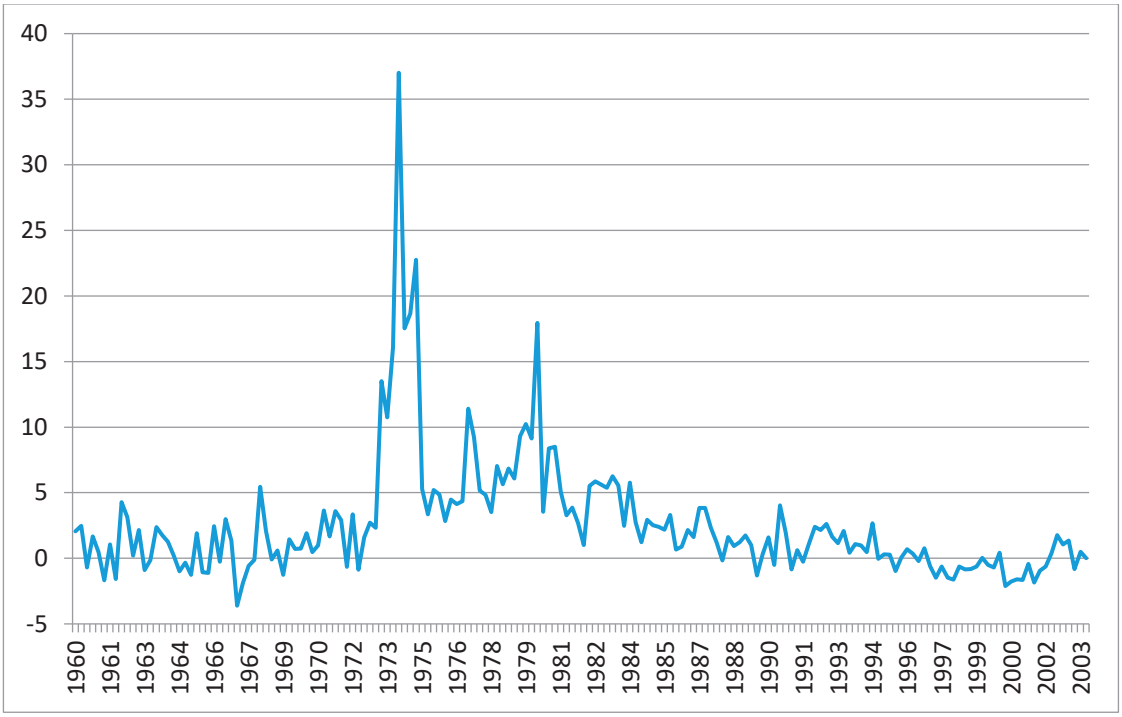
Figure 1: Evolution of US government beliefs about the Phillips Curve, 1960 to 2003, Sargent et al (2006)



If a policymaker believed that an inflation surprise would not decrease unemployment, then the sum of inflation coefficients would be around or above zero. The graph suggests that the FOMC expected that an inflation surprise would have a real effect between the mid-1960s and 1990.

The second variable in the paper was a perceived sacrifice ratio, calculated by feeding into the equation the actual past unemployment rate and 2 per cent past inflation, to generate a theoretical unemployment rate. In other words, this was the unemployment rate that policy makers revealed, as a matter of inference, that they would have to endure to reduce inflation to 2 per cent. This is shown in Figure 2. This second variable identifies a shorter period of less conservative beliefs, this time from the early 1970s to the early 1980s.

Figure 2: Evolution of US government beliefs about the level of unemployment required to secure 2 per cent inflation, 1960 to 2003, Sargent et al (2006)



Carboni and Ellison (2009) extended this paper to include unemployment forecasts published in the Greenbook. They noted there had been criticisms of Sargent et al (2006), in particular that some of the beliefs are excessively volatile, which is inconsistent with the FOMC's aims of stabilisation. Therefore, they re-estimated the results of the paper with the additional restriction of the Greenbook data. This produced similar, but much less volatile, results.

These papers make an ambitious claim, namely that there were fundamental shifts in policy making connected with beliefs (Sargent et al 2006) or economic theory (Clarida et al 2000). Orphanides (2003) instead suspected human error. He argued that many of the problems in the 1970s arose from a mismeasurement of the NAIRU. Therefore, past monetary policy should be interpreted from the understanding of policy makers in *real time,* rather than from our statistical knowledge now. He argued that, in the mid-1970s, perceptions of the output gap approached an error of 10 per cent, contributing to looser monetary policy and inflation. Orphanides concluded that central banks should avoid activist policies because they heavily depended on the output gap, which is difficult to measure accurately. This is similar to Volcker's advice in 1990 that the FOMC should only focus on the inflation rate, although he did so on the basis that it would prevent inflation getting out of control in the first place.

While such an approach may be technically superior, it may not be legal, at least for the Federal Reserve. Since 1977, its Act has required monetary policy "to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates" (section 2A).

Method

The general approach was to run regressions across four sets of dependent variables: quarterly interest rates; annual interest rates; FOMC decisions to ease policy; and FOMC decisions to tighten policy. If a result was consistent across the first two dependent variables, and one of the FOMC variables, then that result was regarded as robust. The regressions were all related, but different techniques were involved. For example, the variance of the error terms in the quarterly interest rate regressions changed at various points, leading to a GARCH method. However, the changes in the variance of the error terms was absent in the annual interest rate regressions, so ordinary least squares (OLS) could be used. Logit regressions were used for the FOMC decisions.

Data

Scope

Many papers developing a reaction function for the FOMC have the start point for their data around 1960. This reflects the fact that U.S. economic conditions worsened in the late 1960s, so 1960 gives sufficient data for a baseline for papers focussing on stagflation. However, 1960 is not the only possible start point. For example, the academic Phillips Curve literature commenced at this time, in particular with Lipsey (1960) and Samuelson and Solow (1960). A start date some time before 1960 would reveal whether there was any evidence for a Phillips Curve effect. Another possible start date would reflect the signing of the Accord between the U.S. Department of the Treasury and the Federal Reserve in 1951. The Accord resolved a conflict between the President and the Federal Reserve over the Administration's pressure on the Fed for it to accommodate Government borrowing after World War II. It provided the Federal Reserve with a greater degree of independence.

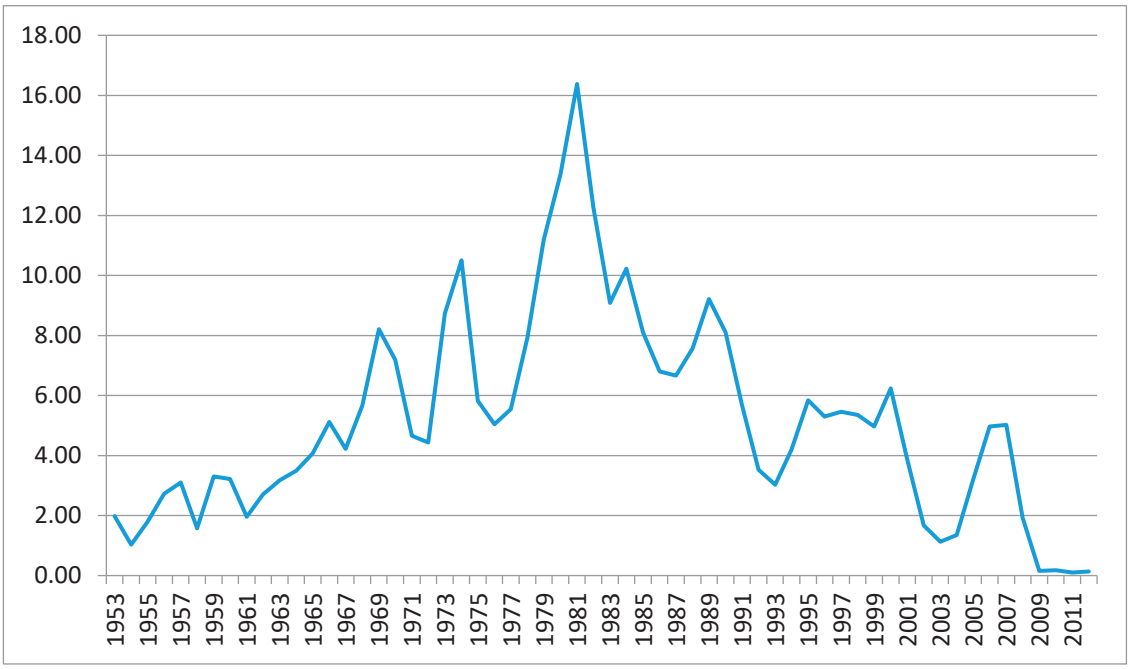
Where possible, the scope of this paper will be from 1953 to 2012. It provides a longer baseline to determine whether there were any changes in the models caused by the Phillips Curve literature in the early 1960s. A longer period means that the results in the paper are more general. In some cases, the scope of the paper will be from 1960 to 2003. This corresponds to the period in Sargent et al (2006), and Carboni and Ellison (2009). Martin Ellison has kindly

provided some of the results from both papers. Where these are used, the shorter time period applies.

The federal funds rate as an independent variable

This rate is the weighted average of transactions between banks at the Federal Reserve, typically overnight. Bernanke and Blinder (1992) confirmed that the federal funds rate is a good indicator of monetary policy. The Board of Governors publishes federal funds rate data back to July 1954. Prior to this period, they published data on various interest rates, including three-month Treasury bills (Board of Governors 1976). Using monthly data from July 1954 to February 1957, the rate on new issues of three-month Treasury bills was regressed on the federal funds rate, generating the equation FFR = 0.165 + 0.935*Billrate with an R-square of 0.96. This equation was then used to generate data for the federal funds rate from 1951. Romer and Romer (2002) give implicit support to this approach by demonstrating that the members of the FOMC in the 1950s were considering interest rate conditions in markets generally. Annualised data are shown in Figure 3. It shows a series of peaks and troughs, as well as an upward trend to 1981, a downward trend thereafter, and zero rates at the end of the study period.

Figure 3: Annual federal funds rate, 1953 to 2012 (%)

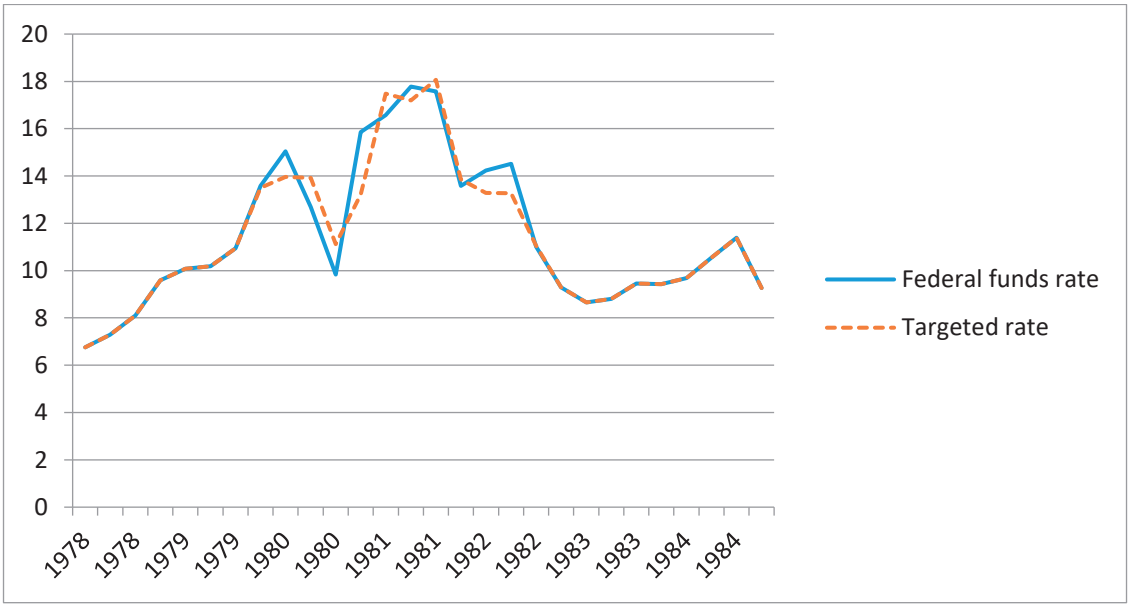


During the Volcker disinflation, the FOMC primarily targeted money supply growth, rather than interest rates (Bernanke and Mihov 1998). This period started in October 1979 and concluded in October 1982. This resulted in policy becoming much less stable. However, there are two reasons why the federal funds rate can be used as the independent variable in regressions

during this period. Firstly, the decisions of the FOMC in the Annual Reports of the Board of Governors indicate that, although the FOMC was formally focussing on the money supply at this time, it was also monitoring interest rates. At each meeting, not only did it give a money supply growth target, but it also gave a likely range of interest rates. If actual interest rates were outside this range, then the FOMC would reconvene to reconsider policy.

Secondly, interest rates usually matched the FOMC's projected ranges. To demonstrate this, an interest rate target variable was developed by taking the midpoint of the FOMC's projected range at each of its regularly scheduled meetings from October 1979 to August 1982. The irregular meetings were not used in this instance because they were held in response to changing economic conditions and so would reflect actual economic conditions, rather than forecasts. Figure 4 shows quarterly data for the interest rate target and actual interest rates, with some comparative periods on either side. Although the two variables are not identical, it shows that they track closely.

Figure 4: Targeted and actual federal funds rate (%), quarterly data, 1978-1984



FOMC decisions as an independent variable

Information on FOMC meetings was sourced from the Board of Governors' Annual Reports. The decisions were analysed to determine whether its decision at each meeting fell into one of three categories: easier policy; maintaining the status quo; or tighter policy. Mostly this coding was a simple matter, such as when the FOMC decided to cut interest rates (easier policy), maintain current conditions (status quo), or increase reserve pressures (tighter policy). The most difficult aspect to this coding was during Volcker's period as Chair because the FOMC usually referred to money supply targets and a range for the federal funds rate, rather than making current

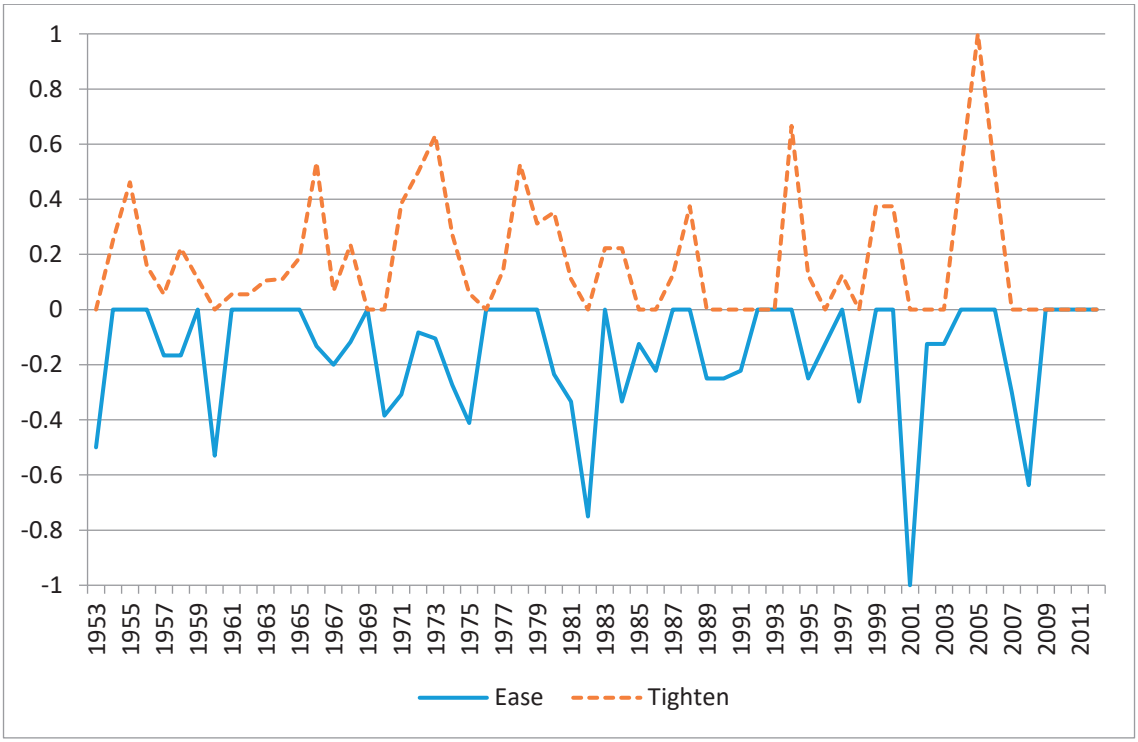
policy a reference point or setting an interest rate target. For this period, the midpoint of the interest rate range was taken as the target, with the interest rate prior to the meeting taken as current policy. Comparing the two produced the coding. Due to the instability of the period, current policy and the target had to differ by more than half a percentage point to be regarded as a change in policy.

The FOMC decision was taken as the unit of analysis. There were 708 meetings during the period where the FOMC considered whether to change monetary policy. At these meetings, the FOMC agreed to ease policy 103 times and tighten policy 131 times. It would be possible to develop a dataset of the votes of individual members, with each member that supported the FOMC's decision being coded on that basis, and then adjusting these scores according to whether individual members dissented for easier or tighter policy. However, FOMC members are well known for seeking to come to a consensus at their meetings. Therefore, individual member votes cannot be regarded as being independent within a particular meeting, which breaches the independence assumption made for many statistical methods.

It would be possible to model the dataset as three ordered discrete outcomes: decisions to ease, decisions to hold, and decisions to tighten. However, this assumes uniform behaviour across these categories. This often occurred, but not always. It would also be possible to model the dataset as multinomial outcomes to incorporate variation between them. However, this assumes the independence of irrelevant alternatives, which did not always apply. Therefore, two binary logit models were used: one for the decision to ease and one for the decision to tighten policy. Decisions at the prior meeting were included in the regressions and these were coded as a three-way factor variable, rather than a continuous variable, to allow for variation in their effect.

Figure 5 summarises the data. It shows the proportion of meetings each year where the FOMC decided to tighten policy (the line above the origin) or ease policy (the line below the origin). If the FOMC kept policy steady for a whole year, then that year would show a single line along the x-axis. If it tightened (or eased) policy every meeting in a year, then the line above (below) the x-axis would extend to a value of 1 (-1). The Figure reflects many of the cyclical aspects of interest rates, with sustained tightenings in the mid-1950s, the mid 1960s, the late 1970s, the mid 1990s and the mid-2000s. There were sustained easings around the early 1970s, the early 1980s, the early 1990s, and early and late 2000s.

Figure 5: Proportion of tight and ease decisions each year



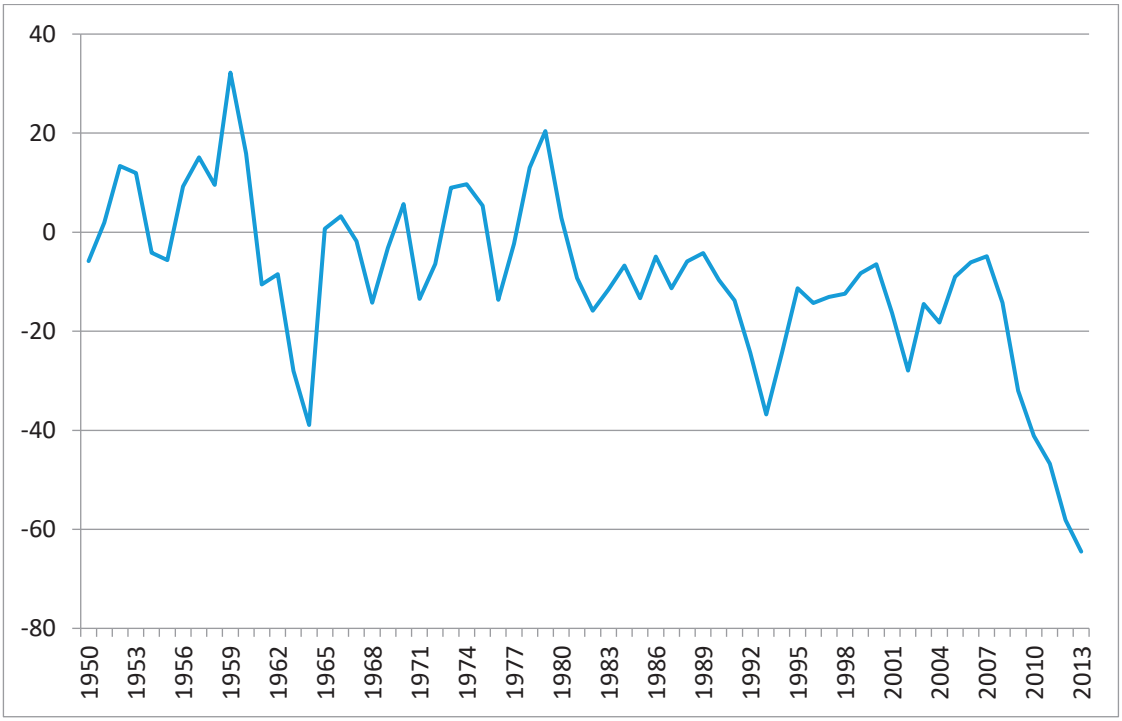
Presidential signalling

Studies such as Chappell et al (1993) have found that signalling by Presidents is correlated with monetary policy. That study used the index developed by Thomas Havrilesky, who examined Presidential statements reported in the Wall Street Journal. The index was time-consuming to prepare (Havrilesky 1988, 89; Mixon and Sawyer 2007, 1098). This paper instead uses State of the Union speeches, which are given each January. The reasons for using this index are that it is simple to generate, it is the most serious and well considered statement that the President makes about public policy, it is made regularly, and it is widely reported. Wahlbeck used State of the Union speeches to code Presidential attributes for a study into Presidential influence on the Supreme Court (1997).

Speeches were coded for the number of times they referred to words using the core letters "employ" and "job" in the context of the employment market, such as "unemployment" or "unemployed." The same was done with the core letters "inflat" and "pric" in the context of macroeconomic price stability. These two numbers were multiplied by 10,000 and divided by the total number of words in the speech to produce employment and inflation signalling indices. The employment index was then subtracted from the inflation index to produce a general signalling index. A higher value of this index would be expected to be correlated with tighter policy.

The speeches occur in January. Quarterly data was generated by treating them as occurring in quarter I of each year, and then interpolating. 1969 and 1977 were special years in that the incoming President did not give an oral speech. Rather, the written speech of the outgoing President was used instead. The annualised index is reproduced in Figure 6 below. President Carter was the last to deliver an unambiguously anti-inflationary State of the Union speech. The most conservative President on these issues was Eisenhower. Until recently, Johnson was the least conservative President on this measure, but he was overtaken by Obama after the Global Financial Crisis.

Figure 6: Annual Presidential signalling in support of either output (-) or prices (+), 1950 to 2014



The real time unemployment gap

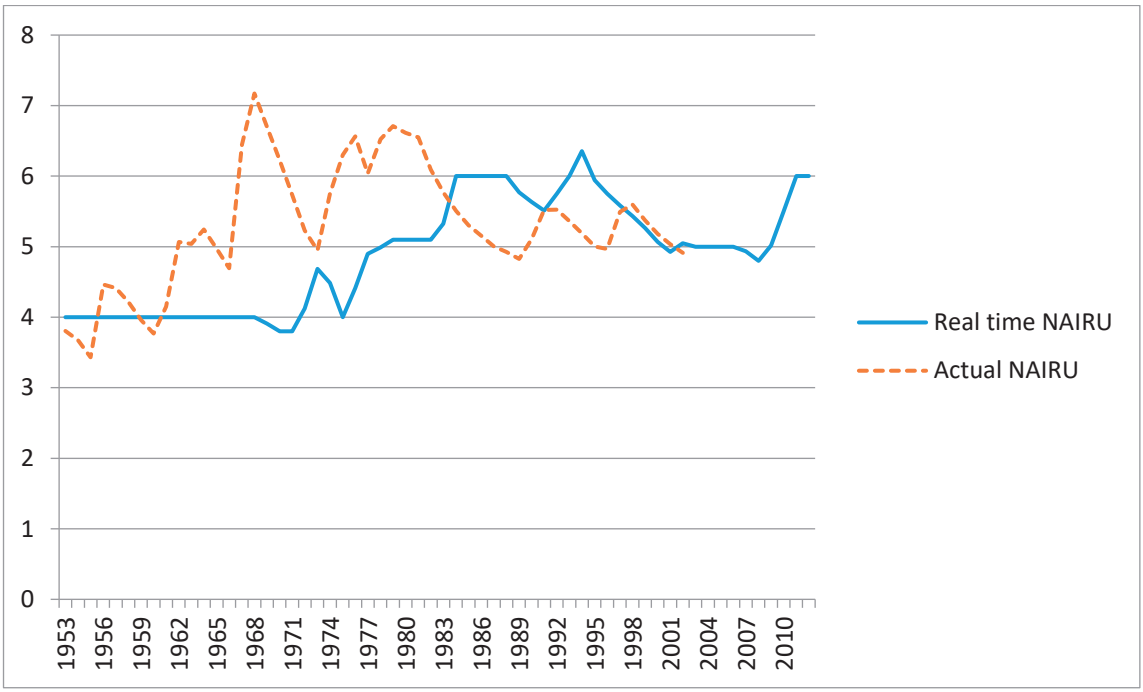
This statistic is the difference between the unemployment rate and what was generally regarded as the full employment unemployment rate at each point in time. The gap is constructed from a number of sources. In the 1950s and into the early 1960s, there were no formal estimates published by economics agencies of full employment output or the equivalent unemployment rate. For this period, this paper uses estimates of the full employment unemployment rate that were published in the academic literature at the time. A search was conducted on JSTOR of papers published that included the terms “full employment” and “unemployment rate.” An examination of these papers indicated that the full employment rate of unemployment was considered to be approximately 4 per cent during the 1950s and early 1960s (e.g. Hildebrand 1954, Long 1960, Weinberg 1953).

From 1962 into the 1970s, the full employment unemployment rate was taken from the Economic Report of the President, which was published each January. Until the mid-1970s, the report set the unemployment benchmark around 4 per cent. In the mid-1970s, there was some oscillation around 4 and 5 per cent and the benchmark permanently increased to 5 per cent in 1977. If a Report did not give a value for full employment, then it was assumed to be the same as the previous year. Quarterly data was generated by treating the Report as being published in quarter 1 and then interpolating.

From 1980, the Board of Governors generated its own estimates. In the 1980s, the estimate is the "high employment unemployment rate," which the Fed used to generate the federal government high employment budget surplus or deficit. This was 5.1 per cent at the start of the decade and then shifted to 6.1 per cent in 1983. Estimates for the 1990s are drawn from Blue Book information published on the website of the Federal Reserve Bank of Philadelphia. Estimates from 1997 onwards are from the Green Book spreadsheets on the same website. These were publicly available in the Green Book up to 2010. The Board of Governors has a policy of keeping its forecasts or estimates of the economy confidential for approximately five years. Values for this variable after 2010 were assumed to have not changed since then.

A graph of the real time NAIRU is in Figure 7 below. Also included is a graph using data from Tulip (2004) showing an estimate of the actual NAIRU based on minimum wage data.

Figure 7: Real time and subsequent estimates of the NAIRU, 1953 to 2012



The graph shows that the NAIRU was consistently under-estimated in the 1960s and 1970s, sometimes extending to 3 per cent. From the mid-1980s to the late 1990s, the NAIRU was generally over-estimated, although the errors much smaller, reaching only 1 per cent. The time period of policy error is similar to that in Sargent et al (2006) in relation to Phillips Curve beliefs.

Presidential electoral cycle

A simple variable was used. This was coded as a 1 in Presidential election years, -1 in Congressional election years, and 0 otherwise. This approximates the results in Grier (1989). Beck (1987) has argued that such a variable would really reflect accommodation of the deficit. Therefore, the deficit was also used and is discussed below.

Economic data

Monthly unemployment data were taken from the Bureau of Labor Statistics website. Inflation expectations data was taken from the biannual Livingston Survey at the Federal Reserve Bank of Philadelphia website. These biannual figures were interpolated to provide a quarterly time series. Monthly oil price data was for West Texas Intermediate sourced from the FRED database maintained by the St Louis Federal Reserve. Deficit data as a percentage of GDP for all three tiers of government was obtained from the Bureau of Economic Analysis website. Whether to respond to the deficit is an important question for all central banks; a higher deficit could be correlated with easier monetary policy. On the other hand, Evans (1987) has disputed the influence of the expected deficit on the FOMC.

Money supply is represented by growth in M1. Monthly data for M1 was first published by the Fed in 1960. In order to generate money supply data for the 1950s, money stock data (currency outside banks and demand deposits) were regressed on the Board of Governors' M1 data between 1959:1 and 1961:8. This produced the equation M1 = 5.314 + 0.941*Stock with an R-square of 0.97. This equation was used to generate M1 data for the 1950s. M2 data will not be used because it was not published until 1970. A dummy variable will be applied to a "Volcker disinflation" period, from October 1979 until October 1982 (Q4 1979 to Q3 1982), and a cross product was created for money supply growth during the Volcker disinflation.

Monetary policy tends to move in cycles, so lags of the federal funds rate and differences in this rate were used to represent this. In the equations for meeting decisions, the decision at the last meeting and the direction of previous decisions (0 or 1 for an easing cycle or tightening cycle respectively) were also used.

Results

Testing Orphanides' theory

The first set of regressions included both the real time gap and the unemployment rate to compare how strongly they were correlated with monetary policy. Regressions were conducted with key economic and political variables, discussed above. The output gap was typically not measured with a great deal of rigour by relevant parties at the time. Therefore, the regressions were conducted largely in levels and the results revolved not around the standard errors of the coefficents, but the sign and size of the coefficients.

In two regressions, the dependent variables were interest rates. In one, the dependent variable was FOMC decisions to ease policy (0=ease, 1=not ease) and in the last the dependent variable was FOMC decisions to tighten policy (0=not tighten, 1=tighten). The expectation is that the output gap would be correlated with looser monetary policy, so the preferred variable would have a greater negative effect. A summary table is below and full results are in the Appendices.

Table 1: Excerpts of regression results comparing the real time gap and unemployment, 1953 to 2012

Variable and regression	**Coefficient**	**Std error of variable**
Quarterly interest rates (ARCH)		
Real time gap	-0.19	1.50
Unemployment	0.16	1.63
Annual interest rates (OLS)		
Real time gap	-0.45	1.47
Unemployment	-0.05	1.61
Real time gap (from Q4 1982)	0.38	1.14
Unemployment (from Q4 1982)	0.16	3.33
FOMC decisions to ease (logit)		
Real time gap	-1.73	1.42
Unemployment	1.70	1.59
FOMC decisions to tighten (logit)		
Real time gap	0.17	1.47
Unemployment	-0.63	1.53

In the regressions on quarterly interest rates and FOMC decisions to ease, the real time gap has a negative sign, and the unemployment rate has a positive sign. In the regressions on annual interest rates, both have a negative sign, but the real time gap has a much larger coefficient. These three results support Orphanides' theory. The results are reversed for the regression on FOMC decisions to tighten policy; the unemployment coefficient is large and negative and the coefficient for the real time gap is small and positive.

Overall, then, the results favour Orphanides' theory, but not comprehensively so. But it would certainly be advisable, to use a real time gap measure, rather than the unemployment rate.

Testing the conservatism theory

Base regressions were created for the four dependent variables: quarterly interest rates, annual interest rates, FOMC decisions to ease policy, and FOMC decisions to tighten policy. The regressions used the following dependent variables as a starting point: lags of the interest rate, inflation expectations, the real time output gap, oil price inflation, the deficit as a proportion of GDP, the lag of the interest rate (or the previous FOMC decision), growth in the money supply, the Volcker disinflation and its cross product with the money supply, presidential signalling, and the presidential electoral cycle. In the regressions on FOMC decisions, the previous decision was also used, as was a 0/1 variable for the general direction of decisions. If the previous decision was an easing or tightening of policy, then it was a 0 or 1. If the previous decision was to maintain policy, then it was determined by the most recent non-maintaining decision.

The base regressions are reproduced in the Appendix. The first equation, with quarterly interest rates as the dependent variable, demonstrated a unit root and auto-regressive conditional heteroscedasticity (ARCH), volatility from 1979 to 1982, and some large outliers. To correct for these, the data was first differenced, and a (1, 2) GARCH model used. The diagnostics applied for this model were a Q-Q plot and a correlogram of the adjusted residuals (for the main model), and a correlogram of the adjusted residuals squared (for the model's variance). The second equation uses OLS and has annual interest rates as the dependent variable. Once again a unit root was present, so the data were first differenced. The results were tested against the following diagnostics: heteroscedasticity, autocorrelation, normal residuals, the RESET test, and tests for CUSUM, CUSUMSQ, and ARCH. The equation breached the RESET test at the 5 per cent level of significance, so cross products were added for the real time output gap against the disinflation and post-disinflation periods.

The two meeting equations have 0/1 binary dependent variables. In the first, a 0 indicates easier policy, and in the second, a 1 indicates tighter policy. A logit technique was used, and the

diagnostic tests were for specification (Pregibon's linktest) and heteroscedasticity (Davidson and Mackinnon 1993), as well as a likelihood ratio test for parameter stability. The sixty year study period was divided into two sub-periods, with the second period commencing in Q4 1982 (after the Volcker disinflation). For k independent variables and a constant, the test statistic had a chi-squared distribution with 2*(k+1) degrees of freedom. Some cross products were added to address diagnostic issues and are listed in the Appendix. In both equations, a cross-product was generated between the Volcker disinflation and the monetary policy cycle. The large negative coefficient reflected the fact that policy cycles were much shorter during this period.

Overall, the base equations are consistent with the research on reaction functions. The FOMC is more likely to tighten policy when prices rise and unemployment drops. The Volcker disinflation also has an impact in all of the equations, although not always connected to money supply growth. This is consistent with the view that the operational change to targeting the money supply during this time was simply a means to the end of higher interest rates and tighter money more generally (Kettl 1986; Neikirk 1987). Presidential signalling and the deficit are also statistically significant in most of the equations.

A common issue in time series studies of monetary policy is identification. That is, the effects of a central bank by tightening or easing policy can be moderated or exacerbated by market reactions (Zha 1997). However, this issue is minimised for this analysis. In particular, the study is examining just monetary policy itself, rather than its effects. The lag in effect of monetary policy is well known, so contemporaneous variables are generally appropriate. The exception is the money supply. However, the reactions of the FOMC to changes in the money supply during the Volcker disinflation were so prompt that no lags were applied in this instance.

With the base regressions settled, the next step was to insert the different variables that interpret the conservatism theory into each of the four equations. The results are in Table 2.

Table 2: Excerpts of regression results testing the conservatism theory, 1953 to 2012

Variable	Quarterly rates	Annual rates	Ease decisions	Tighten decisions
Post*Expected inflation	-0.18	0.2	0.55**	-0.15
	(0.10)	(0.45)	(0.16)	(0.21)
Post*Real time gap	0.20*	0.58*	0.39	0.15
	(0.10)	(0.22)	(0.22)	(0.25)
Post*Deficit	0.085	0.16	-0.21	-1.87**
	(0.076)	(0.32)	(0.37)	(0.68)
Post*Oil inflation	0.0058	00013	0.008	0.037
	(0.0047)	(0.0068)	(0.26)	(0.035)
Learning	5.28**	-0.76	-3.19	-6.63*
	(1.96)	(4.63)	(3.58)	(2.80)*
Learning*Expected inflation	-0.38	0.53	-0.077	-0.040
	(0.20)	(0.29)	(0.46)	(0.31)
Learning*Real time gap	0.24	0.81	0.37	-0.19
	(0.17)	(1.49)	(0.47)	(0.50)
Phillips Curve beliefs (Sargent)	-0.072	-0.78	-0.21	-0.62
	(0.24)	(1.04)	(0.68)	(0.61)
Phillips Curve*Expected inflation	-0.034	-0.21	-0.20	0.35
	(0.092)	(0.29)	(0.22)	(0.19)
Sacrifice ratio belief (Sargent)	-0.018	0.035	0.017	0.054
	(0.012)	(0.072)	(0.036)	(0.033)
Sacrifice*Expected inflation	0.0058	-0.023	0.0043	0.002
	(0.0052)	(0.016)	(0.019)	(0.011)
Sacrifice*Real time gap	-0.003	-0.05	-0.019	-0.001
	(0.01)	(0.047)	(0.032)	(0.031)
Phillips Curve beliefs (Carboni)	-8.47**	-21.7	0.26	-6.74
	(2.47)	(11.1)	(7.88)	(6.67)
Phillips Curve*Expected inflation	-1.85	-0.44	-1.82	0.61
	(1.16)	(2.44)	(1.46)	(1.38)
Sacrifice ratio belief (Carboni)	0.05**	0.12	-0.018	-0.004
	(0.016)	(0.065)	(0.036)	(0.041)
Sacrifice*Expected inflation	0.0005	-0.034*	0.0003	-0.001
	(0.0056)	(0.016)	(0.011)	(0.01)
Sacrifice*Real time gap	0.0014	0.028	-0.062**	-0.001
	(0.0087)	(0.033)	(0.023)	(0.031)

Notes: Variables for the interest rate equations are first differenced. * indicates significant at the 5 per cent level and ** at the 1 per cent level. * indicates significant at the 5 per cent level and ** at the 1 per cent level. Data for variables from Sargent et al (2006) and Carboni and Ellison (2009) run from 1960 to 2003.

Which variables are robust? This paper adopts the standard of accepting that a variable is truly robust when it is statistically significant and has the same direction of effect across both the interest rate equations and one of the meeting equations. However, none of the conservatism variables meet this standard and most of them are not statistically significant in any of the equations. The inflation aversion theory proposed in Clarida et al (2000) is represented by the cross product between the post-Volcker disinflation dummy and expected inflation. However,

this is statistically significant and positive only in the equation for FOMC decisions to ease. In two cases, the coefficient's sign is negative. Instead, the best candidate for the conservatism theory is the cross product between the post-Volcker disinflation dummy and the real time gap. It is statistically significant and positive in both the interest rate equations. For FOMC decisions to ease, it has a positive sign, but its p-value is 0.08, marginally above the stipulated 5 per cent level. The results are approaching the recommendation in Orphanides (2003) that central banks should not attempt to use the output gap as a guide for stabilisation policy.

Explaining the inflation aversion results

Clarida et al (2000) is a heavily cited paper, yet the results in this study provide little support for the conservatism theory, especially when expressed as increased inflation aversion. Therefore, further regressions were conducted to explore whether there was some basis for the theory. These were conducted on quarterly interest rates, annual interest rates, and FOMC decisions to tighten policy, none of which showed correlations consistent with increased inflation aversion. Earlier, the regressions on FOMC decisions to ease showed a correlation consistent with the theory.

Rigour on the regressions was relaxed in three ways: the time period was shortened to 1996, similar to that in Clarida et al (2000); the time series regressions were conducted in levels, rather than differences; and some of the variables were omitted, particularly the political ones. However, tests were still conducted for the same diagnostics as before. Results are in Table 3 on the next page.

Table 3: Results of regression relaxing rigour to explain support for the inflation aversion theory, 1953-1996 and 1953-2012

Variable	Quarterly rates (GARCH 1,1)			Annual rates (OLS)		Tight decisions (Logit)	
Interest rates (-1)	1.11** (0.068)	0.33** (0.085)	1.31** (0.074)	0.55** (0.086)	0.41** (0.11)	-0.30** (0.10)	-0.25* (0.10)
Interest rates (-2)	-0.35** (0.060)	-0.026 (0.087)	-0.49** (0.066)				
Maintain policy at last decision						1.96 (1.05)	2.25* (1.03)
Tighten policy at last decision						3.43** (1.09)	4.03** (1.07)
Expected inflation	0.24** (0.021)	0.17 (0.11)	0.18** (0.019)	0.58** (0.073)	0.44* (0.16)	0.26** (0.091)	0.29** (0.087)
Post disinflation	-0.40 (0.34)	-0.084 (2897)	-0.12 (0.11)	-2.52 (1.56)	-0.86 (4.05)	-4.49* (1.96)	-0.46 (0.79)
Post*Expected inflation	0.15* (0.068)	0.20 (0.19)	0.015 (0.027)	0.65* (0.31)	0.57 (0.57)	0.75* (0.38)	0.066 (0.19)
Real time gap	-0.12** (0.034)	-0.28** (0.088)	-0.062 (0.033)	-0.53** (0.15)	-0.65** (0.24)	-0.48** (0.18)	-0.33 (0.18)
Deficit	-0.16** (0.030)	-0.13* (0.53)	-0.037* (0.014)	-0.39* (0.16)	-0.44 (0.22)	0.14 (0.14)	-0.068 (0.094)
M1 growth	-0.020 (0.033)	-0.12** (0.047)	-0.038 (0.029)	-0.0075 (0.044)	-0.025 (0.065)	0.38 (0.34)	0.064 (0.21)
Volcker disinflation	0.17 (0.25)	1.67** (0.33)	0.013 (0.26)	-14.9* (6.26)	-12.0** (4.22)	-0.0004 (0.97)	-0.071 (0.98)
Disinflation* M1 growth	0.68** (0.10)	-0.68** (0.21)	0.70** (0.14)	2.59** (0.93)	2.40** (0.67)	0.22 (1.02)	0.67 (1.03)
Constant	0.67** (0.092)	-0.007 (0.024)	0.41** (0.086)	1.57** (0.34)	0.0058 (0.16)	-3.10** (1.07)	-3.61** (1.05)
Data type	Levels	Differenced	Levels	Levels	Differenced	Levels	Levels
End year	1996	1996	2012	1996	1996	1996	2012
N	176	176	240	44	44	571	708

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. A variable, for the lag in the quarterly difference in interest rates, is omitted from the regressions for tightening policy. The results are: 0.77* (0.35); and 0.75* (0.36). The logit regressions use robust standard errors.

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Using this approach in the regression on quarterly interest rates, the coefficient for expected inflation after Q3 1982 is positive, statistically significant at the 5 per cent level, and over half the size of the coefficient for expected inflation generally. However, this result is lost when the data is differenced, or when the time period is extended to 2012. The results are similar for annual interest rates; differencing the data produces a similar coefficient but a much higher standard deviation, meaning that it is not statistically significant.

The results for FOMC decisions to tighten also show a marked effect on the coefficient for expected inflation after the Volcker disinflation, in this case in response to extending the time period. However, what is also interesting is the large coefficient for the post-disinflation dummy in the 1996 equation of -4.5. Combining this with the post-disinflation coefficient for inflation of 0.75 produces tighter policy in times of higher inflation (above 6 per cent) and easier policy in times of lower inflation (below six per cent). Since annual inflation generally stayed below 6 per cent, the results are consistent with easier policy overall, which may be justified because due attention is paid to inflation. However, this result only extends to 1996, and not the full set of observations.

The presented equations all passed the diagnostic tests at the 5 per cent level, except the last one, which failed the stability test (for the same coefficients before and after Q4 1982). This indicates that, with these variables, the cross-product between the post-disinflation period and expected inflation is not sufficient to explain the differences before and after Q4 1982.

One main conclusion from these results is that a paper based on data up to 1996, like Clarida et al (2000), is more likely to find inflation aversion than a paper based on a longer time series, such as to 2012. With hindsight, Clarida et al was published too early; its results may reflect residual anti-inflation aversion after the Volcker disinflation, which dissipated over time. At the least, it should be viewed as only applying to a limited period. The other main conclusion is that there was a change in monetary policy after 1982 that was similar to increased inflation aversion. However, this correlation was not robust to more rigorous methods and other explanations must be sought.

The change in the correlations with the real time gap

The results in relation to the real time gap after the Volcker disinflation are worth further scrutiny. Therefore, reaction function regressions were run for the twenty six year period from 1953 to 1978 and the thirty year period from 1983 to 2012. By excluding the volatile Volcker disinflation, it may be possible to discern other patterns.

The results are in Table 4. The first two columns show results for first differenced quarterly interest rate data. The variance in the residuals for 1953 to 1978 became much greater from the late 1960s, so a (1,1) GARCH model was used. For 1983 to 2012, the variance in the residuals was sufficiently random to permit the use of OLS, rather than a GARCH technique. The usual OLS diagnostics were investigated: normality of the residuals; heteroscedasticity and autocorrelation; the RESET test; and the CUSUM and CUSUMSQ tests. Autocorrelation was evident, leading to the use of robust standard errors. The CUSUMSQ test was breached at the 5 per cent level, leading to the use of a lag of the presidential election cycle and replacing the current series of the real time gap with its lag. This equation shows a greater responsiveness by the Fed to oil inflation, but no appreciable change in responsiveness to the real time gap, except for the fact that it is a one-period lag in 1983 to 2012.

OLS equations were used for both periods for first differenced annual interest rate data. The same OLS diagnostics were used and there were no issues. Responsiveness to inflation increased and responsiveness to the real time gap decreased across the periods. The coefficient for the real time gap in 1953 to 1978 has a t-value of -2.10. However, it is not statistically significant (p-value of 0.051) due to the small sample size.

Table 4: Second test of conservatism theory – FOMC reaction functions of interest rates, difference data, before and after the Volcker disinflation (1953-78 and 1983-2012)

Variable	**Quarterly rates**		**Annual rates**	
	GARCH	OLS	OLS	OLS
Period	1953-1978	1983-2012	1953-1978	1983-2012
Interest rates (-1)	-0.038 (level) (0.023)	-0.028 (level) (0.018)		
Change in int. rates (-1)	0.33** (diff'd) (0.11)	0.39** (diff'd) (0.12)	0.32* (diff'd) (0.15)	0.16 (diff'd) (0.21)
Expected inflation	0.032 (0.12)	0.064 (0.068)	0.72 (0.35)	1.49** (0.42)
Oil inflation	-0.0075 (0.0088)	0.0054* (0.0022)	-0.0037 (0.0058)	0.0053 (0.0054)
Real time gap	-0.31* (0.12)	-0.26*(-1) (0.12)	-0.56 (0.26)	0.50 (0.46)
M1 growth (-1)	-0.069 (0.085)	0.015 (0.027)	0.081 (0.14)	-0.0075 (0.062)
Deficit	-0.14 (0.085)	-0.12 (0.061)	-0.55* (0.25)	-0.21 (0.23)
Presidential signalling	0.0052 (0.0064)	0.030* (0.015)	0.0020 (0.014)	0.083** (0.021)
Election cycle	-0.070 (0.065)	-0.16* (0.064)	-0.40 (0.19)	-0.45* (0.17)
Election cycle (-1)		0.088 (0.061)		
Quarter 1	-0.11 (0.064)	-0.0040 (0.053)		
Quarter 2	-0.064 (0.069)	0.077 (0.063)		
Quarter 3	-0.0018 (0.062)	0.17* (0.068)		
Constant	0.15 (0.088)	0.10 (0.069)	-0.011 (0.20)	-0.021 (0.17)
ARCH (-1)	0.64** (0.24)			
GARCH (-1)	0.50** (0.14)			
Constant (error equation)	0.0094 (0.012)			
Standard errors	OPG	Robust	Standard	Robust
R-square	NA	0.54	0.87	0.73
N	104	120	26	30

Note: * indicates statistically significant at the 5 per cent level and ** at 1 per cent.

Table 4: Second test of conservatism theory – FOMC reaction functions, 1953-78 and 1983-2012

Variable	**Ease decisions**		**Tighten decisions**	
	Logit (levels)	Logit (levels)	Logit (levels)	Logit (levels)
Period	1953-1978	1983-2012	1953-1978	1983-2012
Interest rates (-1)	-0.84** (0.24)	-0.80** (0.24)	-0.32* (0.15)	-0.47 (0.33)
Change in int. rates (-1)	2.09** (0.75)	4.70**(diff'd) (1.37)	1.38** (0.51)	0.98 (diff'd) (1.99)
Ease policy at last decision	Reference	Reference	Reference	Predictor
Maintain policy at last decision	1.34** (0.52)	0.63 (0.58)	0.95 (1.11)	3.90 (2.72)
Tighten policy at last decision	Predictor	Predictor	2.41* (1.17)	Reference
Trend		-0.13* (0.061)		0.17 (0.10)
Maintain policy*trend				-0.32* (0.14)
Policy cycle	1.95 (1.08)	1.00 (0.69)	-0.017 (0.46)	1.75 (1.02)
2nd half of period	1.36 (1.48)			
Policy cycle*2nd half	-2.72* (1.29)			
Expected inflation	0.88** (0.32)	0.81** (0.29)	0.24* (0.12)	0.036 (0.47)
Oil inflation	-0.0052 (0.011)	0.024 (0.027)	-0.014 (0.028)	0.051 (0.038)
Real time gap	0.66 (0.49)	0.25 (0.15)	-0.53** (0.18)	-0.22 (0.39)
Real time gap*2nd half	-1.42** (0.45)			
M1 growth (-1)	-0.96 (0.69)	0.062 (0.17)	1.43** (0.53)	0.010 (0.41)
Deficit	-0.15 (diff'd) (0.25)	-0.44 (diff'd) (0.30)	-0.10 (0.29)	-1.79** (diff'd (0.59)
Presidential signalling	0.073*(diff'd) (0.037)	0.14 (diff'd) (0.095)	0.044 (diff'd) (0.027)	0.26** (diff'd) (0.073)
Election cycle	-0.22 (0.34)	0.23 (0.30)	-0.48 (0.22)	0.050 (0.40)
Constant	1.86 (1.31)	4.72* (2.24)	-2.33 (1.21)	-3.38 (2.78)
Standard errors	Robust	Robust	Standard	Robust
Pseudo R-square	0.40	0.38	0.26	0.44
N	324	216	404	212

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. In three of the regressions, a type of previous FOMC decision was a perfect predictor of the decision at the next meeting. In these cases, the observations with these variables were dropped.

For the FOMC decisions, decisions to ease were never followed by decisions to tighten and vice versa for 1983 to 2012. In other words, they were usually perfect (non-)predictors of each other. Therefore, prior decisions to ease were dropped from observations where the FOMC decision was to tighten, and vice versa for 1983 to 2012. Where these variables occurred, the observations were dropped. This meant that the regressions were often determining the chance of an easing or tightening of policy following a decision to maintain policy. The diagnostics were for heteroscedasticity, the linktest for specification, and the likelihood ratio test for a split in stability from the mid-point.

The main diagnostic problem was the stability test, which was breached for three of the equations; the exception was for decisions to tighten policy in 1953-1978. The stability problem was addressed in the later tightening equation by adding an annual trend and its cross-product with the variable for maintaining policy at the previous meeting. The new variables indicate that a decision to tighten became less likely over time where the FOMC had previously decided to maintain policy. Instability in the earlier ease equation was addressed by including a dummy for the second half of the period (1966 to 1978) and multiplying it by the real time gap and the policy cycle. The statistically significant variables that result indicate that monetary policy had shorter cycles and that the FOMC strongly focussed on the real time gap during this time. In the later ease equation, instability was addressed by adding an annual trend. The negative trend here, and the negative trend cross-product in the later tighten equation, suggests that monetary policy became looser over time.

In the equations for 1953 to 1978, lags of the changes in interest rates were positively correlated with monetary policy. The other variable that was typically correlated with monetary policy was the real time gap. The two qualifications to this are that it only occurred for decisions to ease in the second half of the period (1966 to 1978) and accepting this occurred for annual interest rates, where the p-value was 0.051 but the number of observations was low at twenty six. Correlations between prices and monetary policy did not occur for the quarterly interest rates, but did for the other equations (accepting the p-value of 0.056 in the annual interest rates equation).

In the later equations, only two variables meet the benchmark of being statistically significant and the same sign in the interest rate regressions and one of the FOMC decisions. These are inflation (if oil price inflation included) and presidential signalling. The real time gap is statistically significant in just the regression for quarterly interest rates, in particular its one-month lag. The real time gap's political cousin is the deficit. This indicator broadly responds to

unemployment, adjusted for fiscal policy settings. The deficit was statistically significant in the equation for FOMC decisions to tighten. If the deficit is regarded as a proxy for the real time output gap, then there is more evidence that the FOMC has been responding to employment since 1983, although there is better evidence that it responds to inflation.

In its charter, the Fed is required to pursue stable prices, full employment and moderate interest rates. These results suggest that the FOMC has changed the weights it applies to these goals, by having less focus on full employment. The results also suggest that the FOMC has been influenced by recommendations in Orphanides (2003), that the Fed not focus on the output gap, and in Volcker (1990), that the Federal Reserve focus on controlling inflation. From the perspective of general price stability, this approach has been successful.

Conclusions

This paper has tested some of the more popular theories about monetary policy in the United States in the context of the Great Inflation. Although the theories are well-known, the methods in this paper are new. Instead of focussing on a single equation or a single dependent variable, this paper has established four dependent variables: quarterly interest rates, annual interest rates, FOMC decisions to tighten, and FOMC decisions to ease. Determining robustness from a single dependent variable, no matter how much effort is involved, involves the risk that a correlation can be by chance or from a hidden weakness of method. This then raises the question of publication bias. If twenty researchers examine the correlation between two variables, it is probable that one of them will find a correlation by chance. It is possible they will proceed to publication, whereas the remainder will not.

The approach here prevents this occurring by using four related dependent variables, where the independent variables should have the same effect across the different equations, and then assessing their performance overall. The benchmark is that a variable must be statistically significant at the 5 per cent level across both interest rate equations and one of the FOMC decision equations. This is exacting, but not unduly so; the usual variables in relation to prices, output, and the Volcker disinflation meet this standard, as do the deficit and Presidential signalling.

Firstly, the paper tested Orphanides' (2003) theory that the FOMC consistently over-estimated the output gap, resulting in looser monetary policy than conditions truly required. Data presented in this paper suggest that the FOMC over-estimated the output gap for over twenty years and that the errors were sometimes of the order of 3 per cent. In both the interest rate

equations, and FOMC decisions to ease, the variable for the real time output gap had a much larger effect size than the unemployment variable. Orphanides' theory passed this initial test.

Secondly, the paper tested Orphanides' (2003) theory against the conservatism theory by putting both types of variables in the four reaction function equations. Surprisingly, only the equation for FOMC decisions to ease was consistent with the argument that the FOMC became more inflation averse after 1982. The best result for the conservatism theory was that the correlation between the real time gap and quarterly and annual interest rates was lower after 1982 at the 5 per cent level of significance, and the correlation between the real time gap and FOMC decisions to ease was lower after 1982 at the 8 per cent level of significance.

These results were further investigated. Support for the theory that the FOMC became more inflation averse was present if the regressions were less rigorous, for example limiting the range of the data to 1996 (as in Clarida et al 2000) or using time series data in levels, rather than in differences. One interpretation is that something similar to, but fundamentally different from, increased inflation aversion did occur.

The correlations between the real time gap and monetary policy were further explored by conducting regressions for the four equations between 1953 and 1978, and then between 1983 and 2012. In each case, the correlations with the real time gap reduced or changed in nature. For quarterly interest rates, the variable for the real time gap changed to a lag in the second period. In all other cases, the coefficient for the real time gap was no longer statistically significant and sometimes had a positive sign. This provided further evidence that the FOMC has been less averse to the output gap since 1983. This result is consistent with Sims and Zha (2006), who found that the FOMC has become more conservative after the disinflation period, but not markedly so. They argued that the truly conservative period was 1979 to 1982, and the results in this paper are consistent with this finding.

Reduced aversion to the output gap is consistent with advice by Orphanides (2003) and Volcker (1990). Orphanides made this statement on the basis that the gap was hard to measure. Volcker said so because he thought the Fed would be more effective if it focussed on one policy outcome, in particular prices. But what the reaction function literature often overlooks is that the FOMC needs to comply with its legal mandate. It is required to pursue full employment, stable prices, and moderate interest rates. It would be illegal for the Fed to focus only on prices, or to neglect output altogether. What the FOMC appears to have done is compromised. In microeconomic terms, it has chosen a point in the decision set that maximises its utility by

focussing less on output within the legal constraint of applying a minimum weight to each of its three policy goals.

Appendix

Table A1: GARCH (1,1) FOMC reaction function of quarterly interest rates to compare coefficients for the real time gap and unemployment, data in levels, 1953-2012, N=240

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Interest rates	NA	5.16	3.48	0.07	17.78
Interest rates (-1)	1.29** (0.071)	5.16	3.48	0.07	17.78
Interest rates (-2)	-0.43** (0.064)	5.17	3.47	0.07	17.78
Expected inflation	0.14** (0.022)	3.95	2.96	-1.77	13.98
Oil inflation	0.0068** (0.0022)	2.26	13.63	-50.53	134.57
Real time gap	-0.19* (0.080)	1.05	1.5	-1.43	5.57
Unemployment	0.16* (0.075)	5.93	1.63	2.57	10.67
M1 growth	-0.024 (0.027)	1.25	1.29	-1.79	7.58
Volcker disinflation	0.018 (0.28)	0.05	0.22	0	1
M1 growth*Volcker	0.70** (0.13)	0.07	0.41	-0.57	3.48
Deficit	-0.044** (0.014)	2.77	2.7	-1.95	11.31
Presidential signalling (diff'd)	0.012* (0.005)	-0.32	5.12	-13.73	15.59
Post disinflation	-0.25* (0.11)	0.5	0.5	0	1
Election cycle	-0.049 (0.031)	0	0.71	-1	1
Constant	-0.030 (0.31)				
ARCH (-1)	0.52** (0.12)				
GARCH (-1)	0.50** (0.077)				
Constant (error equation)	0.019** (0.0068)				

Note: * indicates statistically significant at the 5 per cent level and ** at 1 per cent.

Table A2: OLS FOMC reaction function of annual interest rates to compare coefficients for the real time gap and unemployment, data in levels, 1953-2012, N=60

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Interest rates	NA	5.16	3.43	0.1	16.39
Interest rates (-1)	0.59** (0.13)	5.19	3.39	0.1	16.39
Expected inflation	0.54** (0.13)	3.72	2.58	-1.48	11.98
Post disinflation	-3.73 (3.60)	0.5	0.5	0	1
Expected inflation*Post	0.68* (0.26)	1.79	1.96	0	6.04
Oil inflation	0.0045 (0.0043)	9.11	28.85	-46.23	167.85
Real time gap	-0.45 (0.77)	1.05	1.47	-1.1	4.61
Unemployment	-0.047 (0.74)	5.93	1.61	2.93	9.71
Real time gap*Post	0.38 (0.84)	0.39	1.14	-1.1	4.28
Unemployment*Post	0.16 (0.89)	3.17	3.33	0	9.63
M1 growth	-0.089* (0.042)	5.09	4.19	-3.31	15.36
Volcker disinflation	-14.0* (6.31)	0.05	0.21	0	1
M1 growth*Volcker	2.63** (0.94)	0.34	1.39	0	7.4
Deficit	-0.059 (0.14)	2.77	2.67	-1.61	10.55
Deficit*Interest rates (-1)	-0.037 (0.022)	14.88	18.17	-8.02	82.97
Presidential signalling (differenced)	0.027* (0.010)	-1.19	11.95	-26.42	39.64
Election cycle	-0.16 (0.16)	0	0.71	-1	1
Constant	1.86 (3.02)				
R-square	0.96				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. Usual standard errors applied.

Table A3: Logit FOMC reaction function of ease decisions to compare coefficients for the real time gap and unemployment, 1953-2012, N=577

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Ease decision	NA	0.82	0.38	0	1
Interest rates (-1)	-0.60** (0.11)	5.13	3.43	0.07	19.1
Change in int. rates (-1)	0.86 (0.52)	-0.04	0.45	-3.15	3.06
Post disinflation	-3.65** (0.90)	0.38	0.49	0	1
Change in int. rates (-1)*Post disinflation	2.27* (1.07)	-0.03	0.15	-1.31	0.74
Ease policy at last decision	Reference				
Maintain policy at last decision	1.13** (0.36)	0.82	0.38	0	1
Tighten policy at last decision	Predictor				
Policy cycle	0.81 (0.44)	0.45	0.5	0	1
Volcker disinflation	2.36 (1.21)	0.04	0.2	0	1
Policy cycle*Volcker	-5.05** (1.56)	0.01	0.12	0	1
Expected inflation	0.25* (0.11)	3.9	3.06	-1.77	13.98
Expected inflation* Post disinflation	0.52** (0.18)	1.4	2	-1.38	6.78
Oil inflation	0.0038 (0.011)	0.95	11.29	-32.7	134.57
Real time gap	-1.73** (0.53)	1.21	1.46	-1.5	5.7
Unemployment	1.70** (0.50)	5.91	1.59	2.5	10.8
M1 growth	1.23* (0.59)	0.43	0.67	-3.2	6.11
M1 growth*Volcker	1.08 (1.45)	0.02	0.15	-1.18	1.26
M1 growth*Post	-1.43* (0.61)	0.21	0.65	-3.2	6.11
Deficit (differenced)	-0.22 (0.18)	0.09	0.72	-2.85	3.25
Presidential signalling (differenced)	0.087** (0.026)	-0.68	5.73	-13.73	15.59
Election cycle	-0.056 (0.21)	0.02	0.71	-1	1

Table A3 (cont'd)

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Constant	**-4.15*** **(2.01)**				
Pseudo R-square	0.35				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. A tighten decision at the previous FOMC meeting was a perfect predictor of not easing at the next meeting. The 131 observations with these variables were dropped. Standard errors are robust.

Table A4: Logit FOMC reaction function of tighten decisions to compare coefficients for the real time gap and unemployment, 1953-2012, N=664

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Tighten decision	NA	0.20	0.40	0	1
Interest rates (-1)	-0.33** (0.095)	5.30	3.47	0.07	19.10
Change in int. rates (-1)	0.73* (0.34)	0.06	0.48	-3.15	3.06
Ease policy at last dec'n	Reference				
Maintain policy at last decision	2.44 (1.25)	0.71	0.45	0	1
Tighten policy at last decision	4.13** (1.29)	0.20	0.40	0	1
Post disinflation	-1.64 (1.02)	0.32	0.47	0	1
Maintain policy*Post	0.60 (0.61)	0.26	0.44	0	1
Tighten policy*Post	Predictor				
Policy cycle	-0.066 (0.43)	0.59	0.49	0	1
Volcker disinflation	2.94* (1.20)	0.05	0.22	0	1
Policy cycle*Volcker	-3.43** (1.24)	0.03	0.16	0	1
Policy cycle*Post	1.46* (0.73)	0.14	0.35	0	1
Expected inflation	0.38** (0.10)	4.11	3.28	-1.77	13.98
Oil inflation	0.011 (0.012)	1.31	10.32	-26.23	134.57
Real time gap	0.17 (0.42)	1.13	1.41	-1.50	5.30
Unemployment	-0.63 (0.42)	5.79	1.53	2.5	10.4
M1 growth	0.23 (0.29)	0.38	0.55	-1.20	5.69
M1 growth*Volcker	0.089 (0.83)	0.02	0.17	-1.18	1.40
Deficit (differenced)	-0.21 (0.25)	0.01	0.66	-2.85	3.25
Deficit*Post	-2.00** (0.68)	-0.017	0.30	-1.43	2.75

Table A4 (cont'd)

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Presidential signalling (differenced)	0.041 (0.025)	-0.04	5.71	-13.73	15.59
Signalling*Post	0.19* (0.086)	0.042	1.93	-9.14	7.46
Election cycle	-0.21 (0.17)	0.01	0.71	-1	1
Constant	-1.13 (2.02)				
Pseudo R-square	0.27				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. From Q4 1982, an ease decision at the previous FOMC meeting was a perfect predictor of not tightening at the next meeting. The 44 observations with these variables were dropped. Usual standard errors used.

Table A5: GARCH (1,2) FOMC reaction function of quarterly interest rates, differenced data, 1953-2012, N=240

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Interest rates (level, -1)	-0.030 (0.0073)	5.16	3.48	0.07	17.78
Interest rates (differenced, -1)	0.49** (0.049)	-0.01	0.90	-3.99	6.02
Expected inflation	0.057 (0.044)	0.02	0.54	-1.92	2.65
Oil inflation	0.0045** (0.0011)	-0.02	17.80	-134.57	128.41
Real time gap	-0.31* (0.12)	0.01	0.41	-1.73	1.82
M1 growth	-0.088** (0.024)	0.01	1.04	-4.09	4.82
M1 growth (-1)	-0.0005 (0.029)	0.01	1.04	-4.09	4.82
Volcker disinflation	-2.00** (0.56)	0.00	0.09	-1.00	1.00
M1 growth*Volcker	1.52** (0.24)	0.00	0.40	-2.39	4.05
M1 growth (-1) *Volcker	2.00** (0.15)	0.00	0.43	-2.39	4.05
Deficit	-0.10* (0.048)	0.03	0.68	-2.85	3.25
Presidential signalling	0.0055 (0.0042)	-0.32	5.12	-13.73	15.59
Post disinflation	3.02 (4.53e+7)	0.00	0.06	0.00	1.00
Signalling*Post	0.020* (0.0086)	-0.25	2.87	-18.22	7.46
Election cycle	-0.080* (0.034)	0.00	0.50	-1.00	1.00
Quarter 1	-0.057 (0.033)	0.00	0.71	-1.00	1.00
Quarter 2	-0.029 (0.035)	0.00	0.71	-1.00	1.00
Quarter 3	-0.0048 (0.031)	0.00	0.71	-1.00	1.00
Constant	0.11** (0.035)				
ARCH (-1)	0.51** (0.14)		GARCH (-1)	0.20 (0.10)	
ARCH (-2)	0.44* (0.18)		Constant (error equation)	0.020 (0.011)	

Note: * indicates statistically significant at the 5 per cent level and ** at 1 per cent.

Table A6: OLS FOMC reaction function of annual interest rates, differenced data, 1953-2012, N=60

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Interest rates	NA	-0.03	1.79	-4.69	4.30
Interest rates (-1)	0.079 (0.081)	-0.03	1.79	-4.69	4.30
Expected inflation	0.81** (0.18)	0.07	0.91	-2.94	2.64
Oil inflation	-0.0085 (0.0033)	-0.02	40.14	-160.26	159.07
Real time gap	-0.51* (0.21)	0.05	1.16	-2.77	3.32
Volcker disinflation	-22.4** (5.11)	0.00	0.15	-0.76	0.76
Real time gap*Volcker	1.72** (0.61)	0.00	0.54	-3.51	1.90
Post disinflation	4.82* (2.15)	0.02	0.10	0.00	0.76
Real time gap*Post	0.58* (0.22)	0.03	0.84	-2.77	3.26
M1 growth	-0.11 (0.040)	0.17	3.33	-7.78	9.65
M1 growth*Volcker	3.67** (0.67)	0.00	0.97	-5.02	4.41
Deficit	-0.38* (0.14)	0.14	1.49	-1.98	5.12
Presidential signalling	0.023* (0.011)	-1.19	11.95	-26.42	39.64
Election cycle	-0.25* (0.11)	0.00	1.01	-1.00	1.00
Constant	-0.063 (0.11)				
R-square	0.84				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. Usual standard errors applied.

Table A7: Logit FOMC reaction function of ease decisions, 1953-2012, N=577

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Ease decision	NA	0.82	0.38	0.00	1.00
Interest rates (-1)	-0.52** (0.11)	5.13	3.43	0.07	19.10
Change in int. rates (-1)	0.85** (0.52)	-0.04	0.45	-3.15	3.06
Post disinflation	-1.54* (0.70)	0.38	0.49	0.00	1.00
Change in int. rates (-1)*Post disinflation	2.16* (1.01)	-0.03	0.15	-1.31	0.74
Ease policy at last decision	Reference				
Maintain policy at last decision	1.37** (0.36)	0.82	0.38	0.00	1.00
Tighten policy at last decision	Predictor				
Policy cycle	0.56 (0.42)	0.45	0.50	0.00	1.00
Volcker disinflation	3.29** (1.13)	0.04	0.20	0.00	1.00
Policy cycle*Volcker	-4.97** (1.57)	0.01	0.12	0.00	1.00
Expected inflation	0.25* (0.11)	3.90	3.06	-1.77	13.98
Expected inflation* Post disinflation	0.55** (0.16)	1.40	2.00	-1.38	6.78
Oil inflation	0.011 (0.010)	0.95	11.29	-32.70	134.57
Real time gap	0.032 (0.12)	1.21	1.46	-1.50	5.70
M1 growth	1.23* (0.61)	0.43	0.67	-3.20	6.11
M1 growth*Volcker	1.11 (1.52)	0.02	0.15	-1.18	1.26
M1 growth*Post	-1.38* (0.64)	0.21	0.65	-3.20	6.11
Deficit (differenced)	-0.43* (0.19)	0.09	0.72	-2.85	3.25
Presidential signalling (differenced)	0.08** (0.025)	-0.68	5.73	-13.73	15.59
Election cycle	-0.088 (0.21)	0.02	0.71	-1.00	1.00
Constant	2.28** (0.54)				
Pseudo R-square	0.33				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. A tighten decision at the previous FOMC meeting was a perfect predictor of not easing at the next meeting. The 131 observations with these variables were dropped. Standard errors are robust.

Table A8: Logit FOMC reaction function of tighten decisions, 1953-2012, N=664

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Tighten decision	NA	0.20	0.40	0.00	1.00
Interest rates (-1)	-0.31** (0.094)	5.30	3.47	0.07	19.10
Change in int. rates (-1)	0.72* (0.34)	0.06	0.48	-3.15	3.06
Ease policy at last decision	Reference				
Maintain policy at last decision	2.34 (1.23)	0.71	0.45	0.00	1.00
Tighten policy at last decision	4.03** (1.27)	0.20	0.40	0.00	1.00
Post disinflation	-2.40** (0.88)	0.32	0.47	0.00	1.00
Maintain policy*Post	0.53 (0.61)	0.26	0.44	0.00	1.00
Tighten policy*Post	Predictor	0.06	0.23	0.00	1.00
Policy cycle	-0.094 (0.43)	0.59	0.49	0.00	1.00
Volcker disinflation	2.70* (1.17)	0.05	0.22	0.00	1.00
Policy cycle*Volcker	-3.20** (1.21)	0.03	0.16	0.00	1.00
Policy cycle*Post	1.53* (0.73)	0.14	0.35	0.00	1.00
Expected inflation	0.30** (0.084)	4.11	3.28	-1.77	13.98
Oil inflation	0.010 (0.012)	1.31	10.32	-26.23	134.57
Real time gap	-0.44** (0.12)	1.13	1.41	-1.50	5.30
M1 growth	0.19 (0.29)	0.38	0.55	-1.20	5.69
M1 growth*Volcker	0.18 (0.82)	0.02	0.17	-1.18	1.40
Deficit (differenced)	-0.19 (0.26)	0.01	0.66	-2.85	3.25
Deficit*Post	-1.87** (0.68)	-0.014	0.30	-1.43	2.75
Presidential signalling (differenced)	0.037 (0.025)	-0.04	5.71	-13.73	15.59
Signalling*Post	0.18* (0.087)	0.042	1.93	-9.14	7.46
Election cycle	-0.17 (0.17)	0.01	0.71	-1.00	1.00

Table A8 (cont'd)

Variable	Coefficient	Mean	Standard deviation	Minimum	Maximum
Constant	-3.45** (1.27)				
Pseudo R-square	0.27				

Notes: * indicates statistically significant at the 5 per cent level and ** at 1 per cent. From Q4 1982, an ease decision at the previous FOMC meeting was a perfect predictor of not tightening at the next meeting. The 44 observations with these variables were dropped. Usual standard errors used.

4 – Central banks in the UK, Germany and the United States: Do politics explain the Great Inflation better than central bank independence?

Abstract

This paper compares two competing theories in terms of how they explain the inflation outbreak of the 1970s. The first theory is that higher central bank independence (CBI) addresses the time inconsistency problem and produces lower inflation through constraining politicians. The second theory is that politics is central to the inflation problem; central banks were constrained by politicians and the public, and inflation dropped after a policy learning process and a decline in inflationary expectations.

The paper tracks events in Germany, the United Kingdom and the United States to determine which theory is better reflected in the data. The UK had low CBI and no inflation history, Germany had high CBI and experience with hyperinflation, and the US had high CBI but no inflation history. The politics theory has more explanatory power than CBI, because it can also explain how the UK launched its inflation response in 1979, and the US maintained its response under Reagan, whereas CBI theories cannot.

The paper proposes a new theory that is the reverse of current CBI theories, namely that governments are more likely to delegate a disinflation to a central bank when it has more legal independence. Further, the militant behaviour of UK unions suggests that class division may also have affected how countries responded to the Great Inflation.

Introduction

The Great Inflation in the 1970s led to the central bank independence (CBI) literature. This started with the concept that governments needed a way to demonstrate their credibility in a range of policy fields, including price stability. Then mathematical models were developed suggesting that an independent central bank would be a way of securing this. Next came bivariate quantitative studies that showed that CBI was inversely correlated with inflation, followed by studies that showed that the relationship still applied if other variables were added, such as the conservatism of the government or levels of union membership (for example, Franzese 1999). Making central banks independent from politicians and giving them an inflation goal is now the orthodox view. The purpose of this paper is to show that CBI theories are poor at explaining the behaviour of politicians who were key players in the Great Inflation. Politically oriented theories may well be superior to CBI theories and we may need to reconsider the relationship between central banks and politicians.

An important part of the quantitative literature that covered the OECD nations is the experience of Germany, Austria and Switzerland because they are the outliers that have a large influence on the results; in the 1970s and 1980s they had the most independent central banks and the lowest inflation. But these countries had other features that made them outliers as well. For example, Germany and Austria suffered hyperinflation in the 1920s and Germany had a currency crisis after World War II. The German people's dislike of inflation is commonly mentioned (Kennedy 1991, 9; Kloten 1985, 365). Switzerland is synonymous with its international banking industry. While a country's financial sector has received some coverage in the quantitative literature (for example Posen 1995 and Franzese 1999), inflation aversion in Germany and Austria has received little attention.

The remainder of the OECD nations followed a different path to Germany, Austria and Switzerland, experiencing much higher inflation. However, from 1980, many of them disinflated through fiscal and wages policies and by the 1990s, inflation had been resolved. Taking the G7, monetary policy was used in four countries, fiscal policy in four, and wage policies in three. Theories of CBI are well suited to explaining why Germany, Austria and Switzerland had lower inflation compared with other countries, but not why the other countries had politically-led disinflations after the 1970s. In other words, CBI can explain cross sectional variation in inflation, but is less able to explain variation over time.

The legal independence of central banks is relatively straightforward to measure, and this has assisted the growth in this literature. But variables that reflect social attitudes are more difficult

to develop and often require interviewing samples of the population. Without precise questionnaires on this issue, it is difficult to develop meaningful data. The closest is the "most important problem" questionnaire undertaken by Gallup in the United States and a few other countries. However, there is little consistent data for developed nations going back to the 1970s. This paper takes a different approach. Instead, it will conduct process tracing (e.g. George and Bennett 2005; Van Evera 1997) for three nations that had different levels of legal CBI and different inflation histories. The first country is Germany, which had the legally independent Bundesbank and a history of hyperinflation in the 1920s. The second two are the United Kingdom and the United States, where neither had an inflation history. Both were subject to political influence; the Bank of England was subject to government direction, whereas the Federal Reserve was subject to various forms of persuasion.

CBI is indicated in several ways. For example, a central bank is politically more independent if the government cannot dictate policy through quickly and costlessly changing the senior staff of the bank, or through changing the bank's goals. A central bank is more economically independent if the government cannot borrow from it at rates significantly below those in the market. The differences between the central banks of Germany, the United Kingdom and the United States during the stagflation period were outlined in a number of articles. This paper uses Grilli et al (1991), part of which is reproduced in Table 1. Central banks in the Grilli et al study could have a total score of sixteen, where the last criterion could contribute two points if the central bank had no responsibility for bank supervision.

Of the eighteen countries in that study, Germany had the most independent central bank at thirteen points, ahead of the United States and Switzerland with twelve. The least independent central banks were those in New Zealand and Portugal, with three points each.

Table 1: Features of central bank independence in Germany, the UK and the US, 1970s

Independence criterion	**Germany**	**UK**	**US**
Political independence			
Governor not appointed by government			
Governor appointed for more than 5 years	*		
All the board not appointed by government			*
Board appointed for more than 5 years	*		*
No mandatory government participation on board	*	*	*
No government approval of monetary policy required	*		*
Bank has statutory requirement for monetary stability	*		*
Legislative process if bank disagrees with government	*		
Economic independence			
Government's direct credit facility is not automatic	*	*	*
Direct credit facility is at market rates	*	*	*
Direct credit facility is temporary	*	*	*
Direct credit facility is for a limited amount	*	*	*
Bank does not participate in primary bond market	*		*
Discount rate set by bank	*	*	*
Bank supervision not entrusted to central bank alone	*		*
Total	13	6	12

Note: Source is Grilli et al (1991, 368-9).

The process tracing method in this paper examines the CBI literature to determine what it predicts in terms of economic outcomes and the actions of political leaders and central banks. The same is done with the politics theory. Next, events in Germany, the United Kingdom and the United States are sketched out. The final step is to compare the two theories to determine which one's predictions more closely match the data. This approach is similar to that proposed

by Karl Popper (1972), who argues that the best way of improving our knowledge is to compare theories' explanatory power against each other. The theory that is the better match is preferred.

The time inconsistency literature

The initial paper was Kydland and Prescott (1977). It examined optimal control theory in the context of economic policy and used examples such as planning approvals in flood plains and managing aggregate demand. Optimal control theory is where a decision made at each point in time is best, based on current information and similar decisions in future. The paper concluded that optimal control theory is not suitable in economic systems because expectations change over time, such as through changes in governments. It states, "suboptimality arises because there is no mechanism to induce *future* policymakers to take into consideration the effect of their policy, via the expectations mechanism, upon *current* decisions of agents." In other words, we cannot bind future policy makers. The paper recommended adopting rules-based economic policy as a way of addressing the problem, with these rules being protected through institutional arrangements.

The next paper was Barro and Gordon (1983a), which applied a mathematical model to the aggregate demand problem posed in Kydland and Prescott (1977). The model assumed that unemployment depended on the natural unemployment rate (below which inflation would increase) and inflation surprises. It also used a loss function, where society would be worse off if inflation and unemployment deviated from their targets, being zero and the natural rate. The loss function includes the relative weighting policymakers place on inflation and unemployment. In order to generate activist policy, the loss function made the key assumption that the loss to society would be greater if unemployment was above the natural rate, rather than below it. The model produced the equilibrium results that policymakers are tempted to produce inflation surprises to reduce inflation, but in the long run employment stays at the natural rate and inflation is above zero. Ireland (1999) found that the performance of the United States economy from 1960 to 1999 is consistent with some of the predictions in Barro and Gordon's model.

The central bank independence literature

The first main paper to propose CBI as the answer to the commitment problem was Rogoff (1985). It used an economic model, but, apart from a social loss function, it used a different approach to Barro and Gordon (1983a). This involved a micro-foundations model, omitting the

non-accelerating inflation rate of unemployment (NAIRU). It concluded that the best way to reduce society's loss was to remove all labour market distortions such as income tax and unemployment benefits. The next best approach would be to delegate monetary policy to the central bank with the instruction that it target zero inflation and then specify how it is to react to disturbances such as supply shocks. The difficulty with this, however, is that it is not possible to anticipate all possible contingencies. The third best solution, and the most practical, is to delegate monetary policy to a central bank that takes a more conservative approach to inflation than the rest of society, provided it also places some weight on employment outcomes. This will produce lower equilibrium inflation and reduce society's losses.

This paper has an easily testable prediction, namely that inflation is lower where a country more fully delegates monetary policy to a conservative central bank. A substantial quantitative literature resulted. Early papers, such as Grilli et al (1991) showed a bivariate negative correlation between CBI and inflation in developed economies. Cukierman et al (1992) showed that the correlation did not extend to developing countries. Alesina and Summers (1993) confirmed the bivariate relationship, but found that CBI was not correlated with unemployment or output. The rest of the 1990s saw a flurry of articles examining whether other variables affected the relationship between inflation and CBI. For example, Franzese (1999) showed that the correlation was robust to the addition of employment share of the financial sector, union membership, and the political orientation of the government of the day, among others. In 2001, Berger *et al.* concluded that the relationship was robust.

Lohmann (1992) generalised Rogoff (1985). This paper uses a model of the economy that included the NAIRU, but then added another institutional variable to the policy maker's loss function, namely the cost that the policy maker will incur if they override the central bank. This produces two types of policy outcomes: where output shocks are moderate, then the conservative central bank is free to manage the economy and zero (or very low) inflation results. This is because the cost to the policy maker of overriding the central bank is large, compared with the possible output benefits. Where an output shock is sufficiently large, then the output benefits of overriding the more conservative central bank exceed the cost of overriding. Anticipating this, the central bank is more accommodating and inflation is high for a large, negative output shock and deflation can technically occur for a large, positive output shock. The exact shape of the policy response depends on the conservativeness of the central bank and the cost of overriding. The most efficient policy setting is to have a higher cost of overriding, rather than a more conservative central bank. In Rogoff, the overriding cost is very high, which implies no outbreaks of inflation. Considering that there were inflation outbreaks in the United

States in the twentieth century, Lohmann considered that the Rogoff model did not represent the situation in the United States.

Walsh (1995) proposed a way to improve on the outcomes in Lohmann (1992). He suggested that a government and its central bank could establish a contractual relationship with transfer payments made from the government to the central bank. If the transfers were appropriately designed, then it would be possible to eliminate the inflation bias of discretionary policy and to produce optimal economic outcomes regardless of the size or type of a supply shock. The design of the transfer payment depended on the assumptions of the model, but in all cases the central bank would be penalised for inflation above or below the theoretical target of zero. In some cases, the central bank would be penalised where output did not equal society's target level, which could be different to equilibrium output (broadly similar to the output achieved at the NAIRU). Although the paper defines the transfer narrowly as a payment, it recognises that there are other ways of representing it, such as dismissal.

Given these foundation papers, what are the implications of the central bank theory? In other words, what sort of events, political, economic or otherwise, could be expected to happen as a result of the theory? The broad implication from Rogoff (1985) is that an independent central bank is correlated with lower inflation. Lohmann (1992) takes this further in that, where the costs of overriding an independent central bank are higher (which is similar to saying that the central bank is more independent), the bank is less likely to accommodate a supply shock in the interests of controlling inflation. Larger supply shocks are also less likely to be accommodated. Walsh (1995) suggests that suitably designed incentive payments will produce low inflation and steady output, irrespective of the size of supply shocks.

One observation about the central bank theory is that it has little to say about politicians. Its main implications revolve around economic concepts: inflation, output and the accommodation of shocks. This leaves other matters unexplained. For example, do politicians support the central bank when it tightens money? If society's loss function includes inflation, then a politician might do this. However, it is important to remember that, while central bank theory relies on the loss function and the time inconsistency problem, these two concepts can stand on their own and support other, competing theories.

The politics literature

The idea of the politicians or the political process playing a positive, or partly positive, role in addressing inflation has had less coverage in the literature. The most comprehensive treatment

is De Long (1997), which describes the economic and political developments in the United States in the 1970s and early 1980s. He argues that, due to the influence of the Depression, the consensus in the 1970s was for employment-first policies. This came from both the Democrats in Congress, as well as President Nixon. Arthur Burns, as Chairman of the Federal Reserve, could not fully respond to inflation because Congress would have been fundamentally changed the Fed as an institution. As the 1970s progressed, fears about inflation grew so that a political mandate developed to fight inflation despite the risk of a significant recession. De Long states that this mandate was fully formed by 1979, although its development was slow and informal.

The idea that policy makers learnt a lesson from the 1970s has occurred in different ways in the economic literature, typically with a focus on learning by economists, rather than politicians. One example is the idea that the Federal Reserve did not properly understand the relationship between inflation and unemployment (Sargent 1999 and Sargent et al 2006). Another is that the Federal Reserve and most other parties did not understand that the non-accelerating inflation rate of unemployment had risen from approximately 4 per cent in the early 1950s to be close to 6 per cent in the 1970s (Orphanides 2003), or occasionally higher (Tulip 2004).

De Long's theory is supported by two of the central figures in the United States in the history of the Great Inflation. Arthur Burns (1979), Chair of the Fed from 1970 to 1978, argued that there was little political or community appetite to address inflation during his tenure. But by 1990, Paul Volcker, Chairman from 1979 to 1987, was able to conclude that, "at a certain point in the inflationary process, public opinion will support strong policies to restore stability even though those policies seem to entail a harsh short term cost" (14).

Simplifying further to a theory, the argument is that a developed country's inflation experience is inversely correlated with its inflation performance. Or to put it another way, once a developed country experienced high inflation, it was no longer prepared to tolerate it. This produces the testable prediction that inflation is inversely correlated to inflation history. However, it also produces other testable predictions. For example, it predicts that leaders in developed countries will eventually support reducing inflation and that this leadership matters, even where a central bank has a large degree of independence. The corollary is that central banks will not conduct disinflations, or at least will not be successful at it, if they do not have political support to do so.

The United States

Establishment of the Federal Reserve

The United States had a high degree of turnover in its early central banks until the creation of the Federal Reserve in 1913. Initially, the Bank of North America was established to help fund the War of Independence, but its charter was later repealed in line with the general dislike of centralisation at the time. In 1791, the Federal Government established the First Bank of the United States. It established branches, which put offside the many note-issuing banks created under State laws. Its charter was not renewed in 1811. The Second Bank of the United States was created in 1816 and met a similar end in 1833.[1]

Both these banks contributed to financial stability by encouraging the clearing of the notes of rival banks. In other words, they increased the rate at which banks would return the notes of other banks to the original banks for payment. This is an important constraint against the excess issue of notes. The lack of regular, prompt clearing was a continual problem in the United States in the eighteenth century. The national banks also had the potential to offer support to State banks during financial crises, which the State banks did recognise in the case of the Second Bank. The opposition of the State banks to the nascent central banks was only in their short run interests.

There were two general suspensions of cash payments in the 1830s. But from the 1840s the situation improved as regulation was tightened. For example, the shareholders of banks were now required to pay up their capital. There were also some voluntary systems developed to improve the clearing of banknotes.

In 1838, New York passed the Free-banking Law. This allowed anyone to issue notes, provided they had lodged an equivalent amount in certain securities with the Comptroller. One of the main type of securities was State or Federal bonds. Although they facilitated the issue of notes, it also meant that the amount of notes in circulation depended on the price of the bonds. If a bank wished to reduce the value of its notes in circulation, it faced a Catch-22 because it could not sell the bonds to raise the cash to redeem the notes, because then it would have more notes in circulation than securities lodged with the Comptroller. This inflexibility became an ongoing

[1] Material for the early history of the central banks in all three countries is drawn from Smith (1936), unless otherwise indicated.

issue in American banking. The alternative would have been to give banks discretion in the mix and value of commercial assets they would use to back their notes.

The Civil War created the next big change. The administration had difficulty borrowing from the public due to the poor financial management of the previous President, James Buchanan. The New York, Philadelphia and Boston banks were persuaded to assist with a $50 million loan, with it being paid in specie. The administration also started to issue notes, and if banks accepted them, they were required to redeem them in specie as well. This placed considerable pressure on the banks and, at the end of 1861, they suspended payments. Treasury also ceased redeeming the notes. Bills were passed to allow the issue of three sets of legal tender of $150 million apiece, which were valid for almost all payments, but could not be redeemed for coin.

The administration refined its monetary approach in 1864 with the passage of an Act to implement a national banking system so that groups of individuals could establish banks and issue notes, providing they held a certain amount of federal bonds to back the notes; in other words, a bond deposit system. The main aim was to create a demand for federal bonds, but the benefits of a uniform currency were also promoted. The new banks were not permitted to establish branches. Such a reform would have beneficial because it would have made it easier for the public to redeem the banks' notes and prevent the excess issue of notes.

From 1860, the federal government reduced its debt, which also reduced the quantity of bonds available to support the issue of notes. Banks tried to avoid issuing notes to their borrowing customers. It was much simpler to increase the customers' deposits with the bank instead. Different interest rates applied on loans, depending on whether they involved notes or deposit credits. The inflexibility in the currency was compounded by a limit on the value of notes that could be retired in any one month. Banks tended to use their notes to their full extent, meaning that reserves were limited.

The inflexibility in the currency showed up in various ways. Interest rates tended to spike in autumn due to foreigners borrowing and purchasing US dollars to purchase crops (Meltzer 2003). Between 1873 and 1907 there were five financial crises, where interest rates jumped markedly. Banks suspended cash payments in three of these cases. Instability was increased by the practice of country banks placing deposits with the major New York banks. The country banks regarded these deposits as a form of insurance, but the practical effect was mass withdrawals during a drop in confidence.

Some policies were implemented to address this but they were not effective. In 1900, the amount of notes able to be issued increased from 90 per cent of the value of bonds held to 100 per cent. The tax rate was dropped from 1 per cent to 0.5 per cent of the note issue. Further, the Treasury interpreted the law more widely and accepted municipal and other bonds as suitable backing for notes. However, these changes only allowed the expansion of the note issue without giving it the flexibility to contract. The changes fuelled an inflationary boom in the 1900s.

The 1907 crisis prompted further reform. The consensus at the time was that a co-operative system of emergency financing between banks would be sufficient. This led to the Aldrich-Vreeland Act of 1908 which allowed banks to form voluntary associations. The idea was that member banks could deposit securities, both government and commercial, with an association and issue notes against them. The banking membership would then be liable for redeeming the notes. More importantly, the Act established the National Banking Commission to investigate other possible reforms. The Commission ran for four years and published comprehensive research on the US and European banking systems. It shifted the US consensus towards a permanent central bank.

The Commission led to the establishment of the Federal Reserve System in 1913. It was different to other central banks. The System comprised twelve banks that were owned by the member banks. The twelve banks operated individually, but under the guidance of the Federal Reserve Board which comprised presidential appointees and two *ex-officio* members, the Secretary of the Treasury and the Comptroller-General. The System resembled the voluntary associations enabled by the Aldrich-Vreeland Act.

During the 1920s, it became apparent that the Federal Reserve System had considerable power over the economy through trading government securities on the open market. US government securities typically have a fixed value at maturity. The Federal Reserve found that it could buy or sell these securities on the open market and change their price. The gap between their price and redemption value, adjusted for time, was their interest rate. If these open market operations were conducted on sufficient scale, it was possible to change market interest rates. It is also became apparent that these actions could affect the flow of gold. However, decisions on open market operations were not undertaken by the Board, but instead by a specially appointed committee comprising the Federal Reserve banks of New York, Boston, Philadelphia, and later Cleveland (Kettl 1986).

The System was designed for managing the money supply and providing liquidity during crises, not macroeconomic management. There were no lines of control or accountability between the Board, the open markets committee, and the twelve reserve banks. Conflicts occasionally arose between them. Further, it mismanaged its response to the Depression and politicians came to the view that there should be political control or influence over such a powerful body. Congress amended the Federal Reserve legislation in the 1930s. The reforms included removing the *ex-officio* members of the Board and having a specially designated Chair. The Federal Open Markets Committee was also formalised as a twelve-member body comprising a seven-member Board appointed by the President and five of the twelve bank presidents, selected on a rotating basis. Therefore, Presidential appointees had a majority (Kettl 1986).

The modern era of the Federal Reserve commenced with the appointment of William McChesney Martin in 1951 to help resolve the dispute between the Administration and the Fed over the extent to which the Fed would ease policy when the Administration sought to sell Treasuries.

The Great Inflation

Under President Eisenhower, the FOMC's job was straightforward. Eisenhower did not have an aggressive economic policy and he often stressed the importance of price stability (see, for example, his State of the Union addresses and the Economic Report of the President, 1961). However, full employment and avoiding recessions were the primary economic goals for Presidents Kennedy, Johnson and Nixon. Further, President Johnson preferred to fund the Vietnam War through budget deficits and the NAIRU was believed to be 4 per cent, when it was closer to 6 per cent (Orphanides 2003).

The first Presidential action against inflation occurred in August 1971, when Nixon announced a ninety day freeze on all wages and prices. He did not philosophically support such a policy, but adopted it as a tactic against the Democratic controlled Congress, which passed the Economic Stabilization Act in 1970 over his objections. The Act allowed the President to impose controls and the Democrats assumed that Nixon would not use it, which could then become a way of embarrassing him. However, Nixon's use of the Act was politically popular and it became an electoral asset in the 1972 elections. The problem was that, the longer the price controls continued, the economic tensions they created grew as well, especially when supply shocks occurred in agriculture and oil. The Administration allowed the program to expire in April 1974 (Walker 2011).

President Ford conducted the second Presidential action against inflation. He was an economic conservative and believed that inflation was the domestic priority when he commenced his term. However, the Democrat controlled Congress ensured that he was unable to progress his economic agenda. He initially proposed a tight fiscal policy with higher taxes and reduced spending, along with a volunteer organisation titled "Whip Inflation Now." The Democrats attacked the fiscal proposal and it resulted in a number of Republicans losing their seats in the 1974 Congressional elections. At the end of 1974, the economy moved into recession and Ford started to change policy, proposing a tax cut. However, Congress outflanked him and he was forced to accept the Democrats' larger cut. Congress also passed many spending Bills and Ford's veto was overridden twelve times. At the end of 1975, Ford proposed smaller government through a tax cut and reduced spending. Again Congress outflanked him and passed the tax cut, while only promising to cut spending (Greene 1995).

In 1970, Nixon had appointed Arthur Burns, an economist with strong Republican links, as Chair of the Fed. During Burns' tenure, the Federal Reserve steered a course between fighting inflation and not permitting unemployment to rise too high. Ford's Council of Economic Advisers supported the Fed's tight money in their advice to the President. However, Congress took a different view and conflicts between it and the Fed escalated in the 1970s as interest rates increased. A number of proposals were made to increase Congressional oversight of the Federal Reserve, which Burns opposed because he believed that the Fed required flexibility to adapt monetary policy to the changing needs of the economy. The Federal Reserve proved adept at fighting off most of these proposals, or creating loopholes so that they were of limited effect. The most effective proposal was that the Fed is now required to meet with both the House and Senate banking committees twice a year (Kettl 1986).

Arthur Burns was Chairman of the Fed until 1978. In 1979, he argued that the inflation problem reflected a number of new features about the economy, which he outlined in his speech, *The Anguish of Central Banking.* These were that: the economy had an inflation bias because expectations about employment and output had risen; fiscal policy had become less responsive due to legislative deadlock, which placed more responsibility on monetary policy; and the disappearance of the traditional inverse relationship between inflation and unemployment meant that it became harder to control inflation. Burns also pointed out that there was no social consensus for fighting inflation. What was needed was "new currents of thought [to] create a political environment in which the difficult adjustments required to end inflation can be undertaken" (Burns 1979, 22).

Early in his Presidency, Carter decided that the economy was recovering and he came to the view that inflation was the real problem. Despite being a fiscal conservative, there were two reasons why Carter did not confront inflation head-on. Firstly, the Democratic Congress and the great majority of his advisers were not were not supportive of restraint. The other reason was that he was never prepared to accept austerity as the cost of fighting inflation. The third Presidential attempt at controlling inflation was wage and price guidelines that would permit wages and inflation to increase, but at reduced rates compared with 1976-77. The plan was that management would maintain a 7 per cent cap in its negotiations with organised labour, which would minimise confrontation between the Administration and the unions. However, businesses started giving wage settlements above the 7 per cent limit. Therefore, Vice-President Mondale negotiated an "Accord" with the unions that allowed annual wage increases of up to 9.5 per cent. Business was not enthusiastic about the program because wages were generally permitted to rise, whereas prices were not. By February 1980, inflation had risen to 18 per cent and the Administration attempted to enforce the guidelines through "jawboning" meetings between the President and industry sectors. However, little came of them (Hargrove 1988).

At the Federal Reserve, Arthur Burns and President Carter did not develop a good working relationship. In 1978, Burns was replaced by Bill Miller, a business CEO who had close links with Democrats. As inflation worsened in early 1979, Treasury Secretary Blumenthal and Chairman of the Council of Economic Advisers, Charles Schultze, started leaking to encourage the Fed to increase rates. Miller stated that he wasn't going to be pressured by the Administration and that the President valued an independent Federal Reserve. Carter disliked high interest rates and wrote to Blumenthal and Miller, demanding that they desist (Hargrove 1988).

In July 1979, Carter delivered his crisis of confidence speech and, as part of his action plan, fired Blumenthal and replaced him with Miller, leaving the Chairman's seat at the Fed vacant. Although convenient, this led to a loss of confidence in the markets and there was an international run on the dollar. Carter needed to quickly appoint someone who would gain the confidence of the markets or, in other words, he needed to make an appointment that would satisfy a key interest group. This was a key political turning point. Carter first discussed the Chairman's job with David Rockefeller and Alden W. Clausen, who were CEO of Chase National Bank and President/Chairman of the Bank of America, respectively. However, both rejected the offer. Paul Volcker had been a senior official at Treasury and the Federal Reserve for many years, as well as having private sector experience. He had been considered as a possible Chairman of the Fed in 1965, when the Johnson administration thought that it might replace Chairman

Martin. Volcker was also suggested by many of those whom the White House discussed the appointment with, and so the President interviewed Volcker as the third choice. Volcker advised Carter that he would pursue a tighter monetary policy than Miller. Carter, having few options, gave him the job (Neikirk 1987; Kettl 1986; Greider 1987). This became the fourth Presidential attempt at controlling inflation.

Volcker started his term in August 1979 and increased interest rates at his first meeting. However, the seven Governors were split on whether to increase rates further. The other monetary policy instrument the Fed has is the discount rate, at which banks borrow funds directly from the Fed. This rate is set just by the Governors. On 31 August, it refused to increase rates from 10.5 per cent, and then on September 18 it split four-three in agreeing to increase the rate to 11 per cent. The markets interpreted this as a signal that the Fed was at the top of the interest rate cycle, or as Volcker put it, “they’re at the end of their string”. The value of the dollar dropped in international markets and Volcker began exploring the idea of targeting the money supply as a way of restoring credibility (Feldstein 2013; Neikirk 1987). The Administration did not initially support the policy switch, but Volcker persisted. After all, the President appointed him to settle the markets and there was a political imperative to keep him on side. Opposition among the Governors to tight money was also dissipating as the economic situation deteriorated. After a special meeting on 6 October, Volcker announced the new policy to the press and that interest rates would increase from 11 per cent to 12 per cent. The White House, again short on options, issued a statement in support (Neikirk 1987).

By the end of February 1980, rates had reached 16.5 per cent. The Carter Administration disliked high interest rates and developed an economic program that comprised the fifth Presidential attempt at controlling inflation. The aim was to stabilise the economy without high interest rates. Carter announced the new program in March 1980 and it included an oil import fee and credit controls. The latter part was to be implemented under the Credit Control Act of 1969, where the Federal Reserve could act under the President’s authorisation. Volcker and the Federal Reserve were unenthusiastic about the controls because they could harm the economy and be administratively difficult. In negotiations with the Administration, Volcker would only support a weak system of credit controls and wanted a more conservative fiscal policy. Therefore, the economic program included fiscal reforms designed to put the budget in surplus. Consumer spending had already started to soften so the effect of credit controls on consumer confidence was immediate. In the second quarter, real GNP dropped 2.5 per cent, or 10 per cent at an annualised rate. Mid-year, the Federal Reserve discontinued credit controls and eased monetary policy. This did restore economic growth, but at the cost of rebuilding

inflationary pressures, so the FOMC returned to tighter policies in the second half of 1980 as the election approached. Carter's advisers encouraged him to criticise the Federal Reserve's policies, which he did in Philadelphia in early October. However, it backfired and Carter was widely criticised (Neikirk 1987). Ronald Reagan noted that Carter could not credibly criticise the Fed when he had appointed the Chairman and most of the Governors (Greider 1987). During the disinflation, there was a political cost to criticising the Fed.

Unlike his predecessors, Reagan commenced his four-year term advocating that inflation should be reduced. Further, he did not state that this needed to be balanced against other policy goals, such as employment, and often stressed the need to stay the course and avoid quick fixes (Poole 1988). Behind the scenes, his staff believed that inflationary expectations had to be brought under control quickly before interest groups sought special treatment or financial assistance (Mumper and Uslaner 1982. The main source of criticism of Volcker's tight monetary policy within the Administration was the Treasury, including the Secretary of the Treasury, Donald Regan. If Treasury criticism became extreme, the White House would ask Treasury to desist and a meeting would be arranged between the President and Volcker to settle relationships (Neikirk 1987).

The closest matters came to a crisis was in January 1982, when President Reagan stated that an increase in the money supply was sending the wrong signal to the money markets and that industry investment was being delayed due uncertainty about what the Fed would do. Unlike previous occasions, the President only gave a neutral answer when asked whether Volcker should resign. Regan followed up with his own criticisms that the Fed could not control growth of the money supply. A week later, Volcker responded by arguing that high deficits were causing high interest rates. In mid-February, Reagan and Volcker had a private meeting. Little is known about this event, but three days later at a press conference Reagan fully endorsed the FOMC's actions (Neikirk 1987). Reagan was balancing policy outcomes and outsourcing political risk. He was giving Volcker enough support to bring inflation back under control, while at the same time running a large deficit to be seen to support the economy.

As 1982 progressed, the Fed began to ease monetary policy. This was partly due to the drop in inflation, but it was also due to the realisation that it was becoming harder to define the money supply due to financial innovation. Banks began offering accounts that combined a range of features, such as interest bearing accounts that supported cheques as well (NOW accounts). On 5 October 1982, in a climate of falling inflation and the Mexican debt crisis, the FOMC eased policy and no longer strictly aligned monetary policy to the money supply (Axelrod 1985; Neikirk

1987). Although some inflation scares re-occurred during the 1980s (Goodfriend 2007), the worst was over and the United States economy performed relatively well by their targets for the next twenty years. In 1990, Volcker gave a lecture, *The Triumph of Central Banking?,* where he noted that public opinion would eventually support a disinflation, even though the short term cost was high (Volcker 1990).

United Kingdom

Through the sheer volume of literature, the US tends to become the base case in international comparisons. However, other countries can have some fundamental differences to the US. For example, the US was by far the world's largest economy in the 1970s and issued the world's reserve currency, the dollar. By and large, this meant that other countries had to react to the US and needed to regularly monitor their international position. The US, however, rarely had to do so; the main exception was in the late 1970s, discussed above. Another area of potential difference is labour relations. Unions played a small part in stagflation politics in the US due to low levels of union membership and low levels of class division. Many other countries had different conditions.

Both of these factors served as potential areas of difference in the UK. For much of the period after World War II, the UK pound was over-valued. This bred currency speculation and UK economic policy was, from time to time, motivated by the desire to avoid devaluation. Secondly, the UK had strong class divisions, which were reflected in the conduct of its unions. Together, these factors combined to produce an economy that lacked optimism and was instead characterised by poor productivity, uncompetitive exports and a propensity to import (Morgan 1990).

Establishment of the Bank of England

This central bank was established in the late seventeenth century. In 1672, Charles II was heavily in debt to London bankers and solved the problem by suspending payment. This ruined the creditworthiness of the sovereign. When William and Mary took the throne, the sovereign was again in need of credit, this time to fight France. William Paterson proposed that a joint stock bank be created to facilitate government borrowing. Parliament passed the Tonnage Act in 1694 to establish the Bank of England and the Bank's capital of £1.2 million was fully subscribed in eleven days (Dean and Pringle 1994).

The Bank of England proved to be very profitable. This was partly due to the many privileges that Parliament granted it. This included the requirement that all sums due to the government

had to be paid through the Bank. It was able to issue notes, had a monopoly in joint stock banking, and the right to deal in bullion. The Bank earned interest from its loans to the government, but then it was also able to issue banknotes (that matched the government loans) as loans to private borrowers, which also earnt interest. Funds invested in the Bank earned interest twice. The Bank was backed by the government, in particular by its duties on shipping and alcohol (Dean and Pringle 1994).

From time to time, Parliament would renew the Bank's charter, some additional privilege would be added, and the Bank's capital would be increased to facilitate further borrowing. In 1764, the renewal included the Bank paying the Crown a fee of £110,000. Governments were keen to expand the Bank's capacity to lend. At the start of the French Revolutionary Wars in the 1790s, William Pitt the Younger requested advances from the Bank, which were not permitted without the express permission of Parliament. The Bank agreed to legislation to make such advances, on the condition that they were legally capped. Pitt got the amendments through, but omitted the cap.

The Bank Act of 1844 aimed to limit the Bank's operations in various ways, such as capping the fiduciary note issue to £14 million. This meant it could issue notes backed by government securities up to £14 million. Any issue above this was to be covered by gold. It was hoped that this provision would act as a discipline on the Bank and the market. However, in times of financial stress, such as 1847, 1857 and 1866, the government was prepared to exempt the Bank from the ceiling to allow it to lend to support the market. This had public support. In other words, the government was prepared to override the constraint to achieve other policy aims, in line with the expectations of the general public.

As the twentieth century progressed, economic theory developed and it became apparent that monetary policy could influence economic output through the interest rate. With increased suffrage, economic output became a politically important outcome. Therefore, the Bank became more than a tool of government finance. Its operations also needed to be managed politically. In 1925, the Conservative Government returned to the gold standard. Churchill was the Chancellor of the Exchequer, and the move was against his better instincts, but it had the support of the Bank and the business community. To maintain the rate for gold, the Bank kept interest rates high and unemployment stayed above 10 per cent (Wood 2005). The Conservative Government lost the 1929 election.

During this Parliament, the Labour Opposition attempted to nationalise the Bank of England. James Maxton presented a private members' bill in 1926 to this effect that would also have

required the Bank to present full accounts, the appointment of three Commissioners to set a price for the Bank's shares, and for the establishment of a sinking fund and depreciation fund. However, the Bill could not proceed due to contravening parliamentary Standing Orders in relation to affecting private interests. Eventually Labour had its way. Upon coming to government in 1945, it had a general agenda of nationalising much of the British economy, and the Bank of England was a priority. The Bank was nationalised in 1946, although with much less transparency or process than in Maxton's bill. The share price was the market price. This only considered future income streams, without allowing for asset values. Further, the bill made no requirements in relation to accounts or for an annual report. What information was published was generally available elsewhere (Hennessy 1992).

From nationalisation to the 1990s, the Bank was largely implementing government policy (Cairncross 1995).

The Bank of England has been credited as assisting the United Kingdom in becoming the world's superpower in the nineteenth century. The Bank reduced risk for those who lent to the Crown, reducing the interest rate. The Crown could therefore borrow to fund warfare and other enterprises more cheaply than its geopolitical rivals (North and Weingast 1989).

The Great Inflation

The 1960s saw the introduction of wages policies by both sides of politics, none of which were completely successful. The sectors involved tried to beat them, governments tended to introduce them in a crisis, and economic policy was not consistent with them (Dawkins 1980). In 1969, the Labour Government became concerned that union power was getting out of hand. The 1966 Seaman's Strike led to a run on the pound and the courts found that unions' agreements with their employers were not binding, which gave them a free hand in undermining their employers' business (Morgan 1990). The Government released a White Paper titled *In Place of Strife,* which sought to place some legal controls on unions. This was strongly opposed by the Parliamentary Labour Party, including by James Callaghan, a senior minister. The Government used an agreement with the Trades Union Congress (TUC) to drop the White Paper. The TUC promised to monitor strikes and use moral suasion to resolve them. However, no-one expected it to work and many people argued it made the UK ungovernable (Morgan 1990).

Inflation became a headline issue in the election of June 1970. At this point, annual inflation had been around 6 per cent for the past eighteen months. When in opposition, the Tories had not developed a fundamental, thought out approach to the problem. Rather, inflation's

intractable character meant they tended to defer it in policy meetings (Campbell 1993). During the election, it became a useful vote-winner and so the Tories were happy to capitalise on it. This became problematic because even their own advisers recognised that their policies had the effect of increasing inflation (Campbell 1993).

Initially, Heath's economic policies were neo-liberal. Fiscal policy was tight (Westaway 1980), some state enterprises were sold off, and wage regulation was dismantled in favour of collective bargaining (Derbyshire and Derbyshire 1988). However, by mid-1971, annual inflation had climbed to over 10 per cent. This was partly due to a generous Budget in 1971, designed to fight unemployment (Campbell 1993). It was also due to the removal of credit controls, which were designed to remove distortions to competition. The problem was that this allowed loose fiscal policy to fuel property speculation, which increased inflation (Cairncross 1995; Campbell 1993). The Government's suggested wages policy of "n-1" (each year, workers would receive a pay increase 1 per cent lower than the year before) was destroyed by the first miners' strike in early 1972, which not only delivered the miners higher wages, but public support as well (Morgan 1990; Campbell 1993). This political response was partly due to the erosion of miners' wages in real terms, but it nonetheless indicated public support for unions and suggested that wage policies were unlikely to work in a disinflation crisis.

During 1972, the Government introduced the "Dash for Growth," which increased inflationary pressures. The miners' strike convinced Heath to introduce a statutory price and wage policy at the end of 1972. He did try to get the unions to accept a voluntary policy, but they would only do so if prices were regulated, with wages unregulated (Campbell 1993). During 1973, the Government expanded its regulation of prices and wages, and announced a growth target of 5 per cent. This was very popular, but the Government had to give up on it at the end of 1973 due to a falling pound, inflation, and a large balance of payments deficit (Campbell 1993). At this time, the National Union of Miners sought pay increases outside those permitted by Stage 3 of the wage and price policy, using the first oil price shock as leverage. Heath could have used various compromises to allow the miners their increase and to put pressure back on the unions, but instead chose to call an election under the theme "Who controls Britain?" He failed to energise the country over what was a crisis of governance and he lost the election in February 1974 (Campbell 1993).

When Wilson returned as Prime Minister, the UK was embarking on a period when it had the highest inflation of the G7 economies (Hill 1982). His main means of controlling inflation was the "social contract" with the TUC, negotiated in 1973 when Labour was in opposition. Labour

promised not to regulate trade unions and the unions promised wage restraint. However, the social contract did not moderate behaviour on the shop floor, where wages were effectively negotiated. Wage settlements regularly approached 20 per cent, and even the TUC was concerned (Morgan 1990). The two Budgets in 1974 were cautious, partly to not upset the unions (Morgan 1990), but worsening economic performance led the Chancellor of the Exchequer Dennis Healey to introduce an austerity Budget in 1975, with the TUC agreeing on a fixed wage increase of £6 a week for everyone. Inflation dropped and unemployment increased (Morgan 1990; Derbyshire and Derbyshire 1988). Wilson resigned in 1976 due to exhaustion and a loss in his powers of concentration, but the fact that he did not have any new strategies for dealing with inflation has also been cited as a factor (Ziegler 1993).

Callaghan replaced Wilson. Early in his tenure, Treasury suggested a devaluation to boost the economy. Callaghan was not supportive, but when news leaked the pound started to drop and, in order to meet its international commitments, the UK took out a loan from the US. Healy delivered another austerity Budget to calm the markets, but the UK was unable to meet the terms of the US loan (Derbyshire and Derbyshire 1988). The UK then had to borrow from the IMF, which necessitated further spending cuts, divestiture of BP shares, and a commitment for tight control over the money supply (Morgan 1990). At its conference in September 1976, the Labour Party revolted through resolutions calling for nationalising the banks and introducing new welfare benefits. Callaghan responded with his “New Realism” speech where he made the textbook monetarist case that expansionary policy in the long run had only served to increase inflation without output benefits (Derbyshire and Derbyshire 1988).

The Government embarked on a more conservative approach and started to have some success (Derbyshire and Derbyshire 1988). By early 1978, inflation was down to 10 per cent, but excessive pay claims started occurring again. Callaghan announced a new 5 per cent inflation goal without consulting his Cabinet, perhaps influenced by Helmut Schmidt. Cabinet waved it through, thinking that there would be an election soon (Callaghan 1987). However, Callaghan did not call the election until 1979. He believed that the economy would continue to improve and Foot and Healey supported him in this decision, although most observers were surprised (Derbyshire and Derbyshire 1988).

Pressure for higher wages increased throughout 1978. Two senior union leaders (Jack Jones and Hugh Scanlon) retired, reducing the ability of the TUC to moderate wage claims. Cabinet agreed on 5 per cent pay rises in the middle of the year, but the TUC and the Confederation of British Industry would not formally commit to this goal, despite their informal support. In December,

pay demands escalated and Ford capitulated, giving its staff 17 per cent increases. Lorry drivers demanded up to 30 per cent and their union adopted it as an official dispute. Strikes occurred throughout the public sector including local government, with household refuse not being collected, rubbish building up in the streets, and (because gravediggers were on strike) newspaper reports about a build-up of unburied bodies. The so-called Winter of Discontent was very unpopular with the public and support for the unions and the government evaporated. The TUC did agree to moderate union demands, but a political turning point had occurred and the Government's popularity was beyond repair (Callaghan 1987). Callaghan was forced into a May election when the devolution referenda went badly in Scotland and Wales. Scottish Nationalist MPs were frustrated and voted against the Government in a censure motion and the 1979 election brought in Margaret Thatcher.

Margaret Thatcher started her tenure in a difficult position because most of her Cabinet had voted for Ted Heath in 1975 and they were economic "wets." However, the Winter of Discontent worked to her advantage because it gave her the evidence and political support to promote a tough economic policy (Evans 1997). One of her key tactics was to place loyal ministers in key economic portfolios (Derbyshire and Derbyshire 1988; Keegan 1984). During the 1970s, conservatives debated inflation and concluded that it represented a general malaise in society, in addition to its economic consequences, and that extreme measures were warranted in combatting it (Tomlinson 2012). Accordingly, Thatcher went to the election promising to cut inflation and curb union power (Derbyshire and Derbyshire 1988).

Inflation initially surged because the Government increased VAT and carried out an election promise to implement the Clegg Commission's recommendations on public sector pay (Derbyshire and Derbyshire 1988). But policy was consistently anti-inflationary from this point on. In 1980, the Government set money supply targets and introduced the Medium Term Financial Strategy, where the money supply was to be linked to public sector borrowing. The 1981 Budget had steep cuts. This was an important political moment because it was a key test of the Government's credibility and the wets folded (Derbyshire and Derbyshire 1988; Tomlinson 2012). By 1982, inflation was still high at 12 per cent, but it was starting to drop. This was not necessarily related to the money supply; the Government tended to miss its targets because it was dismantling much of the institutional framework. Rather, higher interest rates increased the value of the pound, producing cheaper imports and increasing unemployment, both of which reduced inflation (Tomlinson 2012; Hill 1982).

After implementing such extreme policies, the question was whether Thatcher would lose the next election. But in early 1982, she was not worried because the parties were even in the polls and she had the political momentum: inflation was dropping; productivity increasing; the Opposition was disorganised; and there were still two years to go to the next election (Derbyshire and Derbyshire 1988; Evans 1997). The Falklands War then intervened, giving her Government a further advantage. At the 1983 election, voters did not blame the Government for unemployment and Labour could not convince them that its programs would not reignite inflation, or that it could effectively address unemployment. Michael Foot was a poor leader and the Opposition were in disarray with the Labour Party still split by moderates and extremists despite the right leaving to create the Social Democratic Party (Derbyshire and Derbyshire 1988; Tomlinson 2012; Keegan 1984). Keegan (1984) also suggested that the Government was relentless in promoting its economic vision and managed to fool "enough of the people enough of the time". However, the experience of the 1970s meant that the left had no credible economic policies. The Conservatives' brand of politics suited the situation, supplemented with lessons learnt from the 1970s.

The first postscript to the deflation was the decrease in union power and the reduced risk of wage pressure on inflation. Thatcher's Government had restricted union powers with the Employment Acts of 1980 and 1982. The changes included restricting the definition of lawful picketing to the worker's place of work, and making unions liable for damages for unlawful union action. The grand finale was the miners' strike of 1984-85, where the National Union of Mineworkers was defeated.

The second postscript comprised the later central bank reforms. Margaret Thatcher rejected her Chancellor's proposal in 1988 for making the Bank of England more independent. She believed that inflation was a political problem and institutional change would not boost credibility. Lawson covered the issue in his resignation speech the next year and "The genie was out of the bottle" (Kynaston 2005; Wood 2005).

The next major development was in 1992, when the UK was forced to withdraw from the European Exchange Rate Mechanism. Chancellor Norman Lamont raised CBI with the Prime Minister, John Major, who declined the proposal because CBI was a condition for entering the monetary union under the Maastricht Treaty and Eurosceptics within the Government would see increased CBI as a step towards that goal (King 2001). Instead, the Government announced an inflation target within the range of 1 to 4 per cent and invited the bank to publish a quarterly *Inflation Report* where it detailed its progress towards the target (Wood 2005). In 1994, the

Government announced that it would publish minutes of its monthly monetary policy meetings with the Bank (King 2001).

Gordon Brown, as Shadow Chancellor of the Exchequer, faced a different set of problems. In particular, he needed to address perceptions that Labour was the party of financial instability, given previous crises in 1947, 1967, and 1976. Brown was introduced to CBI in 1992 by Ed Balls, who then worked at the *Financial Times,* but later became a senior Labour politician. Balls argued that CBI would give a Labour government anti-inflationary credibility and allow it to focus on fiscal and microeconomic policies. Balls and Brown followed this up with their own research, meeting central bankers in other countries and examining the legal arrangements that applied. From 1993, Brown flagged reform to the Bank of England, and in the 1997 Labour Manifesto this was expressed in terms of reforming the relationship between the Government and the Bank. Brown found the combination of CBI theory and political benefits to be persuasive (King 2001).

Soon after its win in 1997, the new Labour Government announced that the Bank would set monetary policy independently of the Government through a monetary policy committee. Some commentators saw this as a "shrewd political move" to protect the new government against claims that it would not be able to manage the economy (Wood 2005, 395). Responsibility for debt management and banking supervision would be transferred to other agencies. As part of the reforms, the Governor would be required to write an open letter to the Chancellor if inflation strayed more than 1 per cent from the target and every three months after that. The target was initially 2.5 per cent, but later changed to 2 per cent. For the next decade, conditions were very stable and no letters were issued. However, from 2007 to 2012, the Governor wrote fourteen letters to the Chancellor (Bank of England, 2014; Bank of England website).

Germany

Establishment of the central bank

Germany comprised a collection of States until its unification in 1871, and it was not until then that a central bank was permanently successful. Germany took a much more regulated approach than other countries for several reasons, including a view that full incorporation with limited liability was a privilege to be rationed, and a desire for greater economic integration between the German States. The discussion here focuses on Prussia because the Preußische Bank became the Reichsbank. Further, by 1870 the Prussian central bank had become the

dominant issuing bank, accounting for two thirds of the total banknotes in circulation (Tilly 1994a; Tilly 1994b).

In 1765, Frederick the Great established the Royal Bank of Berlin. Frederick preferred to make it a private joint stock bank, but could not raise the capital, and so it was created as a State bank. It enjoyed privileges, such as charities and courts being legally required to place their deposits with it, and it managed government funds. The Government also permitted it to suspend cash payments during the Napoleonic Wars. The Government reorganised it afterwards when Prussia's loss of some Polish territory meant that the Bank had to write off significant assets.

In 1833, a law was made prohibiting the issue of notes by banks, including the Royal Bank. The aim was to promote State paper money, which had started circulating in the Napoleonic Wars. There were also concerns that issuing banknotes could create monetary instability that would interfere with economic integration (Tilly 1994a). However, there arose a shortage of currency, particularly because gold was scarce. Silver was used instead, but this was heavy and impractical. Notes were sometimes sought at a premium. The Royal Bank was reconstituted in 1846 as the Prussian Bank, partly backed by private capital. It had the power to issue notes, but was subject to limitations. These were a maximum note issue, a one third metal reserve for notes, and an interest rate limit of 6 per cent.

These reforms did not meet the demand for notes and a movement sprang up in support of free banking. Some reforms were made in 1848, but they were marginal and had little effect. Neighbouring States allowed their banks to issue notes, and these started to circulate inside the Prussian border. In the 1850s the bank laws were further liberalised. This included granting the Prussian Bank unlimited rights of note issue. The Government also made the convenient arrangement that half of the State paper money would be commuted to interest-bearing State debt.

The financial crisis of 1857 brought about a shift in policy away from free banking. The 6 per cent limit on interest rates was removed, as was the Prussian Bank's ability to issue unlimited notes. The Bank itself behaved much like a central bank in a crisis, lending freely to reputable firms. Similar events unfolded in the 1866 financial crisis. The creation of the Norddeutscher Bund (a federation of twenty two north German States) in 1867 and the formation of the Reich in 1871 gave the final push to implementing a uniform monetary system.

The new bank issued a common currency based on the gold standard and the French indemnity from the Franco-Prussian War (1870-71) provided a ready source of reserves. However, the Germans were used to handling silver, which being heavy and difficult to transport, provided a practical barrier to currency flows. But once gold started to flow out of Germany in 1873, a scare arose that the gold would run out and Germany would go off gold.

Germany revamped its banking legislation in 1875, following the provisions of the British Bank Act of 1844, but with more regulation. Thirty-three existing banks were nominated as note-issuing banks nation-wide. No further banks could be so denominated, and if they renounced their right to issue notes, then it reverted to the Reichsbank. There was a legal maximum on the fiduciary issue of these banks and the Reichsbank, and a reserve requirement of one third of their total note issue. Banks could issue notes and avoid these requirements, but only if they operated in their home State.

Germany now had a modern central bank and a new currency, the Goldmark. However, its links with the government were very close. The Chancellor was the Chair of the Reichsbank's supreme board. The Reichsbank's directorate, who comprised its day to day managers, were required to follow the Chancellor's instructions (Marsh 1992).

Initially there were few government interventions because adhering to the gold standard ensured a prudent approach. However, once the threat of war became apparent around 1910, the Reichsbank's methods changed. It converted its foreign reserves to bullion. It also assisted with legislative changes to suspend the convertibility of gold and to be able to print more paper money. The original requirement was that one third of paper currency be backed by gold. The new provision was that the Reichsbank could set up loan offices (supplementary branches) that could issue loans. These were backed by collateral and paid out in loan office notes. If the Reichsbank held these notes, they could be counted as gold reserves for the purpose of backing the Goldmark (Marsh 1992).

Germany used the Franco-Prussian war of 1870-71 as the financial template for World War I. It expected that it would be able to be in a position to charge its enemies for the cost of the war. However, the War was much longer and more costly than its predecessor. Further, Germany sought to finance the War through bond issues, rather than taxes, leading to a trebling of prices by 1918. From this point on, the Reichsbank occasionally raised the issue of monetary stability with the government of the day, but it rarely took a stand and rarely raised the issue publicly. The hyperinflations of the 1920s can be traced back to the Reichsbank's wartime practices (Marsh 1992).

Germany's first post-war central bank was the Bank deutsches Lander (BdL), established by the Allied founding law in 1948. It was largely based on the American Federal Reserve; operations were conducted by the Lander Banks and the policy committee mainly comprised the Presidents of the Lander Banks. Only two members of the policy committee came from the BdL, and they were elected by the Lander Bank Presidents. Its decisions were subject to the Allied Banking Commission until the Transformation Law of 1951.

The Transformation Law say other changes for the BdL. For example, it became legally independent with the single goal of price stability (Berger 1997). There was some debate over whether it should be brought under government control, but the Lander did not want to lose the seigniorage profits they received from the bank's operations (and which would normally go to a national government). Therefore, the bank remained independent but the Government received 20 per cent of seigniorage profits. The BdL was required to support government policy "within its duties," that is, subject to its main goal of price stability. The Government could also suspend a BdL decision for eight days, but apart from this, the legal framework was much the same as before (Berger and de Haan 1999).

The German Basic Law required that a new, permanent law be passed for the central bank. After much deliberation, this was addressed in 1957. There were three key issues. The first was the extent of centralisation, given the BdL was very decentralised. The compromise was to partly increase centralisation; there was a single bank with the Government holding its capital and the Lander appointing a representative each to the policy committee. The Government could make some of its own appointments as well, but there was a small majority in favour of the Lander appointees. The second issue was independence; the new bank would remain largely independent, with some ability for the Government to give instructions. Lastly, it was created as a public body, rather than private (Stern 1999). Erhard was the main supporter of the bank's independence within the Government (Marsh 1992; Stern 1999). The bank's role was to safeguard the currency, but it was also expected to follow the Government's general economic direction. No guidance was given as to which had priority, so it was determined by politics.

The Great Inflation

Germany's context was different again. Following World War II, its ruined economy had descended into a barter system. Two major reforms were implemented in June 1948 in the Bizone: the Allies abolished the discredited Reichsmark and replaced it with the Deutsche mark (DM), which was quickly adopted; and Ludwig Erhard, as Economics Director, started to remove price controls, albeit against Allied advice. Around this time, Konrad Adenauer was looking to

form a right wing party that would govern without the socialists (SPD), who at the time supported a planned economy. Such grand coalitions were common at the Lander level. Erhard was just the person Adenauer was looking for because his free market policies were too extreme for the socialists, and if his policies succeeded, then he would be popular, and an asset to whichever party he joined. Events followed just this course. By early 1949, after a difficult transition period, Erhard's reforms were clearly successful. He joined the Christian Democratic Union (CDU) with a minimum of formality, and became Economics Minister in a CDU Government that formed a coalition with the liberals, the FDP. By 1959, the CDU's economic policies were so successful that the SPD largely adopted them at its conference in Bad Godesberg (Nicholls 1994). Adenauer's political machinations delivered long run economic benefits for Germany.

Germany's economic recovery after World War II was based on an undervalued currency, which facilitated growth through exports. This process had run its course by the late 1970s, but until then it allowed Germany to rebuild its economy. The difficulty with this approach was that it put upward pressure on the DM and Germany faced several revaluation crises, especially during the fixed exchange rate period under Bretton-Woods. Indeed, the Bank Deutsches Lander (BdL) and the Bundesbank spent a lot of their time directing monetary policy to managing Germany's external position, instead of domestic price stability, and imported inflation as a result (Holtfrerich 1999). The CDU tended to oppose revaluation because it harmed the interests of its industrial, exporting base. The SPD tended not to have a typical position, and the BdL and Bundesbank tended to support the stability of the currency, although positions changed over time and often depended on which individual filled a key position. Ultimately, the DM was floated from March 1973.

The other context issue is labour relations. German unions are known for being compliant and they have been attributed as contributing to Germany's economic success (Medley 1982). They have an important role in economic negotiations, but the level of conflict they incite is low. For example, in 1967, the Economics Minister scolded the unions for not demanding a large enough pay rise so as to help Germany recover from recession (Medley 1982). Reasons advanced for this are that workers enjoyed the benefits of much of Germany's post-war growth (Kreile 1977) and they have been given some responsibility through codetermination laws, where they have seats on the boards of larger companies (Nicholls 1994).

There were several inflation crises after World War II. A preliminary encounter was in October 1950, when the BdL raised interest rates to allow Germany to meet its external debt

requirements under the European Payments Union, part of the Marshall Plan. Although it had some of the hallmarks of an inflation crisis, including Adenauer summoning the policy committee to meet with him before it made a decision, it did not form an inflation precedent because it focussed on the balance of payments. Further, the BdL was technically under the supervision of the Allied Banking Commission, although by this time the Commission no longer had much influence (Marsh 1992). With some support from Erhard, the BdL increased rates by 2 per cent (Berger 1997).

The first inflation crisis came in 1955-56. The German economy had been booming since the middle of 1954 and the BdL started its tightening cycle in August 1955, raising the discount rate from 3 to 3.5 per cent. The BdL stated that this was a "warning" and also critiqued the Government's fiscal policy. Neumann (1999) argues that the BdL's actions were too little too late and economic policy generally followed a similar pattern. The Government introduced some weak stabilisation packages and the BdL postponed interest rate increases. In November, Adenauer wrote to Vocke, the President of the BdL, and warned him against any incisive changes in policy without consulting the Government. Vocke responded by stating that monetary policy was the preserve of the BdL (Neumann 1999).

By the end of 1955, the BdL had formed an informal coalition with Erhard and Fritz Schaffer, the Finance Minister, to pursue tighter money. Erhard sought lower inflation and Schaffer wanted to preserve funds saved for German rearmament for that purpose, rather than have them diverted to pre-election spending. On 25 January 1956, the BdL narrowly voted against increasing the discount rate, and it then invited Erhard and Schaffer to its next meeting, scheduled for 15 February. However, ice on the rails precluded them travelling to the meeting and it was postponed to the 22nd. But on this day, Erhard was in the UK and Schaffer suggested by phone that the BdL delay the decision until he returned. The meeting finally occurred on 7 March, but by this time Adenauer was involved, and he directed his Ministers to inform the BdL that the Government would exercise its suspensory veto. However, Erhard and Schaffer suggested to the BdL that Schaffer's phone call of 22 February could be regarded as the suspensory veto, which only lasted for eight days, and so the BdL increased rates from 3.5 to 4.5 per cent. The BdL formed a political alliance with two senior ministers and was able to invoke their authority for increasing rates.

In March, Adenauer wrote to Erhard, criticising him for not coordinating policy with the BdL and Schaffer. These comments did not make a great deal of sense, and are probably more a reflection of Adenauer's frustration. In April, unknown to Adenauer, Erhard set up a

Stabilisation Policy Council comprising himself, Vocke and Schaffer. In early May they met and agreed on increasing interest rates, cutting import tariffs, and reducing government spending. They announced the policies and stated that they would regularly meet again in future. On 16 May, Adenauer publicly responded by condemning the policies and stating that the meetings would not take place again (Mierzejewski 2004). On 17 May, Erhard and Schaffer surprised Adenauer by submitting a new stabilisation program to Cabinet, and on the 18th, they joined the meeting of the BdL policy committee where it put rates up by 1 per cent. Erhard and Schaffer were pushing their luck and the crisis reached its climax. On 23 May, Adenauer gave a speech in Cologne, which was attended by the leadership of the BDI, the German industry body. He publicly criticised the BdL, Erhard and Schaffer, stating that rates were too high and that it was hurting industry. The next day, Adenauer and Erhard had an argument in Cabinet and Erhard offered to resign, but Erhard's importance to the government meant that Adenauer did not accept it (Mierzejewski 2004). Public support swung behind the BdL and Adenauer was widely criticised. No government has criticised the German central bank so strongly since then and Adenauer did not intervene in economic matters again (Prittie 1972). The political lesson was clear; the German public supported the central bank's actions to control inflation.

The next key inflation event revolved around the first oil price shock. In the early 1970s, the SPD's increased spending programs led to inflationary pressures. The Stability and Growth Act of 1967, which gave the Government the power to implement short term fiscal measures, did not provide price stability because it did not cover wages. Employers were happy to pay higher wages because they believed they could recoup the higher costs through higher prices. The Bundesbank was limited in the extent to which it could control inflation because it was constrained by supporting fixed exchange rates and increasing interest rates often led to large capital inflows (Kitterer 1999; Medley 1982; von Hagen 1999). The Bundesbank did initiate tight money in 1970, but after this point it lost control of the money supply (von Hagen 1999).

In January 1973, Willy Brandt announced that monetary policy would be the main means of achieving price stability. The Government complemented this in March 1973, when it floated the DM, allowing monetary policy to focus on domestic inflation. In April, the Bundesbank advised the Government that it should tighten policy to restrict inflation, and the Government agreed and stated that the Bundesbank should do everything possible to prevent inflation (von Hagen 1999). Interest rates started increasing and, in May, the Government announced tighter fiscal measures (Nelson 2007). By December, there were signs that the economy was stabilising, but the oil price shock put policy makers in a dilemma in terms of which way economic policy should go. A dual strategy was adopted, with the Government announcing that it would relax

fiscal policy, and the Bundesbank announcing that it would maintain a tight monetary policy (Medley 1982). The aim was that monetary policy would control inflation, while looser fiscal policy would address the supply shock of oil prices. Broadly, this is what eventuated (Gibson 1982; Goodman 1992).

The crisis might have subsided here, except that Germany's normally cooperative unions pushed for high pay increases. Brandt made a televised statement that wage settlements over 10 per cent were not feasible, but it carried little weight, partly because he also stated that he did not want to risk unemployment (Kloten 1985). Public employees went on strike and local governments quickly gave large settlements. Brandt had no choice but to follow with federal employees, which made him appear soft (Marshall 1990). On 11 March 1974, Karl Klasen, head of the Bundesbank, and Helmut Schmidt, as Finance Minister, made a joint statement in a Bundesbank press release that inflation would not reach 10 per cent (Kloten 1985). This gave the Bundesbank similar political protection to that the BdL received from Schaffer and Erhard in 1956.

In fact, annual inflation had reached its peak at this point (Nelson 2007). The Bundesbank stated that it would not accommodate the oil price shock as it was a one-off structural adjustment and business would have to endure a profits squeeze (Medley 1082; Nelson 2007). Real wages increased because inflation was less than what the unions expected; unemployment increased and some workers were put on reduced time (Medley 1982). The recession bottomed out in 1975 and the economy started to recover in 1976 (Kitterer 1999). The impact of the crisis was lessened because Germany had strong demand for its exports; OPEC countries had extra income to spend, and other developed countries ran much more expansionary policies in response to the oil price shock (Goodman 1992).

From March 1973, the Bundesbank had a strong internal focus on the money supply. In late 1974, the Council of Economic Experts proposed that the Bundesbank should announce money growth targets to prevent erroneous expectations destabilising the economy, such as what happened with union wage demands that year (von Hagen 1999; Kloten 1985). Schmidt was a strong supporter of the proposal and it became a central feature of monetary policy thereafter (Goodman 1992).

The final inflation crisis revolved around the second oil price shock. In the late 1970s, both fiscal policy and monetary policy were too loose. In 1977, Germany came under pressure from other countries to become an engine of growth for the world economy. Initially Schmidt refused, but by 1978 he began to support it because domestic unemployment was high and inflation low.

After some poor election results in the summer of 1978, the FDP agreed. The Bundesbank acquiesced because the policy was popular, the bank was legally required to support government policy, and the policy had some internal support within the bank as well. At this time, monetary policy was focussed on supporting the US dollar, which increased the money supply (Goodman 1992).

The Bundesbank began tightening policy in January 1979. Manfred Lahnstein, then the state secretary in the Finance Ministry, attended the meeting and argued against tighter policy, without success. He criticised the Bundesbank in a post-meeting press conference, and was then himself criticised in the media and by Lambsdorff, the FDP's Economics Minister (Goodman 1992). This is similar to Adenauer's criticisms Adenauer in 1956, and it delivered a similar political response of support for the central bank in controlling inflation.

By the middle of 1979, the second oil shock had commenced and placed Germany in a much more difficult position than the first oil shock. An export strategy was not open because many other countries were themselves deflating, reducing demand. Oil exporters had already purchased capital goods during the first shock and did not need to repeat it (Goodman 1992). Fiscal policy was already expansionary, and then in early 1980 the Government introduced a large stimulus package of tax cuts (Goodman 1992). The one positive during this crisis was that the unions had learnt the effects of badly-timed wage increases from 1974 and moderated their demands (Kloten 1985). Throughout 1980, the Bundesbank kept rates high, partly to support the DM in international markets. However, by framing monetary policy around the exchange rate, it weakened the case for keeping rates high to manage inflation (Baltensperger 1999).

The national elections were held later in 1980 and the SPD retained office, partly because of Schmidt's popularity and partly because the conservative parties selected a divisive figure, Franz Josef Strauss, as their candidate. But it was also clear that the governing coalition between the SPD and FDP was not going to last as their policy differences were becoming marked after more than a decade together (Derbyshire 1987). Growth in welfare programs and stimulus packages contributed to an increased deficit and the question of how to control the deficit became the key political issue. Schmidt was sympathetic to controlling the deficit, but he was unable to obtain party support for it because he was not party Chairman and the left of the SPD had become stronger after the 1980 elections (Derbyshire 1987; Bering 1999). As 1981 progressed, the Bundesbank tightened policy with greater focus on inflation. It also argued that the Government should repair the deficit, despite Schmidt's strong private criticisms about monetary policy. Further, the SPD became politically outflanked; the FDP started to echo the

Bundesbank's criticisms of the deficit and President Carstens (CDU) supported the Bundesbank by stating that inflation would be good for no-one (Kennedy 1991). The coalition ended in September 1982 when Economics Minister Lambsdorff submitted an economic policy paper which Schmidt could not tolerate. The political process enabled Kohl to become Chancellor, whereupon he started to repair the deficit. The Bundesbank reciprocated by cutting interest rates, pausing for the March 1983 elections (Goodman 1992).

Analysis

Before embarking on the process tracing, it is worth summarising the development of the three central banks. Certainly, the management of State finance played an important part and financing war prompted innovation. Wartime and other shocks placed existing constraints under pressure, sometimes rendering them meaningless. In the context of central bank independence, the example of the UK provides the interesting case study of a government overriding a constraint, namely the limit on the fiduciary issue, with the consent of the general public. The constraint was only binding if it had public support. The early central banks in the US enforced the useful liquidity constraint of requiring banknotes to be returned to these banks. However, this was unpopular with them and the central banks did not have their charters renewed. This resulted in financial and monetary instability for much of the nineteenth century.

Extending this to current central bank theory, CBI will only work if it too has public support. Current theories do not take public support into account.

It is also worth summarising the three case studies. In the United States, Presidents took on the inflation fighting role for much of the 1970s, but they never did it with much conviction. Although it is easy to be dismissive of their efforts, they did not have much support for it, from either the public or Congress, so their lack of success is unsurprising. The situation changed in the late 1970s when the dollar lost confidence in international markets, leading to the appointment of Paul Volcker at the Fed. He has able to finish the job under Reagan, who gave him the minimum political support necessary, while boosting his own political standing with tax cuts. The fact that it made Volcker’s job harder was for him to manage.

In the United Kingdom, the central bank was only a bit-player and austerity policies in the 1960s and 1970s were driven by attempts to support the overvalued pound in international markets, rather than price stability. Addressing inflation in the UK required the additional step of reducing the militancy of the unions, which Thatcher was happy to do. The main task of breaking

expectations was achieved through tight monetary and fiscal policy. One reason for Thatcher's success was that all other "reasonable" measures had been tried and failed.

In Germany, the central bank built and made use of coalitions for its actions from the start. In its first crisis in 1956, it would not start tightening policy until it could do so in the presence of Adenauer's two senior economics ministers. The victory was complete when Adenauer's criticism of the bank was crushed by the German media and community. In 1973 and 1974, the central bank had the support of the Government. In the early 1980s, it had the support of the public and all parties, except the main government party, the SPD. The coalition's days were numbered, and the bank was able to exploit this, intentionally or otherwise, when increasing rates. Berger and de Haan's point about the bank being a "skilful player" is well made (1999, 36).

In all three cases, inflationary expectations were being brought back under control within 10 years of the collapse of Bretton Woods.

In terms of process tracing, CBI theory can explain much of what occurred. Consistent with Rogoff (1985), inflation was lowest in Germany and highest in the UK, inversely proportional to their levels of CBI. Consistent with Lohmann (1992), the Bundesbank refused to accommodate the first oil shock. This led to a short adjustment period whereupon the economy was much more stable than in other countries. Consistent with Walsh (1995), the UK enjoyed considerable stability between 1997 and 2007 under the enhanced CBI regime, although the bank was less able to maintain stability during the supply shock of the Global Financial Crisis. Its performance was similar to that of the Federal Reserve.

However, the politics theory can explain this and more. In Germany, political support for stable money, and stability in general, has been strong since the hyperinflations and the currency reforms after World War II, and the central bank has utilised this during crises. This can explain why Germany had low inflation and did not accommodate the oil price shock. It can also explain why Helmut Schmidt put out a joint press release with the Bundesbank in early 1974, announcing that inflation would not reach 10 per cent. There was no similar event in the US. Finally, it can also explain why a legally independent bank like the BdL/Bundesbank was so attentive to either building, or taking advantage of, political coalitions and support for its actions.

The politics theory It can also explain the timing of the disinflation of the UK; Thatcher came to power with a mandate to cut inflation and curb union power. The reforms to the Bank of

England in 1997 have also been put down to political forces. It is also a component in explaining the US disinflation; Volcker was appointed to settle the international markets, but he received some support from Reagan and was subject to less pressure from this President than previous Fed chairs were. Similar to Germany in 1956, Carter was himself criticised for criticising the Fed's disinflation in 1980. Burns (1979) and Volcker (1990) both thought that public opinion was important. The politics theory is more powerful than CBI theory because the latter could only explain variation across the three countries, whereas the politics theory can also explain variation over time for each country.

The evidence in the study also suggests two new theories about the Great Inflation. The first is that class division exacerbated inflation problems; inflation was much worse in the UK and Morgan (1990) noted that class division was often a barrier to progress. Class division would encourage loose fiscal policy because governments would have a higher incentive to reward their base before the other side of politics won power and did the same for their constituents. This is related to Bernhard's (1998) paper on the causes of CBI in developed nations in the 1970s and 1980s. He argued that higher class voting was correlated with lower CBI because CBI would interfere with a government's ability to reward the base. Higher class voting meant that rewarding the base would be more important to the political parties. Bernhard's broader theory was that diffusion of power structures would be correlated with higher CBI.

The second theory is the reverse of the CBI theory. Where a developed country had a legally independent central bank, the disinflation would almost certainly be conducted by the central bank. Conversely, where the central bank was not legally independent, the disinflation would be carried out by politicians, perhaps even more thoroughly and completely. The first reason for this is that a politician could adopt the Reagan strategy; let the central bank do the difficult work and be criticised at the time, but then the politician can take credit themselves for reducing inflation afterwards. Another possible reason is that, as demonstrated by Bernhard (1998), high levels of CBI were correlated with strong bicameralism. This was based on his diffusion of power theory; a powerful upper house, that had an opposition or mixed majority, would seek to remove government control of a central bank to prevent the government of the day using the bank for its own purposes. But, simultaneously, strong bicameralism would make it more difficult for a government to disinflate through fiscal policy because such policies are contentious. In other words, strong bicameralism can have a blocking effect, rather than being inherently anti-inflationary. The result would be that legally independent central banks were seen to be conducting the disinflations, adding to the perception that CBI brought about low inflation. But observers may have only been watching the outcome of political forces. It may be

that researchers since 1985 have developed a theory to explain what they saw, rather than what was causing it.

Conclusion

Regression analysis is a powerful tool, but its effective use depends on meeting some assumptions. One important assumption is that all important variables should be included. This paper has suggested that some important variables in the research on CBI have been omitted, particularly in relation to political dynamics.

Researchers like to ensure that they have included all relevant variables in their analysis, but this task is almost limitless. There are dozens of potentially important variables to the researcher, especially in studies across nations. Some of these variables will need to be created from scratch. How should a researcher proceed? This paper suggests that a comparative case study can help. By setting out the detail and timeline of events, patterns can emerge that point a researcher to priority areas. An important caveat is that the researcher should not select on the dependent variable. In this study, therefore, countries were selected that had low, medium and high inflation rates. Selecting only countries that had low inflation rates would have increased the risk of simply confirming CBI theory, rather than challenging it.

Of course, a comparative case study such as this lacks the breadth of a regression analysis with a large number of observations. It would be premature to say that CBI theory has been falsified. However, this paper gives us new ideas about how to test an accepted theory and gives us the potential of developing a stronger one.

5 – Is there an economic vote for inflation?

Abstract

The recent literature on the economic vote has drifted away from inflation. It has instead focussed on voter perceptions of the economy, unemployment and GDP growth.

This paper divides elections in developed countries into four categories, depending on two criteria: whether voters have clarity of responsibility (i.e. no government coalition) and whether the grammar of the country's main language specifically indicates the future tense. Research has indicated that, where a person's language does not do this, they make longer term decisions. This is termed weak future time reference.

The paper finds evidence for an economic vote based on benchmarked inflation (a comparison against the performance of other countries), but only for countries that show clarity of responsibility and weak future time reference. It also suggests that voting studies for developed countries should divide elections into the four categories due to the substantial differences across them for certain variables.

Introduction

The idea that the economy influences voting has produced a substantial literature. Hellwig (2001, 1141) has described the economic vote as "one of the more successful research programs in the field of mass political behaviour." Hellwig (2010) also notes that 75 per cent of voters who believe that the economy has got worse will vote against the government. Politicians corroborate this perception by debating the economy.

The economic vote has not always been seen as a robust feature of elections. In 1991, Paldam accepted that there was an economic vote, but that it was "sadly lacking in stability" (9). Paldam suggested that there was possibly an omitted variable, the need for a reformulation, or "one little trick" that could explain the results. Powell and Whitten (1993) largely addressed this through their concept of clarity of responsibility. If a government included coalition partners for example, then it would make less sense to blame it for a bad economy. Similar factors would be opposition control of a second legislative chamber and a minority government.

The other key advance in the economic vote has been to focus on voter perceptions of the economy, rather than the economy itself. This approach has a number of advantages. Firstly, it helps reduce the chances that the analysis is picking up on a third, unknown confounding variable (Lewis-Beck and Stegmaier 2013). Secondly, it is generally accepted that it delivers a better fit (Lewis-Beck and Stegmaier; Sanders 2000; Tverdova 2007). If the basic mechanism of the economic vote is that the economy affects voter perceptions, which then feeds to the vote (Sanders), then using economic perceptions will reduce measurement error. Thirdly, economic perceptions (unlike the economy) can vary across voters at a single point in time. Therefore, analysis can be undertaken at a single election, meaning that a large number of elections and/or surveys are not required.

These two advances have been criticised, however. The problem with voter perceptions is that it can be influenced by a voter's own party orientation, i.e. it is an endogenous variable. Wlezien et al (1997) re-examined Lewis-Beck's results for Britain, France, Germany and Italy (1988) and found that partisanship did influence economic perceptions. Once endogeneity was taken into account, prospective economic voting almost disappeared. Retrospective economic voting was greatly reduced, although there was still some evidence for it. Nadeau et al (2002) suggested that the effect size of the economic vote is not large and Evans and Andersen (2006) used this concept to argue that the effect of the economic vote is overstated. Certainly, its effect size is no greater than political variables (Lewis-Beck and Stegmaier 2013; Sanders 2003) and individual-level variables strongly drive economic perceptions (Duch et al 2000).

Despite these concerns, individual economic perceptions appear to be a valid way of investigating the economic vote. Niemi et al (1999) and Sanders (2000) argue that voters have enough knowledge of the economy to be able to deliver an economic vote. Paldam and Nannestad (2000) found that election campaigns inform voters, meaning that they are better informed when it counts. Duch and Stevenson (2010b) also confirmed an economic vote at the individual level. So while the economic vote may not be large once methodological concerns are addressed, it is relevant at the survey level.

Anderson (2007) has criticised the literature for being so dependent on clarity of responsibility. He argued that the literature should be broader and that good government can extend beyond accountability to other concepts, such as responsiveness. Certainly, the literature has found a wide variety of clarity of responsibility variables, and other conditioning approaches. For example, Pacek and Radcliff (1995) found that the economic vote was reduced if there was a strong welfare system to cushion economic shocks; Palmer and Whitten (1999) found that unexpected variation in economic variables were strongly correlated with the vote; Anderson (2000) found that a larger governing party and a large number of small opposition parties were good alternative indicators of clarity of responsibility; Hellwig (2001 and 2008) and Duch and Stevenson (2010a) found that increased exposure to world trade reduced clarity of responsibility; Ebeid and Rodden (2006) found that clarity of responsibility decreased in US states that had more primary industry (due to its inherent volatility); and Kayser and Peress (2012) found that the media "pre-benchmarked" national economic growth for voters so that they would compare their nation's growth performance against international standards.

Samuels (2004) took a slightly different approach and focussed on presidential electoral systems, which have separate elections for the legislature and the executive. He inquired whether the occurrence of these elections (apart or together) affected the economic vote. If they were together, he found a large economic vote in the presidential election and a small economic vote in the legislative election. If they were apart, he found a small economic vote for the legislature. Hellwig and Samuels (2007) expanded this analysis to cover presidential, semi-presidential, and parliamentary systems. They confirmed that there is an economic vote in presidential systems for both the presidential and legislative elections when they are held together. In semi-presidential systems, they found an economic vote for the president under unified government, and for the legislature under cohabitation. In parliamentary systems, they found an economic vote in high clarity cases only.

The literature on clarity of responsibility is more concerning, because it has not settled on a particular formulation. There have been a range of conditioning variables put forward, all of which appear plausible, and all of which have some evidence to back them up. One way of viewing the complexity of the literature is to take a broader view, as suggested in Anderson (2007). At an election, voters face a myriad of issues that they can give varying priority. An initial question is whether any issue is so fundamental that it is relevant in all elections, regardless of the institutional arrangements. The research into clarity of responsibility suggests that this is not the case for the economic vote. The literature to date has focussed on some of the political context and institutional arrangements as to whether an economic vote exists. What it has rarely examined is the effect of competing issues (such as a war), and whether voters in different countries have a different appetite for economic outcomes or prefer other policy outcomes more highly. This paper will take a new approach to the preferences idea, in particular to how voters discount the future. The approach is discussed in the hypotheses section below.

Another important aspect of the literature is how to define "the economy". The economic vote literature grew in the 1970s, at the same time as stagflation and the oil price shocks. With governments losing control of inflation, this variable was occasionally included in studies, along with unemployment and economic growth. But the growth of election surveys and the greater number of questions included in them meant that researchers had the opportunity to take a more sophisticated approach and use voter perceptions of the economy as the key variable. Lewis-Beck and Stegmaier (2000) state that the shift to voter perceptions in US studies occurred before researchers developed a view on the appropriate economic variables.

Studies that showed an inflation effect include Norpoth (1984) and Beck (1991) on US presidential popularity, Lafay (1985) on French presidential popularity, Fiorina's book on US national elections in the 1970s (1981), the study by Niemi et al (1999) on the US states, Jordahl's study on Swedish voting intentions (2006), and the multi-country studies of Powell and Whitten (1993), Palmer and Whitten (1999), and Chappell and Veiga (2000). Norpoth cites further papers.

It would be fair to say, however, that voters' knowledge of inflation is less accurate than their knowledge of the real economy. In a survey study during the 1992 US presidential election, Holbrook and Garand (1996) found that 36 per cent of voters in Milwaukee County were accurate within a 2 per cent band in relation to unemployment, but only 24 per cent were similarly accurate about inflation. Krause and Granato (1998) found that only high education groups in the US could accurately predict inflation. Paldam and Nannestad (2000) found that

voters' knowledge of inflation in Denmark was only borderline. At the theoretical level, a reduced focus by voters on inflation is not surprising. Almost everyone benefits from economic growth and/or full employment. The few exceptions would be debt collectors and insolvency firms. But the effects of inflation are felt more unevenly, and partly depend on whether the individual is a saver or borrower. The financial sector is averse to inflation, to the extent that the bank presidents on the Federal Open Markets Committee at the US Federal Reserve are known for consistently voting for tighter monetary policy (Belden 1989). Savers lose out to inflation, especially when it is unexpected and interest rates are slow to adjust. Under these circumstances, borrowers can benefit.

More recent papers rarely include inflation or price stability and focus instead on unemployment and/or growth (for example, Kayser and Peress 2012). Similarly, a recent literature review on the economic vote notes a lack of evidence for an inflation effect and concludes that the relevant economic variables are unemployment and growth (Lewis-Beck and Stegmaier 2013, 376).

The graceful exit of inflation from the economic vote literature raises a puzzle; if inflation was relevant to earlier studies, why isn't it relevant now? There are several possible explanations. One is that there has been a change in voters' preferences; Norpoth (1984) noted that early studies had data issues in that politicians protected employment levels at the cost of higher inflation. Many countries did the reverse in the 1980s. Another possible explanation is that the inflation effect is exponential rather than linear. The goal of this study is to re-examine the elections in developed countries to determine whether there is an economic vote for inflation, and under which conditions.

Hypotheses

In order to examine whether there is an economic vote for inflation, the paper will test three hypotheses. The first relates to clarity of responsibility. This paper takes an approach consistent with Powell and Whitten (1993) which proposed that clarity of responsibility was an example of the way that voters used context in their judgements about a government. So if a government was excluded from implementing its policies by various political or institutional factors, then voters would neither reward it for good economic performance, nor punish it for poor performance. Examples of factors that would reduce clarity of responsibility would be whether opposition legislators were committee chairs, if there was weak party cohesion in voting, and if there was a minority government. Anderson (2000) found that clarity of responsibility was also stronger for a larger governing party and for a smaller number of alternative parties.

Clarity of responsibility will be incorporated into this paper through the following hypothesis:

H1: Clarity of responsibility at an election is a necessary condition for an economic vote.

The second hypothesis relates to future time reference, which is the extent to which a language's grammar differentiates between the present and future tenses. An example of a language with strong future time reference is English, where the future tense is often marked by "will" as in "It will rain tomorrow." The common counter-example is German, which relies more on context to indicate the future. A literal translation of the above sentence from German is "It rains tomorrow." The concept is that a speaker of a language with weak future time reference will discount the future less and make longer term decisions.

The general idea that language structure affects decisions is called "linguistic relativity." It has been the subject of much debate among linguists, but evidence since the 1990s supports it (Wolff and Holmes 2011). Chen (2013) demonstrated that individuals who speak languages with weak future time reference make better health decisions, save more, and are wealthier when they retire. Perez and Tavits (2017) showed that bilingual speakers of Russian and Estonian (languages with strong and weak future time reference respectively) were more likely to support a tax increase to fund long term environmental programs when asked the question in Estonian.

This research can plausibly be extended to whether voters might take inflation into account. Inflation increases instability which compromises people's ability to make long term decisions. This could be of more concern to people whose language treats the present and future similarly. In other words, they have a stronger preference for price stability. This leads to the following hypothesis:

H2: Weak future time reference is a necessary condition for an economic vote on inflation.

The obvious way of operationalising these hypotheses would be to create four categories of elections based on the two sets of divisions. However, to do so implies that it provides a worthwhile gain, or in other words, elections across the categories are sufficiently different. The fact that politics and economics work differently in developed and undeveloped countries is well known (e.g. Gasiorowski 2000). The question here is whether there are further differences across developed countries. The final hypothesis is:

H3: The heterogeneity of elections across the categories (defined by clarity of responsibility and future time reference) is sufficient that each of the four categories is the appropriate level of study, rather than the aggregate.

Data

For its economic aspect, this paper uses economic variables, rather than economic perceptions. This is because voter surveys were not widely undertaken in the 1970s, the period that had the highest inflation. The dependent variable is the vote share of the main incumbent government party. This is the data used in Kayser and Peress (2012) and is sourced from Professor Kayser's website. An important independent variable is the vote share of the same party in the previous election, also used in Kayser and Peress. The data is for twenty two countries, in most cases from the late 1940s to 2009.[1]

Data on unemployment is sourced from the *World Economic Outlook,* published by the International Monetary Fund. This data commences in 1980. Data from 1955 for sixteen countries is sourced from Layard et al (1991). Data for real per capita economic growth was obtained from the Penn World Tables (Feenstra et al, 2015). Inflation data was sourced from *International Financial Statistics,* published by the International Monetary Fund. Inflation was not measured as the percentage change in the consumer price index over the previous year. Rather, it was measured as the natural log of the ratio between the consumer price index (CPI) of the current year and the previous year. Similarly to Kayser and Peress (2012), I used the weighted average of the election year's economic variable and the previous year's variable, depending on when the election occurred. Adjustments were made when there was less than a year between elections.

Kayser and Peress (2012) used a benchmarking technique. In that paper, the authors argued that voters use other economies as a reference point for their own economy. For example, if a country's growth is 1 per cent (which might be considered low), but other countries have -1 per cent growth, then comparatively that country is doing well with 2 per cent in benchmarked growth. This was the key innovation in Kayser and Peress and they found a robust positive

[1] The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece*, Iceland*, Ireland, Israel*, Italy, Japan, Luxembourg*, Netherlands, New Zealand, Norway, Portugal*, Spain*, Sweden, and the United Kingdom. An asterisk indicates that observations for the country commence around 1980 due to data limitations. Two countries were omitted: Switzerland because its power-sharing arrangements are not consistent with the idea of a government vote share; and the United States because it drove the world economy, which is inconsistent with the benchmarking idea used in this paper. However, both countries were included for benchmarking the economic variables.

correlation between benchmarked growth and the incumbent party's vote across the whole dataset.

Kayser and Peress (2012) used three benchmarks: the median of all other countries in the study; principal components decomposition (weighting by integration into the world economy and integration into the regional economy); and the weighted average performance of a country's trade partners. Although principal components decomposition gave the best model fit and trade weighting the worst, the results were similar across the three benchmarks, especially when other variables were added. A median benchmark was developed in this dataset for inflation.

This paper takes a different approach to the real economy. Generally, studies of the economic vote treat unemployment and growth separately. However, they are two aspects of the same thing. Unemployment is a measure at a point in time (often averaged over a period) and growth is a measure of the change in Gross Domestic Product over a period. A simple analogy is to a public company. This entity has a balance sheet that states its financial position at a point in time, typically the end of the accounting period. It also has an income statement that shows how it performed over the accounting period. In assessing whether to invest in the company, analysts look at both.

This paper argues that voters undertake a similar analysis for their domestic economy, taking into account both unemployment and growth. An economic variable was developed called "real economy". It was calculated by subtracting the unemployment rate from the growth rate. These two variables had similar standard deviations, so this approach was acceptable. This new variable had more explanatory power than benchmarked growth in regressions across a range of specifications for the full dataset (c.f. Kayser and Peress 2012) and was used instead. The dataset had 307 observations from 1956 to 2009.

A number of secondary (non-economic) variables are also used. A dummy variable for the incumbent was created and had a value of one where the leader of the government party had firstly been the leader at the previous election and secondly had been in power continuously since then. The expectation is that this would indicate a "healthy" government. A dummy variable was also created for election timing and had a value of one where an election occurred six months or more ahead of schedule. If a party were governing in its own right, this would be seen as an opportunistic act designed to maximise the vote. If a party were in coalition, it would more likely indicate a breakdown in the coalition and something imposed externally on the

government, which would indicate a vote risk. Both of these concepts were used in Hellwig (2010).

Another non-economic variable was the time interval, in quarters, between elections. A common maxim in elections is that the longer a government has been in power, the less votes it will receive. This variable was correlated with early elections with an r statistic of -0.60. Chappell and Veiga (2000) used a time interval variable in their cross-country study and it was consistently statistically significant. Vote erosion has been found in other studies (e.g. Norpoth 1984).

New democracies can be volatile while parties and voters find their feet. An age of democracy variable was created based on data from Boix et al (2013), who have coded numerous countries on a 0/1 basis for whether they have a functional democracy. The age of democracy for each country was calculated for each election year and then transformed by the natural logarithm. A similar concept was used in Hellwig (2010). Finally, an annual time trend was created.

Categories linked to the hypotheses were also created. Clarity of responsibility was based on whether a government was in coalition. Kayser and Peress (2012) provided coalition information in their dataset. The main modification to their data was that, if coalition parties had always been in coalition, and not raised the possibility that they might break their coalition, then they were treated as a single party. This meant that the two Australian conservative parties, the Nationals (country) and Liberals (business) were treated as a single party. Clarity of responsibility was determined to apply if the coalition size was one.

Strong or weak future time reference was determined from a country's official languages, and then matching this against language data in Chen (2013). This created an issue for Belgium, which has a mix of Dutch speakers (weak future time reference) and French speakers (strong future time reference). This country was coded as weak future time reference because a greater proportion of Belgians have Dutch as their first language, compared with French. Extra regressions dropping Belgium were run to test the results. This would be expected to make the results stronger, which it did in some cases. This is explained further in the results section.

Applying these two factor variables produced a four-way classification for each election (clear or unclear, and strong or weak). A country's future time reference remained fixed, but its clarity of responsibility could change if its coalition status changed. The twenty two countries are organised into their most common categories in Table 1 on the next page.

Table 1: Countries listed by the majority of their election categories, 1956-2009, N=307

Clear strong (104)	*Clear weak (48)*
Australia (20/20)	Japan (12/18)
Canada (18/18)	Norway (8/14)
Greece (10/10)	Sweden (14/17)
Ireland (8/15)	
New Zealand (13/18)	
Portugal (6/9)	
Spain (9/9)	
United Kingdom (14/14)	
Unclear strong (43)	*Unclear weak (112)*
France (10/12)	Austria (12/17)
Israel (8/8)	Belgium (16/16)
Italy (10/14)	Denmark (13/20)
	Finland (12/14)
	Germany (15/15)
	Iceland (7/7)
	Luxembourg (6/6)
	Netherlands (16/16)

Note: The figures after each country show how many elections are in the category compared with total elections for that country. If not all elections are in that category (for example New Zealand and Austria), then the remainder will be in the other category with the same future time reference. So New Zealand had five elections in the unclear strong category and Austria had five in the clear weak category.

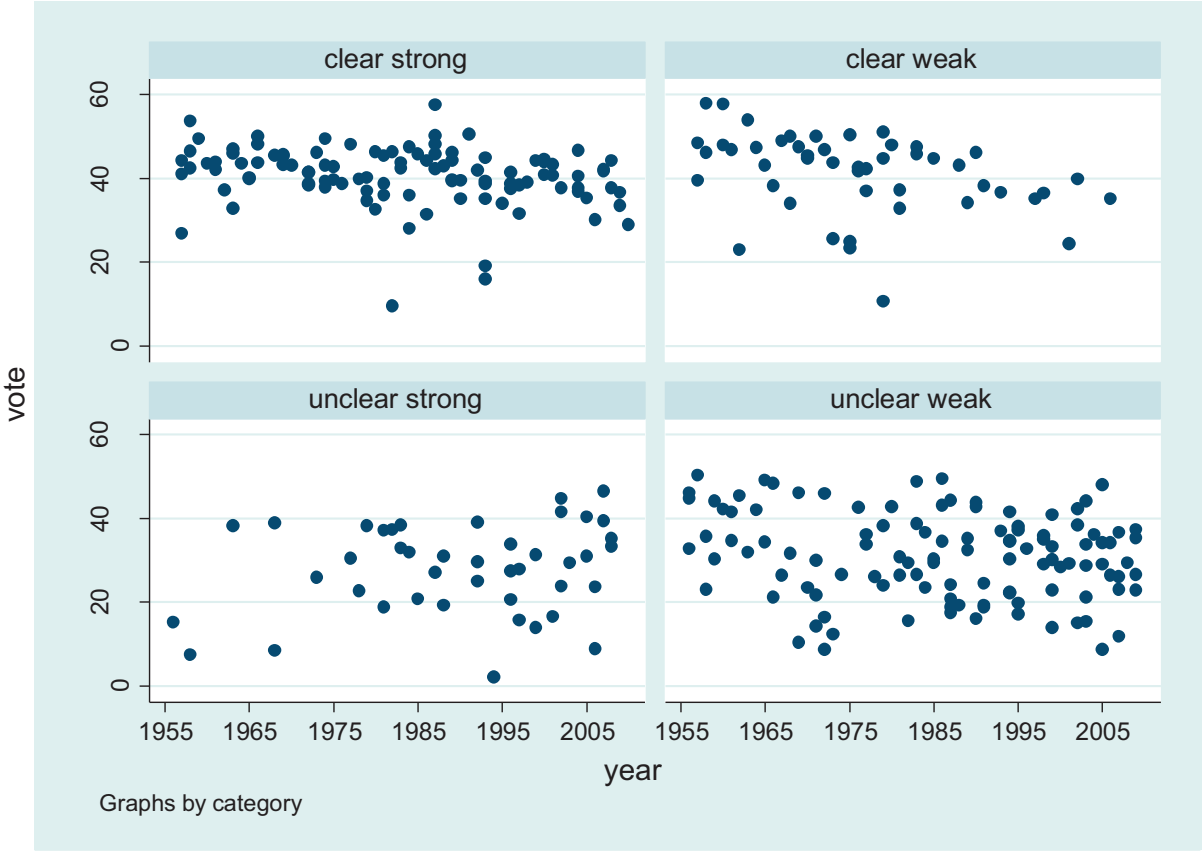
In total numbers, the table indicates that languages with strong future time reference may be consistent with single party government, and that languages with weak future time reference may be consistent with coalition government. This could be an area for future research.

The table produces some expected groupings, but also some unusual ones. For example, New Zealand, Canada and the United Kingdom are together, but then they are also grouped with Greece, Portugal and Spain. Germany and Austria had lower levels of inflation in the 1970s, perhaps from their hyperinflation experiences, but they have minimal levels of clarity of responsibility and so no economic vote is expected for them. In the clear weak category, an inflation vote would be expected for Japan with its high levels of saving, but less so for Norway and Sweden.

Another way of representing the categories is graphically. Figure 1 shows the vote share of the lead government party across the different categories for the dataset. In the two clear

categories, the vote tends to sit at or above 40 per cent, whereas in the unclear categories, it is more variable, which is due to coalition government. A greater number of elections in the dataset each year would be expected from 1980 due to the greater availability of unemployment data. Perhaps surprisingly, there is a lower incidence of clear weak elections later in the dataset, which indicates a greater fragmentation of the vote in some countries.

Figure 1: Vote share of the government party across categories, twenty two developed countries, 1956-2009, N=307



Summary statistics are included in the Appendix, for both the complete dataset and for each of the four categories. One feature of the data is that the average vote share for the government party at an election is always a little lower than at the previous election. This is consistent with the idea of vote erosion and the coefficient on the previous vote would be expected to be a little under one. Another feature of the data is that the average trend value for the clear weak category is lower than the other categories. As Figure 1 indicated, later governments in countries with weak future time reference have been more likely to involve coalitions as time progressed. Finally, countries with weak future time reference, with or without clarity of responsibility, have lower average benchmarked inflation. According to the theories discussed in this paper, this would suggest that lower inflation in these countries is a result of language

and its effect on how people think, rather than the clarity of responsibility or how consensual their politics may be.

Results

I test hypothesis three first. A range of least squares regressions were conducted on the vote share of the main government party. The approach was to conduct two regressions for each set of variables. The first regression excluded the categories (on the assumption that the categories had no effect) and the second would include the categories and their cross-multiples with the variables (on the assumption that they did). A likelihood ratio test was then conducted to determine whether the extra variables, as a group, were statistically significant. The results are in Table 2 on the next page.

The bottom row shows the p-value of the likelihood ratio test of the null hypothesis that there is no difference in the regressions across the four categories. Five of the seven specifications rejected the null hypothesis at the 5 per cent level of significance. One more specification rejected the null hypothesis at the 10 per cent level. Insights into these results can be found in the table under the "different regressors" heading. This part of the table returns results on whether any of the cross-products were statistically different from the base case (the clear strong category). It should be noted that dropping Belgium made little difference to the results.

Column 1 reports results on the simplest specification, for which the independent variables were the previous vote, cross-products against the category factor variable, and the category factor variable itself. In this case, both the unclear strong and unclear weak dummy variables within the category factor variable were different from the clear strong dummy variable at the 5 per cent level (making one different regressor). Then the unclear weak cross-product with the previous vote was statistically different from the clear strong cross-product with the previous vote at the 5 per cent level as well (making the second different regressor). These results reflect the fact that, if a party is governing in its own right, its vote will sit around 40 to 50 per cent and the formula underlying this will have a larger constant and a smaller coefficient for the previous vote. If a party is governing in coalition it will have a lower, more variable vote (for example 25 to 45 per cent) and the formula underlying this will have a small constant and a larger coefficient for the previous vote.

Table 2: Least squares regressions on the vote share of the government party to test the differences across categories, twenty two developed countries, 1956-2009, N=307

	1	**2**	**3**	**4**	**5**	**6**	**7**
Previous vote	✓	✓	✓	✓	✓	✓	✓
Real economy		✓	✓	✓	✓	✓	✓
Inflation (ln)		✓	✓	✓			
Benchmarked inflation (ln)					✓	✓	✓
Secondary variables			✓	✓		✓	✓
Fixed (country) effects				✓			✓
Initial model							
Degrees of freedom	1	3	8	29	3	8	29
Log-likelihood	-959.1	-949.7	-939.0	-930.3	-949.7	-938.9	-930.3
Model with categories							
Degrees of freedom	7	15	35	55	15	35	55
Log-likelihood	-951.1	-941.7	-915.1	-898.9	-939.6	-911.0	-894.4
"Different" regressors	2/2	2/4	2/9	2/9	3/4	3/9	3/9
Category	✓	✓			✓		
Previous vote	✓	✓			✓		
Real economy				✓			✓
Benchmarked inflation (ln)					✓	✓	✓
Early election			✓			✓	
Time between elections			✓	✓		✓	✓
P-value of LR test	0.014	0.19	0.002	7e-5	0.062	9e-4	4e-6

Note: Secondary variables are a time trend, the natural log of the age of democracy, an early election, a continuous incumbent leader, and the time interval between elections.

Table 3: Regressions on the vote of the government party, dataset split by category, 22 developed countries, 1956-2009

Variables	Clear strong			Clear weak		Unclear strong		Unclear weak	
Previous vote	0.61**	0.032	0.076	0.77**	0.77**	0.84**	0.84**	0.83**	0.83**
	(0.17)	(0.13)	(0.13)	(0.092)	(0.088)	(0.11)	(0.11)	(0.07)	(0.072)
*real economy		-0.040*	-0.042						
		(0.017)	(0.019)						
Real economy	0.38*	2.11*	2.18*	-0.0028	0.12	0.082	0.081	0.055	0.053
	(0.17)	(0.80)	(0.89)	(0.24)	(0.21)	(0.26)	(0.26)	(0.098)	(0.098)
*Italy		-4.11**							
		(0.71)							
Inflation (ln)	1.25	3.58		-9.78		3.02		0.023	
	(11.7)	(11.5)		(17.6)		(4.57)		(4.45)	
Benchmarked inflation (ln)			30.6		-74.7**		2.61		-6.70
			(30.4)		(15.2)		(4.78)		(8.13)
Early election	0.60	1.12	1.11	-2.93	-2.89	-6.59*	-6.55*	3.56	3.73*
	(1.15)	(1.78)	(1.80)	(2.17)	(1.79)	(2.76)	(2.77)	(1.62)	(1.59)
Continuous incumbent leader	1.46	0.44	0.49	2.68*	3.30**	0.17	0.20	0.34	0.30
	(1.50)	(1.30)	(1.31)	(1.24)	(1.14)	(2.09)	(2.09)	(0.92)	(0.91)
*Spain		22.1**	20.2**						
		(2.57)	(2.12)						
Age of democracy (ln)	-1.67	7.37*	9.89**	-2.64	-1.78	1.10	1.05	-4.35	-4.13
	(1.59)	(2.97)	(2.87)	(1.99)	(1.79)	(2.10)	(2.11)	(2.44)	(2.49)
Trend	0.022	-0.17*	-0.19*	-0.062	-0.086	0.010	0.0058	-0.0057	-0.011
	(0.054)	(0.063)	(0.065)	(0.049)	(0.050)	(0.090)	(0.089)	(0.045)	(0.045)
Time between elections	-0.41**	-0.19	-0.21*	-0.34	-0.35	-0.21	-0.21	0.15	0.17
	(0.14)	(0.16)	(0.14)	(0.27)	(0.18)	(0.29)	(0.29)	(0.12)	(0.11)
Italy		-7.93							
		(5.82)							
Spain		-9.47	-4.56						
		(9.36)	(9.67)						
Fixed effects		✓	✓					✓	✓
Constant	26.0*	13.0	1.54	24.3	20.4**	3.03	3.40	19.2	18.1
	(12.1)	(15.5)	(14.6)	(12.4)	(10.1)	(11.5)	(11.5)	(9.65)	(9.95)
N	104	104	104	48	48	43	43	112	112
Standard errors	Robust	Robust	Robust	Robust	Robust	Standard	Standard	Robust	Robust
R-square (within)	0.36	0.49	0.46	0.86	0.89	0.74	0.74	0.73	0.73

Notes: * indicates statistically significant at the 5 per cent level. ** indicates significant at 1 per cent. Standard errors in brackets. Diagnostics tests comprised tests for linearity (RESET) and normally distributed residuals.

Columns 2 and 5 show the results for the initial equation after the economic variables have been added (for the real economy and inflation, in levels in column 2 and then benchmarked in column 5) have been added. Under these specifications, there is little variation across the categories in the coefficients for the real economy, and variation only exists for benchmarked inflation. The variation across categories for the economic variables is insufficient to reject the null hypothesis at the 5 per cent level for these specifications.

However, the regressions substantially change once the secondary variables are added in columns 3 and 6. The dummies for the category and the variable for the previous vote no longer vary substantially across categories. This indicates that the variation they were demonstrating is due to underlying factors picked up by the secondary variables, namely early elections and the time period between elections. For early elections, the coefficient for the unclear strong cross-product was much lower than that for the reference case (clear strong). This is consistent with expectations. For the time between elections, the coefficient for the unclear weak cross-product was much higher than that for the reference case. A higher coefficient means that governments under in this category tend to lose less of their vote over time. In other words, their vote is more stable. Voters with weak future time reference would be expected to prefer long term stability, which is consistent with these results.

Adding country dummies for fixed effects increases the differences across the categories. This includes producing a high coefficient for the real economy in the clear strong category, compared with the other categories. Finally, the benchmarked inflation coefficient for the clear weak category is much lower than in the other categories, which is consistent with the theories in this paper. This result appears robust because it occurs in all three specifications with that variable. The other robust result is the variation in the coefficient for the time period between elections.

There are two main lessons to draw from the analysis. Firstly, the four categories generally behave as different groups and there is evidence supporting hypothesis three. The second lesson is that this partly depends on the variables included in a regression. Not all variables behave differently according to the category of the election. Including more variables that behave differently increases the chances of different behaviour overall. Variables that tend to be sensitive to the category of the election include previous vote share, the real economy, benchmarked inflation, an early election, and the time between elections. Including fixed effects also makes it more likely that the categories will behave differently.

Table 3 above shows the results for least squares regressions for each of the four categories of elections. The approach was to conduct two regressions for each category; one with the log of inflation, and a second with benchmarked inflation instead. Diagnostic tests were conducted for normality of residuals, functional form (the RESET test), heteroscedasticity, and whether fixed effects were required. The null hypothesis of no fixed effects was rejected in the clear strong category. In the other three categories the null hypothesis was not rejected, but fixed effects were added in the unclear weak category to improve the distribution of the residuals. The clear strong category failed the RESET test and various country cross-products were added to address this. Finally, robust standard errors were used when heteroscedasticity was indicated.

To demonstrate the effect of the diagnostic additions to the clear strong regressions, a "vanilla" regression without cross products or fixed effects is included as the first column of results. This initial regression shows some expected results, such as a positive, significant coefficient for the real economy and a coefficient for the previous vote lower than that for the other categories in the next two columns. The negative coefficient for the cross-product between the real economy and the previous vote indicates that the economic vote in this category tapers off if the government had a large win at the previous election. The negative coefficient for the cross-product between Italy and the real economy indicates that, in the four elections where there was clarity of responsibility, the real economy played no role. The large, positive coefficient for the cross-product between Spain and an incumbent leader suggests that Spanish elections largely turn on whether the leader of the winning party in the previous election is running again. If Italy and Spain are removed from the clear strong regression, the results are close to the vanilla regression, but with appropriate diagnostics. The main difference is that the coefficients for the previous vote and constant are 0.46 and 41 respectively.

Broadly, hypothesis one is quickly dealt with. This stated that an economic vote only applies if there is clarity of responsibility. None of the economic variables are statistically significant in either the unclear strong or unclear weak regressions, whereas some of them are significant in the clear strong and clear weak regressions. The hypothesis is confirmed.

There is also evidence for hypothesis two, which stated that a vote on inflation would occur in elections with weak future time reference. Combined with hypothesis one, this indicated that an economic vote would only occur in elections in the clear weak category. This has occurred, with the coefficient for benchmarked inflation being statistically significant and having the expected negative sign.

Effect sizes were investigated through multiplying the variables' coefficients and standard errors. For three of the categories, the government party's vote in the previous election has the largest effect size. The exception is the clear strong category. In this case, the cross products involving Italy and the real economy have the largest effect size.

Dropping Belgium had a noticeable effect for the unclear weak category. The coefficient for the previous vote increased; for the regression with benchmarked inflation, it changed from 0.83 to 0.90. The coefficient for an early election increased from approximately 3.6 to 4.5 for the regression with inflation, and from 3.7 to 4.8 for the regression with benchmarked inflation. In this latter regression, the distribution of residuals was sufficiently improved that country dummies were not required. This analysis is consistent with the theory that a particular combination of clarity of responsibility and future time reference produces a distinct type of political behaviour.

The prediction for early elections was that its coefficient would be positive for elections with clarity of responsibility because the party in power would be governing in its own right and would not have to manage coalition partners in setting the election date. Therefore, the government could set the date to maximise its vote. The reverse was expected in elections without clarity of responsibility. Although the coefficient for an early election is statistically significant for two of the categories, it has the expected sign in only one of them, unclear strong. The variable's coefficient is positive and statistically significant for unclear weak.

The theory about early elections proposed here needs to be revised and the results suggest a two-step process. Where a government has clarity of responsibility, it can set the election date to maximise its vote, but, perhaps informed by the opposition, the electorate perceives this tactic and there is no reliable benefit or cost. Where a government does not have clarity of responsibility, then an early election date is not perceived as a cynical tactic, but rather an indication about how the parties in government have managed their coalition. Voters in elections with weak future time reference value the future more, so they may prefer governments to run their full course and for elections to occur at the scheduled time. This may not apply in elections with strong future time reference. Rather, voters may expect the lead government party to demonstrate strength and leadership in managing the coalition. So if there is no clarity of responsibility and an early election occurs, the government party's vote would increase (decrease) if the electorate's main language had weak (strong) future time reference. Table 4 elaborates.

Table 4: Theorised impact of an early election across the four categories

Clear strong	*Clear weak*
No effect Government picks an election date for maximum positive effect but voters perceive the tactic.	No effect Government picks an election date for maximum positive effect but voters perceive the tactic.
Unclear strong	*Unclear weak*
Negative An election date is forced on the government externally which does not suit it and it may be perceived as losing control. Voters do not mind the earlier date.	Positive Voters have a preference against the earlier date. However, they do not blame the government for it because it has most likely been externally imposed, for example by coalition partners, who instead bear the cost.

Finally, the coefficient for the vote share at the previous election deserves comment. It is lowest for the clear strong category but highest in the unclear categories. This suggests that the coefficient will be higher depending on two factors: if there is no clarity of responsibility; and if there is weak future time reference. If there is no clarity of responsibility, then the electorate has less useful data to judge the government and inertia is more likely. If there is weak future time reference, then the electorate is more likely to take the long view and less likely to impose quick judgements on the government.

These two proposed theories match the coefficients in Table 3 and represent areas for further research.

Conclusions

This paper has used a four-category system to analyse the economic vote with a focus on inflation. The categories of elections were generated by grouping elections according to whether there was clarity of responsibility and whether a country had strong or weak future time reference. The divisions represent whether it makes sense to hold a government accountable for its performance, and what sort of economic performance voters prefer.

The analysis is consistent with an economic vote, but also that a great deal of nuance and variation is involved. For example, there is substantial variation in elections across the

categories, even though, as developed countries with reasonably strong democratic processes, they might be regarded as homogenous. Research has shown that politics and economics in developed and undeveloped countries are very different, but this study suggests that the heterogeneity is deeper.

The elections most likely to show an inflation vote are those with clarity of responsibility and weak future time reference. This is the second smallest category in the study and in a sense also endangered; only three out of twenty two countries have the majority of their elections in this group and these elections are less common in the later part of the dataset. The variables that are statistically significant within this category are the previous vote, benchmarked inflation, and a continuous incumbent leader. The clear strong category, with clarity of responsibility but a different perspective of the future, would also be expected to have an economic vote, but not necessarily in relation to inflation. Accordingly, the variables that are statistically significant here are the previous vote, the real economy, and the time between elections. The two categories without clarity of responsibility did not demonstrate an economic vote, as expected. The statistically significant variables in these cases were the previous vote and an early election.

The study has produced four areas for further research. The first is the correlations in relation to early elections. The results suggest a theory based on clarity of responsibility and future time reference where governments do not gain where there is clarity of responsibility due to an early election date being perceived as a tactic. In the unclear weak category, the theory is that voters prefer that governments go full term and they punish minor parties in the coalition and the opposition for not supporting this. For the unclear strong category, voters do not prefer a full term and perceive poor performance by the government in not maintaining its coalition. Case studies to flesh out these dynamics are one possible way forward.

The second research possibility relates to the extent to which the government party's vote at the previous election transfers to the current election. In other words, whether the coefficient for the previous vote variable is close to 1. The results in this study suggest that this is more likely without clarity of responsibility and with weak future time reference. Where neither of these apply, in a clear strong election, the government's vote may in fact depend on economic performance and the political context, rather than precedent.

The third area for possible research is to examine whether a real economy variable, that combines both unemployment and growth, is superior to these variables singly, or benchmarked versions of them. The contentions in this paper are that both unemployment and growth matter, a real economy variable is not a complex concept, and that voters have

sufficient information available to make the necessary judgements. Growth data is widely available through the Penn World Table. The main restriction on developing such a variable is unemployment data.

The final area covers the correlation in the paper between weak future time reference and coalition government. Such a correlation has a theoretical basis. Coalitions share the spoils of government, whereas single party government is along the lines of "winner takes all." Therefore, coalitions reduce risk and increase stability, consistent with the preferences of speakers of languages with weak future time reference. Similarly, Cusack et al (2007) argue that higher degrees of economic co-ordination increased the likelihood of a country adopting proportional representation. They generate an economic co-ordination index for developed countries at around 1900, which has a correlation statistic with weak future time reference of 0.83. It would be worth investigating whether future time reference influenced a country's electoral system.

An attractive feature of the economic vote is that it supports democratic accountability. If a government cannot deliver good economic outcomes, then it is fitting for the electorate to replace them with someone else who might deliver instead. This study has shown that about half of elections in developed countries (those with clarity of responsibility) most often meet this ideal in relation to output, and sometimes in relation to prices. In the other half of elections, the main differentiation appears to be whether there was an early election, which this paper interprets as being a proxy for how the governing parties have managed their coalition. A more open-ended challenge is to determine if there are other mechanisms by which developed countries secure economic outcomes, be it the demands of elites, the ongoing process of debate, a longer term perspective, or simply an acceptance of the free market and the institutions that support it.

Appendix

Table A1: Summary statistics for the regressions in Table 3

Variables	**Overall**		**Clear strong**		**Clear weak**		**Unclear strong**		**Unclear weak**	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Vote	35.40	10.68	40.56	6.99	41.25	9.55	27.96	10.73	30.96	10.29
Previous vote	37.62	10.37	43.89	4.95	43.02	9.93	31.26	10.09	31.93	9.78
*real economy			-193.09	226.92						
Real economy	-2.92	4.98	-4.55	5.25	0.99	3.74	-164.99	155.64	-2.17	4.14
*Italy			-0.14	0.75						
Inflation (ln)	0.058	0.096	0.06	0.048	0.055	0.035	0.11	0.22	0.038	0.051
Benchmarked inflation (ln)	0.012	0.087	0.012	0.03	0	0.024	0.067	0.21	0	0.044
Early election	0.40	0.49	0.46	0.5	0.4	0.49	0.47	0.5	0.32	0.47
Continuous incumbent leader	0.59	0.49	0.71	0.46	0.46	0.5	0.37	0.49	0.63	0.49
*Spain	NA		0.077	0.27	NA		NA		NA	
Age of democracy (ln)	4.16	0.60	4.32	0.59	3.89	0.62	4.19	0.55	4.12	0.58
Trend	29.04	15.33	28.21	15.1	21	12.76	35.09	14.06	30.93	15.68
Time between elections	13.57	4.03	12.99	4.4	12.57	3.64	14.43	4.55	14.21	3.46
Italy			0.038	0.19						
Spain			0.087	0.28						

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6 – Inflation and central banks during the Great Inflation in the OECD

Abstract

The classic example of central bank independence (CBI) delivering good policy is in developed countries during the oil price shocks of the 1970s.

This study examines the robustness of correlations between inflation and CBI for twenty one OECD countries for the 1970s and 1980s. It finds that the normally strong correlations for legal CBI break down when political and cultural variables correlated with CBI are included, either directly or as instrumental variables.

Central banks in developed countries during this period are better viewed as reflecting their politics and culture, rather than a commitment device. Research into whether institutions improve policy performance should also include an understanding of the forces that created the institutions initially.

Introduction

The concept of central bank independence was developed through the experience of the Great Inflation, when developed countries experienced inflation outbreaks in the 1970s and 1980s. There were a range of causes, including oil price shocks in the mid and late 1970s, a priority on securing full employment compared with inflation, and a greater demand for government benefits and services. In the United States at least, there was also an under-estimation of the level of unemployment which was consistent with price stability (the non-accelerating inflation rate of unemployment, or NAIRU - Orphanides 2003).

During this time, politicians in many countries seemed unable to bring inflation under control and were slow to develop a rhetoric that would allow policy makers to restore stability. In this context, economists developed theories about commitment and the challenges that politicians faced in promoting policies that had short run costs but long term benefits. They were also influenced by Friedman's ideas about expectations (1968b). It became known as the time inconsistency literature.

Kydland and Prescott (1977) argued that public policy, which involved discretion, could not be optimal in the long run because the expectations of agents depend on future policy. If future policy is discretionary, then there is no certainty about expectations and it is not possible to make optimal policy decisions now. They suggested that rules-based policy would address this problem. Barro and Gordon (1983a) built on this with a simple economic model and made the assumption that politicians would aim to bring inflation below the NAIRU. The long run result would be inflation (above the theoretical optimal level of zero) and unemployment at the NAIRU level.

Rogoff (1985) used a microfoundations model of an economy to argue that society could avoid most of these costs through appointing a conservative central banker to handle monetary policy. This would not be a perfect solution, but it was the most practicable one. It also included the testable conclusion that inflation would be lower when monetary policy was conducted without the oversight of politicians. Lohmann (1992) generalised this result by applying a cost to politicians when they override a central bank when responding to an economic shock, with Rogoff's paper being the unique case of an infinite cost. The paper predicts varying outcomes, depending on the size of the cost, the relative conservativeness of the central bank, and the size of the shock.

These theoretical papers prompted a range of empirical papers that tested the correlations between inflation and the independence of central banks (CBI) from politicians. The concept of independence was usually operationalised in the legal appointment and dismissal processes of central bank governors and senior staff, whether the government and central bank had to operate at arm's length on financial matters, the extent to which the government could override the bank, and the priority that the bank placed on price stability. For less developed countries, a *de facto* measure of turnover of central bank governors was used.

The empirical papers generally found clear correlations, initially with simple bivariate regressions (for example Grilli et al 1991; Cukierman et al 1992; and Alesina and Summers 1993), but becoming more complex and including more independent variables (for example Franzese 1999; Brumm 2000; Keefer and Stasavage 2003; Way 2004).

There were some criticisms of the research program. Posen (1995) argued that CBI merely reflected the interests of each country's financial sector. Hayo (1998) suggested that it reflected social attitudes to inflation, as did Forder (1996, 1998). Later, Iversen and Soskice (2006) claimed that the CBI literature sought to downplay politicians' achievements after World War II in delivering stable growth through coordinating various sectors of society, and that politicians were capable of doing so yet again in future.

Despite these concerns, researchers stated that the relationship was robust by around 2000 (de Haan 2000). But surprisingly, given the early stage of the empirical work, many governments in the 1990s had already increased the independence of their central banks. Much of this reform was externally driven, such as a requirement of the Maastricht Treaty, but it was also embraced by political elites.

These reforms had the unintended benefit of giving researchers new data. If CBI had increased in many countries, then there should be a corresponding reduction in inflation. It is ironic that, when CBI theories were driving policy reform, problems began to emerge. Acemoglu et al (2008) examined a wide range of countries from 1972 to 2005 and found that CBI was correlated with lower inflation only in countries with middle levels of governance, contrary to the early OECD studies. Klomp and de Haan (2010a) looked at over 100 countries for 1980 to 2005 and found that CBI was correlated with inflation for only 20 per cent of them. Daunfeldt and de Luna (2008) shed some light on this puzzle by examining the inflation performance of twenty nine OECD countries after 1975. They found that the majority of them had achieved price stability before CBI reforms, which suggests that other factors were at play besides the time inconsistency

problem. Some papers still found the expected results, however. Crowe (2008) and Crowe and Meade (2008) both contradicted Acemoglu et al.

The state of the literature is summarised by Klomp and de Haan (2010b), who conducted a meta-regression analysis of the literature from 1991 to 2006 covering fifty nine studies and comprising over 350 regressions. They found that there was no general correlation in the literature between CBI and lower inflation. Such a correlation only applied in studies which covered OECD countries and studies that covered the 1970s. A correlation was also more likely in bivariate regressions, regressions that included the labour market as an independent variable, and where a regression corrected for outliers in OECD countries.

The current state of the research is that CBI theories are robust in relation to OECD countries in the 1970s. In other words, the theory is back where it began, explaining how developed countries succumbed to the Great Inflation. The purpose of this paper is to determine whether this long-standing correlation is robust. Its finding is that, instead of being a commitment device, CBI legislation at that time reflected countries' cultural and political preferences. CBI reforms in developed countries in the 1990s may well have been misguided. The question of what factors shape an institution is an important part of the answer to the question of whether an institutional reform will have policy benefits.

Method

This paper adopts the approach of determining which variables are correlated with CBI, and might be regarded as influencing it. These are then incorporated into regressions on inflation to determine whether the correlation between CBI and inflation is robust. Most of these variables are added directly, however, variables that are not correlated with inflation can be included as instrumental variables.

This approach is similar to Posen (1995). There, Posen examined what economic and political factors were correlated with CBI in OECD countries in the decades between 1950 and 1990. He then used these proposed determinants of CBI to check whether the inverse correlation between CBI and inflation remained robust after they were added to a regression model. Many papers have conducted the second part of this analysis, and some papers have conducted the first part, but very few have put them together. This suggests a missed research opportunity because good candidates for testing the robustness of an institution or policy will be the factors that generated it in the first place.

Data

In the first set of regressions, the dependent variable is CBI. Two aggregated legal indicators were used: that from Bernhard (1998) and that from Franzese (1999). The former used Grilli et al (1991), Cukierman (1992), and Alesina and Summers (1993). The latter divided the Grilli indicator into its economic and political parts, and then used the QVAU and LVAU indicators from Cukierman (1992), and finally Alesina and Summers.

This indicator was developed for 1970 to 1990 from these original sources for twenty one OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. Not all these countries were covered in the initial studies, so some regressions were conducted to allow a fully aggregated figure to be developed based on partial data. Where a country was included in all the initial studies, there was a close match to the figures in Bernhard (1998) and Franzese (1999).

Two original CBI indicators were also used. These were the general legal CBI indicator from Cukierman et al (1992) and a 0/1 dummy based on low/high CBI in Alesina (1988). In the second case, the countries with high CBI were Japan, the United States, Germany and Switzerland. An example of a paper that used a dummy based on Alesina is Oatley (1999).

The first set of regressions use six independent variables, generated for 1960-1990. The first was class voting, measured by the Alford index. The rationale is that the closer political parties are to their base, the greater their interest in controlling the central bank to better direct the benefits of government to the base, rather than governing for the whole community. This is what Bernhard (1998) found and it is similar to the institutional argument made by de Mesquita et al (1999). Data from Nieuwbeerta (1999) was used to supplement that in Bernhard, with regressions being used to expand partial data for some countries. A higher Alford index would be expected to be positively correlated with inflation because governments would be more likely to govern for their supporters, rather than for the whole community.

The next variable was strong bicameralism. This is a dummy variable with a value of 1 where a legislature has a second chamber that has similar powers to the first chamber, but a different electoral system. This applies in Australia, Germany, Switzerland and the United States. This would be expected to improve legal CBI because the second chamber would be a constraint on a government seeking to establish a compliant central bank. Bernhard (1998) found this relationship in his study. As a constraint, it would also be expected to reduce inflation.

A further constraints-type variable was included. This was the polity variable from the Polity IV dataset.

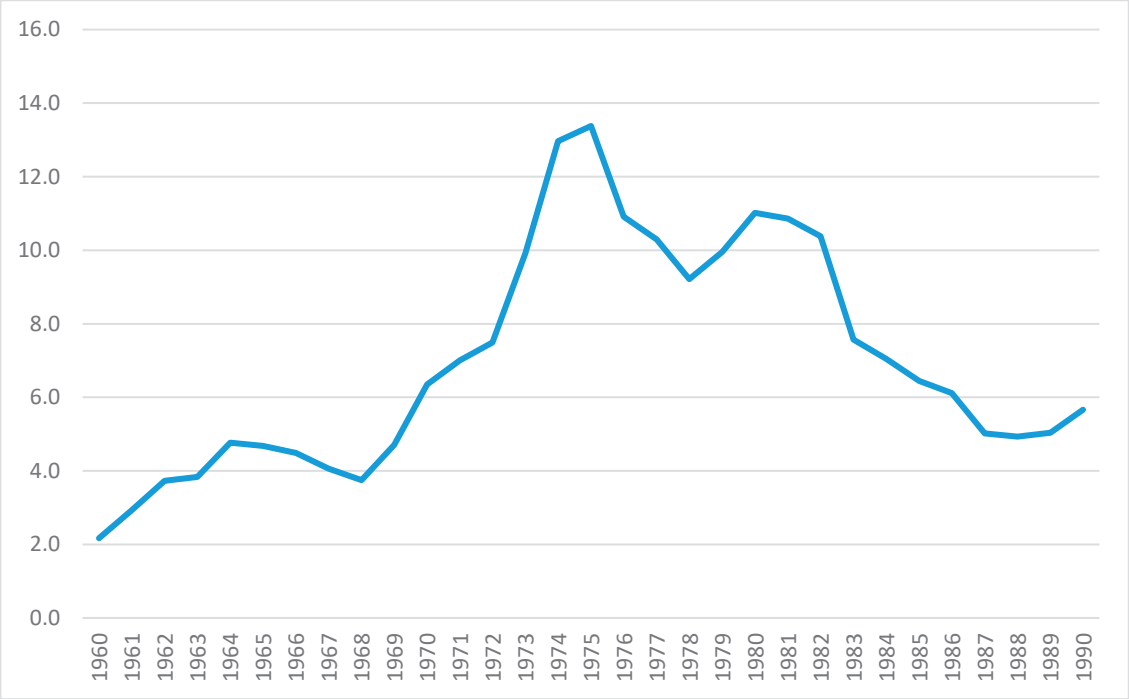
Reflecting Posen (1995), a dummy variable was included for regulation of universal banking, which had a value of 1 if banks were allowed to conduct at least two of the following: commercial lending, securities, and insurance. Universal banking would represent the strength of the financial sector and be expected to be correlated with higher CBI and lower inflation. In Posen's study, this variable was statistically significant in regressions on CBI (the LVAU measure in Cukierman 1992), but not in regressions on inflation.

Two variables representing the preferences of the general community were developed. The first was a dummy variable for whether a country had experienced hyperinflation in the twentieth century. The traditional definition is monthly inflation of at least 50 per cent (Cagan 1956). The website of the Cato Institute lists the countries that have experienced hyperinflation. The countries in this study that did so were Austria (1921-22), Germany (1920, 1922-23), and Greece (1941-45). Hyperinflation experience is expected to be correlated with higher legal CBI and lower inflation. De Haan and van 'T Hag (1995) used a similar variable in their study (based on inflation between 1900 and 1940) and concluded that it was positively correlated with legal CBI.

The other variable representing community preferences is future time reference, developed by Chen (2013). This variable measures the extent that a language differentiates between the present and the future. Some languages, such as Japanese, German and those in Scandinavia, make little difference between the two tenses. Therefore, the future is less different to the present and people who speak these languages are theoretically more likely to take actions now that provide a future benefit. Chen's paper finds that the speakers of such languages tend to save more and make better health decisions. This paper uses the sentence ratio measure in Chen (728). This codes strong future time reference as approaching 1 (such as 0.98 for French and 0.93 for American English) and weak future time reference approaching 0 (such as 0 for Japanese and German). A pro-rata value was given for Belgium (0.39) and Switzerland (0.29). The data listed above was used for the first stage of regression analysis, namely to determine which variables were correlated with CBI. A summary data table is in the Appendix.

The second stage was to develop a regression on inflation and check whether CBI variables were correlated with inflation, and whether this correlation was robust after adding variables correlated with CBI or using them as instruments. For inflation, this paper uses the GDP deflator sourced from Franzese (1999), who used OECD data. Annual inflation averaged across the twenty one OECD countries is given in Figure 1.

Figure 1, Average percentage inflation, 1960-90, 21 OECD countries.



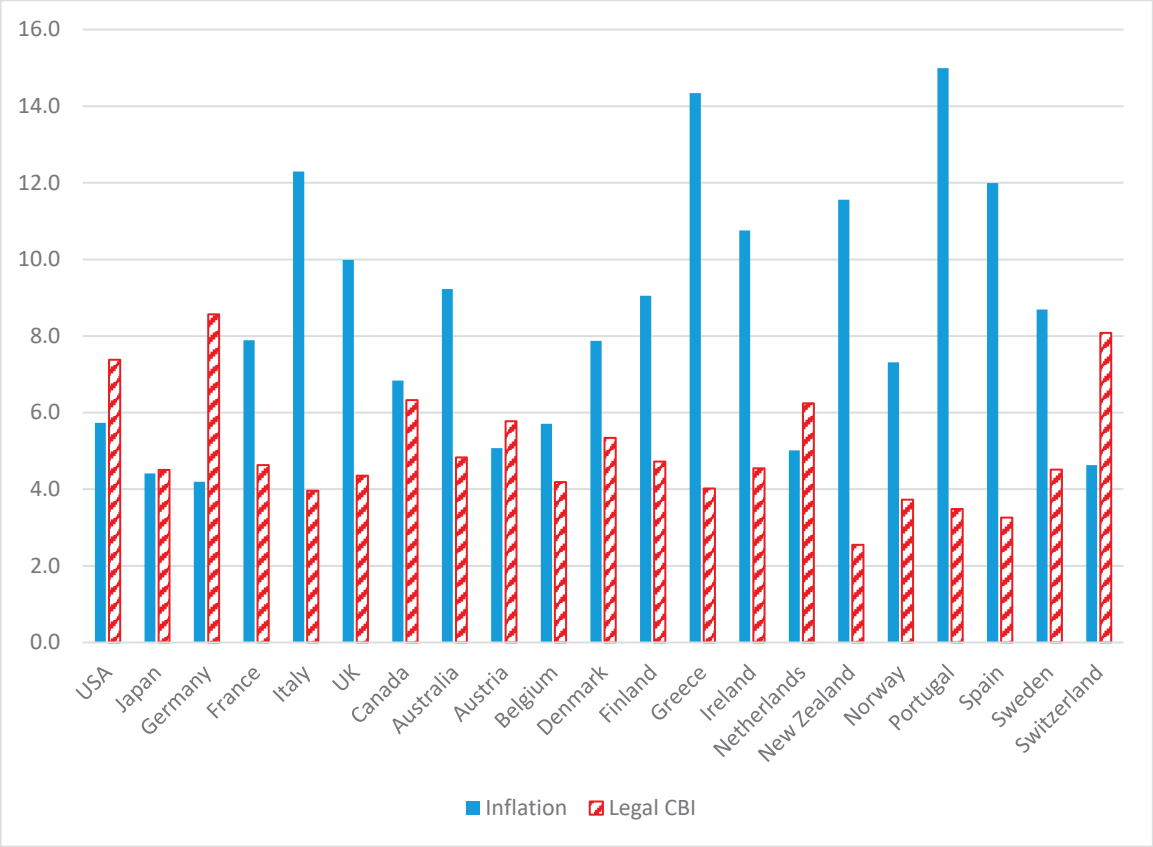
Note: Inflation measured through the GDP deflator. Source is Franzese (1999).

The Figure shows that inflation in the 1960s was low and that it started to increase in the early 1970s. The two oil price shocks in the mid and late 1970s are evident. The 1980s shows inflation dropping, although it does not quickly return to levels in the 1960s, which indicates some persistence. The graph suggests that oil inflation and lagged inflation should be included in the inflation regressions. A cross-country comparison of inflation for the twenty one countries in the sample from 1970 to 1990, along with CBI data, is in Figure 2 on the next page.

The Figure shows that seven countries had average inflation rates below 6 per cent: the United States, Japan, Germany, Austria, Belgium, the Netherlands and Switzerland. The attraction of CBI theory is apparent because four of these countries – the United States, Germany, the Netherlands and Switzerland – also had rescaled legal CBI values above 6. However, Chen's future time reference concept also appears applicable, because all of the seven countries, except for the United States, have a coding less than 0.5 for this variable.

Six countries had an average inflation rate greater than 10 per cent: Italy, Greece, Ireland, New Zealand, Portugal and Spain. All of the three countries with low polity scores are in this list, so the polity variable may also be important. However, legal CBI also appears important because three of these six countries – New Zealand, Portugal and Spain – have low CBI values.

Figure 2 – Average inflation and central bank independence, 1970-90, 21 OECD countries



Note: Inflation measured through the GDP deflator in Franzese (1999). CBI measured through the replication of Franzese's (1999) index. Legal CBI rescaled by being multiplied by 10.

Franzese (1999) used largely institutional and political variables. This paper enhances Franzese's approach by using some economic variables. It is accepted that increased output, holding all other factors constant, is more likely to be inflationary. Therefore, the logged real per capita output measure from Franzese's dataverse was differenced to generate a growth variable. OECD data of general government accounts (the net saving statistic) was used to generate a deficit variable expressed as a percentage of GDP. Some splicing of the data was required due to changing definitions for government accounts. Further, some early observations for Portugal were dropped in some equations because the OECD did not publish government accounts data for these years. Deficit data for New Zealand was sourced from the IMF's *International Financial Statistics.* The deficit variable in levels tended to mirror output growth and was not statistically significant in the regressions. Therefore, the difference in the deficit was used instead.

It is also accepted that movements in a country's currency can have inflation effects through making imports cheaper or more expensive. This paper uses data on the trade weighted index from the website of the Bank for International Settlements. The last economic variable developed was inflation in the price of oil. The price of West Texas Intermediate from the FRED

database of the Federal Reserve Bank of St Louis was used for this purpose, adjusted by a country's exchange rate with the United States. Of all the time-varying variables, this was the only one that was treated as exogenous and was not lagged.

A time trend was also included as an economic variable. It commenced at 1 in 1973 and rose to 18 in 1990. In this context, a negative trend in inflation would be consistent with policy learning, similar to that discussed in Sargent et al (2006).

Most of the dependent variables from Franzese (1999) were also included. The first was openness to trade. This was calculated by adding a country's imports and exports and dividing by GDP. The next was inflation abroad, which comprised the average inflation rate of the other twenty countries. Also included was a left/right politics scale, increasing with greater conservatism. The proportion of workers who were union members was also used. The final variable was a corporatism measure, which decreased with greater fragmentation of organisations in wage negotiations, for both employers and employees. Franzese (1999) included data on financial sector employment as a share of total employment, but this variable was not used because regression tests indicated that it was endogenous to CBI and inflation.

A summary data table for the regressions on inflation is in the Appendix.

One last variable was used as an instrument in some of the regressions not reported in this paper. This was strong and inclusive committees. Following Powell and Whitten (1983), this occurs where the committee system distributes chairs proportionally among all parties and has two of the following three characteristics: more than ten committees, mirroring the bureaucracy in expertise; and limiting the number of committee memberships that a legislator may hold. Data on parliamentary committees was sourced from Bernhard (1998) and the Inter-Parliamentary Union (1986).

Results

Results from the first part of the analysis, examining which variables are correlated with CBI, are given in Table 1 on the next page.

Although the regressions performed differently across the measures of CBI, the strong bicameralism variable was statistically significant and of the same sign across all four measures. The regressions for the Franzese and Bernhard measures were similar, which is to be expected, since these dependent variables are themselves similar. Of the statistically significant variables in the first two regressions, the effect size for strong bicameralism was almost twice as large as

for class voting (measured as multiplying the coefficient by the independent variable's standard deviation). In the Cukierman regression, the effect size for hyperinflation was about a third larger than for strong bicameralism.

The regressions were generally routine; residuals were normally distributed, there was little evidence of heteroskedasticity, and the RESET test did not suggest any non-linearity in the variables.

Table 1 – Regressions on various indexes of central bank independence, 1960-1990, 21 countries.

Variable	**Franzese**	**Bernhard**	**Cukierman**	**Alesina**	**Alesina**
	OLS	OLS	OLS	Logit	Logit
Class	-0.68**	-0.70*	-0.40	-14.7	
	(0.22)	(0.24)	(0.29)	(12.8)	
Strong	0.23**	0.25**	0.15*	4.38*	
bicameralism	(0.049)	(0.052)	(0.064)	(1.93)	
Polity	0.013	0.013	0.0050		Omitted
	(0.0072)	(0.0076)	(0.0094)		
Hyperinflation	0.023	0.053	0.23**	0.09	
	(0.058)	(0.062)	(0.077)	(2.00)	
Grammar	-0.12	-0.094	0.024		-1.84
	(0.058)	(0.061)	(0.076)		(1.76)
Universal	0.031	0.050	0.099		-0.96
	(0.043)	(0.045)	(0.056)		(1.40)
Constant	0.52**	0.47**	0.28	-0.48	0.05
	(0.10)	(0.11)	(0.14)	(1.93)	(1.32)
R-square	0.80	0.80	0.68	0.49	0.06
N	21	21	21	21	17

Notes: * indicates significant at the 5% level and ** indicates significant at the 1% level. Standard errors given in brackets. Cukierman refers to Cukierman et al (1992). In the last column, the polity variable was omitted because it was a perfect predictor, resulting in four observations being dropped. Pseudo R-square reported for the logit regressions.

Table 2 – Regressions on the inflation rate, 1973-1990, 21 countries.

Variable	**OLS**	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
CBI	-4.29**	-2.56*	-2.91*	0.44	0.62	-2.13	-2.18	-2.11
	(1.58)	(1.30)	(1.15)	(2.99)	(2.06)	(1.56)	(1.63)	(1.93)
Inflation (-1)	0.46	0.46*	0.16	0.19	0.16	0.22	-0.16	-0.16
	(0.24)	(0.20)	(0.18)	(0.17)	(0.25)	(0.24)	(0.19)	(0.19)
Inflation^2 (-1)	0.050*	0.052*	0.068**	0.073**	0.064**	0.059**	0.082**	0.082**
	(0.025)	(0.020)	(0.016)	(0.017)	(0.024)	(0.023)	(0.016)	(0.019)
Inflation^3 (-1)	-0.002*	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**
	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0007)	(0.0006)	(0.0005)	(0.0005)
Currency (-1)			-0.077**	-0.084**			-0.055**	-0.055**
			(0.021)	(0.019)			(0.019)	(0.018)
Deficit (diff'd)			0.24*	0.27*			0.19	0.19
(-1)			(0.11)	(0.13)			(0.10)	(0.12)
Growth (-1)			0.34**	0.38**			0.30**	0.30**
			(0.064)	(0.084)			(0.063)	(0.073)
Oil inflation			0.010*	0.010*			0.010*	0.0097*
			(0.004)	(4.6e-3)			(0.004)	(0.0046)
Trade (-1)			-0.36	-0.26			-1.05	-1.05
			(0.28)	(0.44)			(0.62)	(0.67)
Inflation			-0.085	-0.13			0.20	0.019
abroad(-1)			(0.12)	(0.14)			(0.11)	(0.13)
Trend			-0.17**	-0.16**			-0.16**	-0.16**
			(0.062)	(0.056)			(0.061)	(0.053)
Politics (-1)					-0.016	-0.041	-0.16*	-0.16
					(0.091)	(0.11)	(0.068)	(0.10)
Unions (-1)					0.73	0.64	1.99*	1.99
					(1.11)	(1.30)	(1.00)	(1.25)
Corporatism					-1.16	-1.50	-1.48*	-1.47
					(0.73)	(1.04)	(0.64)	(0.93)
Polity (-1)					-0.25**	-0.24**	-0.14*	-0.14
					(0.08)	(0.057)	(0.067)	(0.076)
Class vote					0.097**	0.080*	0.031	0.032
(-1)					(0.035)	(0.035)	(0.020)	(0.031)
Universal					0.66	0.68	0.79*	0.79
banking (-1)					(0.38)	(0.40)	(0.39)	(0.48)
Strong bicam	0.42				-0.63		-0.14	
	(0.31)				(0.50)		(0.46)	
Hyperinf.			0.34		0.78	0.88*	0.48	0.48
Experience			(0.25)		(0.42)	(0.36)	(0.26)	(0.39)
Grammar					2.16*	1.44	1.26	1.28
					(0.99)	(0.90)	(0.74)	(0.82)
Constant	4.21**	3.30**	1.96	0.36	5.02	7.02**	8.73*	8.68
	(1.34)	(0.99)	(1.12)	(1.85)	(2.88)	(2.19)	(2.69)	(2.93)
R-square	0.69	0.68	0.75	0.75	0.72	0.72	0.77	0.77
N	378	378	372	372	378	378	372	372
Instrument		Bicam.		Hyper		Bicam.		Bicam.

Notes: Six years for Portugal dropped in some regressions due to lack of government account data for deficits. * indicates significant at the 5% level and ** indicates significant at the 1% level. OLS regressions use panel corrected standard errors. 2SLS regressions use standard errors adjusted for heteroscedasticity and autocorrelation. CBI variable in this table is from Franzese (1999). Results are similar for other CBI variables.

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The second stage in the analysis is to use these candidate determinant variables for CBI in regressions on inflation, or as instruments, to determine whether CBI is itself robust. To do this, a general inflation equation was generated. Four sets of variables were used: lagged inflation with CBI and an instrument (base variables), then the base variables with economic variables, the base variables with political and cultural variables, and finally all variables together. Two approaches were used: OLS with panel corrected standard errors, and two-stage least squares. In the second approach, the instruments were usually strong bicameralism or hyperinflation, although strong committees were used a few times (sometimes in combination with hyperinflation), and left/right politics once. Results are reported in Table 2 for using the CBI measure from Franzese (1999). Regressions were also run for the other CBI measures, including the four disaggregated measures of CBI from Cukierman et al (1992). The measure using Franzese's CBI measure produced the results most sympathetic to CBI theory.

The CBI variable is statistically significant in the first three equations, but none of the remaining ones. Instrumenting in the equation with economic variables changes its sign to positive. Instrumenting in the last two sets of equations gives the variable the expected sign and coefficient size, but it is not statistically significant. A possible explanation for the results is that CBI was not a driving force behind inflation performance, but was part of the general cultural and political landscape, similar to variables such as corporatism and future time reference. Determining how these variables interact could be an area for future research.

Lagged inflation features squared and cubed terms. These were added because a RESET test of the OLS regressions was statistically significant. The squared term is used to reflect the reality that, if there is negative inflation in a country in one year, there is usually positive inflation the next year. The cubed term lessens the amount of "curve" caused by the squared term. Of the remaining variables, the currency, growth, oil and trend variables are consistently statistically significant. Effect sizes were generated by multiplying variables' standard deviation by the coefficient. The lagged inflation variables had by far the largest effect sizes. Of the remainder, the largest was growth.

As noted above, these eight regressions were repeated for seven other measures of CBI. None of them performed better than the results using the CBI index from Franzese (1999). In three individual regressions, the CBI variable had a coefficient of the wrong sign and was statistically significant. This occurred in the equations with the political and cultural variables only, which is consistent with the view that CBI is a reflection of the wider cultural and political landscape.

The results place serious doubt on the common view that CBI played a key role in the inflation of developed countries during the Great Inflation. Rather, they suggest that the features common to all countries during the Great Inflation was an outbreak of inflation caused by the collapse of Bretton-Woods and the oil price shocks. As time passed, countries developed appropriate responses and brought down inflationary expectations. Individual countries were able to manage inflationary pressures by maintaining a strong currency and taking a conservative approach to growth.

Discussion

CBI is a plausible theory. The lukewarm attitudes of politicians in the 1970s towards controlling inflation were the initial drivers for the theory. However, all theories must be tested with data. The results here suggest that previous studies have been affected by omitted variable bias and endogeneity. In the past literature, CBI theory has managed to bounce back after a study has cast doubt on it. The same may be true here. However, this paper's results are sufficient to permit some further discussion.

Determining whether a literature is subject to omitted variable bias or endogeneity is a difficult matter. Theory is likely to contribute a large number of possible variables, but there is always the doubt that something has been missed. For the institutional literature, a useful pointer towards possibly omitted variables or endogeneity is those variables that determined the evolution of an institution, or are at least correlated with it. Asking what created an institution is integral to the question of whether the institution has any effect.

If CBI theory is not reflected in the data, it is necessary to consider whether there are any weaknesses or omissions in Barro and Gordon (1983a), and Rogoff (1985) and Lohmann (1992). The results in Barro and Gordon rely on politicians seeking to push unemployment ever lower, below the NAIRU. This was evident in the 1970s, especially in the United States. However, Orphanides (2003) has suggested that this was due to an error in measuring the NAIRU. In the 1970s, the official estimate of the NAIRU was around 4 per cent, when it was closer to 6 per cent. Therefore, it is only natural that policy makers at the time would have sought to push unemployment "too low." More accurate estimates of the NAIRU now mean that the probability of this behaviour is much reduced.

In relation to Rogoff (1985) and Lohmann (1992), cross-national comparisons of inflation performance may have been picking up differences in inflation preferences between countries, whereas Rogoff's assumption relates to comparing inflation preferences within countries (the

central banker against everyone else). The author is not aware of studies that focus on this internal difference. Further, the costs applied to politicians for overriding a central bank may be close to nil if there is public support for doing so. In this sense, not only must the politicians be restrained, but the general public as well. Legislation on its own will not achieve this and political leadership is required to let the central bank do its job.

The other way of looking at this problem is to ask if there have been examples where an independent monetary authority consciously went against popular sentiment in monetary policy. Coleman (2001) provides an example of this with the Australian Notes Issue Board in the 1920s. This agency had a high degree of independence and conducted policy in accordance with the quantity theory of money. This meant the supply of money was inelastic to seasonal demand and the exchange rate, leading to large fluctuations and opposition from primary producers and commercial banks. The Government lobbied the Board to be more flexible, to no avail. The Government then put legislation through the Parliament to wind up the Board and transfer the functions to another agency.

In other words, monetary agencies that depart too far from popular sentiment, or the sentiment of key stakeholders, may find themselves legislated out of existence. A different example is the Federal Reserve in the 1970s. This agency was subject to intense Congressional scrutiny when it sought to control inflation. Kettl (1986) argues that, although higher interest rates were technically warranted, they were not politically sustainable. If the Federal Reserve had pushed interest rates higher, its legislation would have been amended to give politicians more control over monetary policy. This suggests that, instead of central banks constraining politicians, the constraint works the other way.

A final comment is that this paper only extends as far as OECD countries for the 1970s and 1980s. It cannot be regarded as falsifying CBI theory entirely. On the other hand, Klomp and de Haan (2010b) show that CBI theory is strongest for studies that include these nations and the 1970s, so this paper is a strong challenge to that theory in favour of the theory that central bank legislation reflected a range of cultural and political factors.

Conclusion

This paper has falsified the classic narrative of CBI theory, that CBI kept inflation low in developed countries during the Great Inflation, in favour of the theory that legal CBI reflected a package of cultural and political factors. The approach used was to examine which factors

were correlated with CBI and could be regarded as causing it. These were then included in regressions on inflation, either directly or as an instrumental variable.

Papers seeking to check the robustness of CBI in regressions on inflation do not usually check whether competing variables are themselves related to CBI, or what variables might be related to it. The results here suggest that this is a serious omission and indicates a lack of understanding of CBI, the key concept under consideration. A literature debating the value of institutional reform cannot be regarded as authoritative unless it has seriously considered the question of how a particular institution came into being in the first place.

Lastly, the author notes Coleman's concluding comments that legal CBI does not necessarily protect monetary policy against vested interests. These interests can lobby the Government and secure their preferred result. Nations will be better off if the political process is used to bring the general interest to bear against vested interests (2001, 746). In other words, a higher quality of political constraints, political leadership and political debate will make a society better off. It may be more useful to ask what politicians can do for central banks, rather than viewing politicians as the problem.

Appendix

Table A1 – Summary data for the OLS regressions on various indexes of central bank independence, 1970-1990, 21 countries (N=21).

Variable	Mean	Standard deviation	Minimum	Maximum
Franzese CBI	0.50	0.15	0.25	0.86
Bernhard CBI	0.48	0.16	0.24	0.84
Cukierman CBI	0.37	0.16	0.16	0.69
Alesina CBI	0.19	0.39	0.00	1.00
Class voting	0.21	0.09	0.01	0.39
Strong bicameralism	0.19	0.39	0.00	1.00
Polity	8.69	2.96	0.58	10.00
Universal banking	0.52	0.50	0.00	1.00
Hyperinflation	0.14	0.35	0.00	1.00
Future tense grammar	0.56	0.47	0.00	1.00

Table A2 – Summary data for the regressions on the inflation rate, 1973-1990, 21 countries (N=378).

Variable	Mean	Standard Deviation	Minimum	Maximum
Inflation	8.71	5.43	-1.4	27.2
Inflation (-1)	8.81	5.34	-1.4	27.2
$Inflation^2$ (-1)	106.04	119.52	0.04	739.84
$Inflation^3$ (-1)	1544.13	2531.08	-2.74	20123.65
Franzese CBI (-1)	0.5	0.15	0.25	0.86
Currency (-1)	-1.08	7.46	-28.05	21.38
Deficit, diff'd (-1)	0.18	1.52	-4.82	6.75
Growth (-1)	2.26	2.59	-8.13	11.01
Oil inflation	18.95	43.81	-61.62	195.34
Trade (-1)	0.5	0.25	0.09	1.4
Inflation abroad (-1)	8.06	2.76	3.73	13.67
Trend	9.5	5.20	1	18
Politics (-1)	5.58	1.67	2.78	10
Unions (-1)	0.44	0.17	0.1	0.85
Corporatism	0.43	0.36	0	1
Polity (-1)	19.36	2.68	1	20
Strong bicameralism	0.19	0.39	0	1
Class voting (-1)	18.91	8.57	4	37.3
Universal banking	0.52	0.5	0	1
Hyperinflation experience	0.14	0.35	0	1
Future tense grammar	0.52	0.41	0	1

Note: N=372 for the differenced deficit due to lack of data for early years for Portugal.

7 – Conclusions

Overview

This thesis has examined the issues around the theory of central bank independence (CBI). This theory seeks a way of constraining politicians so that they implement the best technical policy, rather than the most popular policy, or the policy that best suits their political base. The impetus for the theory was the Great Inflation in the 1970s, where politicians and the general public showed little resolve to keep inflation under control. Researchers were more impressed by the efforts of central banks, especially when they had a free reign in monetary policy.

In Chapter 1, the thesis analysed and critiqued the CBI literature and argued that it had several weaknesses. One of the most important weakness was that, if loose money is popular, then the cost to the government of overriding a legally independent central bank will be low. CBI will be ineffective in delivering technically correct policy. Chapter 2 examined the academic economics literature from 1947 to 2006 to determine whether it may have influenced economic policy. The results were that the literature was less conservative in the 1960s (that is, to take an inflation first approach or argue that the long run Phillips Curve is vertical). This was too early to have a direct effect on policy, but it may have had an indirect effect through influencing politicians, advisers and so forth.

Chapter 3 studied the reaction function of the Federal Open Markets Committee (FOMC), the main decision-making body for monetary policy in the US. It found support for the idea that policymakers in the US made errors in estimating the real time output gap in the late 1960s and 1970s, producing looser monetary policy than was technically optimal. Since 1982, the FOMC has most likely been less responsive to the output gap. Chapter 4 compared events during the Great Inflation across the US, the UK and Germany. It found that a theory of political constraints on politicians was better able to explain these events than CBI, which is a theory of legal constraints. After all, if politicians write the laws, then they may find legal constraints to be more flexible than the general public would. This concept of political constraints was explored in Chapter 5, in particular whether politicians were directly punished for high inflation. The evidence was that this only occurred on a conditional basis, so it is more likely that a political response worked through other channels, such as the interests of elites. This is plausible because the costs and benefits of inflation are borne unevenly across the electorate.

Chapter 6 covers the simple question of whether there is a correlation between CBI and inflation in the classic example of OECD countries in the 1970s. It finds that the correlation drops away

once endogeneity and other cultural factors are taken into account. CBI theory may have been a misinterpretation of this classic case study, in which legally independent central banks took on a leading role in fighting inflation. What may have instead happened was that politicians found it safer to delegate disinflation to a legally independent central bank while running their own agenda from a safe distance. In other words, CBI is a theory designed to explain observations, without being able to explain the underlying incentives of political actors.

The chapters and these arguments are further discussed below.

Chapter 1 – Introduction

This chapter covers the CBI literature. It had its origins in the work of Milton Friedman, who argued in support of long run, stable policy, rather than the adaptive policy that became popular in the 1960s. Friedman was making these arguments as early as 1948, and was able to give them more theoretical rigour with his famous 1968 paper, which argued that inflation could not be used to boost employment in the long run because people's inflationary expectations adapted to the government's actions.

The literature then shifted from explaining the economic effects of policy to explaining how the policy came about. Kydland and Prescott (1977) raised the problem of time inconsistency, namely that the policy choice at a particular point in time need not be optimal in the long run because a particular political leader cannot constrain his or her counterparts at other points in time. However, the policy problem that the paper is trying to solve is quite specialised. Many policy questions are straightforward and have a consensus behind the solution. Kydland and Prescott's paper is really about the conflict between policy and politics when the technically correct policy is apparent to elites, but not the general public, and there are significant losers from it, preventing a consensus solution. The passage of time and the process of debate would be expected to reduce these differences.

Barro and Gordon (1983) made the argument that the Great Inflation was caused by politicians seeking to drive unemployment below the non-accelerating inflation rate of unemployment (the NAIRU). Following Friedman in 1968, this results in excessive inflation while unemployment remains at the NAIRU. However, Orphanides (2003) has a competing explanation that mistakes in estimating the NAIRU caused this behaviour. It is just as plausible and is better supported by the data. It has certainly been influential because the Federal Reserve now publishes its real time estimates of the output gap (see the website of the Federal Reserve Bank of Philadelphia).

The literature then moved from explaining how policy comes about to developing a solution. Rogoff (1985) proposed giving a central bank complete legal independence from government to pursue more conservative monetary policy. Lohmann (1992) generalised this paper to apply a variable cost to the government of overriding the central bank, which interacted with the size of an economic shock to produce various outcomes. The intuition was that, for small shocks, governments tended not to override the central bank, but the chances of overriding increased with greater shocks. The problem with these papers is they do not consider the effect that political opinion might have on the cost of overriding the central bank. If loose policy is popular to protect jobs during high inflation, then a central bank will have trouble pursuing this policy in the long run.

Walsh (1995) proposed a different policy solution, namely to have a contract between the central bank and the government to ensure that the central bank met a particular inflation target. The mistake here is that it assumes these two parties operate at arms' length, similar to two businesses in the private sector. This is partly true in the US where the Federal Reserve banks are owned by the private sector, but not true at all in other countries because governments own these banks. But even in the US, it is clear that a united Congress and President would very much hold the upper hand in any dealings with the Federal Reserve.

Overall, the "cost of overriding" and the "contract" solutions overlook the fact that politicians set the rules and have the choice of whether to be bound by them because they can change them.

Some researchers have incorporated political dynamics into theories of institutions. Riker (1980) argued that institutions can slow down the process of policy adapting to public opinion. However, an institution cannot create too many losers from its policies, or else it will be abolished or substantially reformed. Moore (1995) used the related concept of the authorising environment, which is simply what the general public or relevant interest groups will accept from an institution. The general conclusion from these authors is that the community sets the boundaries of the acceptable decision set and the central bank needs to operate within that. We don't often see central banks or other institutions go outside this decision set because organisations tend to support their own survival. One example of where a central bank went outside the acceptable decision set was the Australian Notes Issue Board in the 1920s, which implemented technically correct policy by the standards of the day, but put offside the banks and farmers. It failed to respond to political pressure and had its leadership replaced (Coleman 2001). Another example is the second and third US central banks, which promoted the prompt

return of banknotes to the issuing banks. This limited the amount of notes they could issue, which increased banks' stability in return for lower profits. Under pressure from the financial sector, these banks did not have their charter renewed (Smith 1936).

One way of entrenching the position of a central bank is through a constitution, which generally requires a supermajority, or series of majorities to be changed. This may well be effective, but implementing such a change would itself require a supermajority or similar process. If this were to occur, it would imply widespread support for the reform, which would again imply that CBI isn't necessary because of the widespread public support for the institution or its goals.

Chapter 2 – The Phillips Curve literature

In many countries, the 1960s saw a shift away from stable economic policy towards economic policy that maximised output (for example, see the Economic Report of the President for 1962). This shift came about through Phillips (1958) and Samuelson and Solow (1960), which explored the link between inflation and real output. In particular, the latter paper argued that inflation of 4 to 5 per cent was the necessary cost of keeping unemployment below 3 per cent. Phelps (1967) and Friedman (1968) responded that an inflationary stimulus could not increase output in the long run as individuals came to expect inflationary surprises. They were not the first to make these arguments. Lutz (1952), Cagan (1956) and Felix (1956) had all done so before from different perspectives. But Phelps and Friedman were the first to do so in the context of the Phillips Curve.

During the 1950s and 1960s, the volume of literature on this question was not particularly large, but it increased greatly during the 1970s as inflation got out of control. Thanks to policy failure, economics had a major dispute on its hands, which gradually resolved in favour of Friedman's expectations argument.

Chapter 2 takes the innovative approach of quantifying the academic literature between 1947 and 2006 on the relationship between unemployment and inflation. A paper is classed as conservative if it recommends an "inflation first" approach to economic policy, or if it rejects a long run trade-off between inflation and unemployment. The dataset is drawn from the top 10 economic journals in the US.

The paper finds that the 1960s were less conservative than the remainder of the study period. This is consistent with the idea that economic literature can be strongly driven by theory because Phelps (1967) and Friedman (1968) were theoretical papers. By 1975, conservatism was the majority view and after 2000 it became the consensus.

There were also some auxiliary findings. For example, after the Federal Reserve broke the back of inflation in 1982, the literature became less conservative after an increase in unemployment. This correlation, however, took place within a generally conservative literature while inflation was under control. Another finding was that having "inflation" in the title of a paper meant it was likely to be more conservative, which might be expected. A less expected finding was that this effect was reduced if both "inflation" and "unemployment" were in the title, perhaps signalling that the paper concerned was more likely to support a diagonal Phillips Curve. Finally, as economic conditions worsened over time, papers with "monetary" in the title became more conservative. This could reflect Friedman's success in promoting stable monetary policy.

The finding that the less conservative literature occurred during the 1960s makes it unlikely that the literature had a direct link to the Great Inflation, which was largely a phenomenon of the 1970s and 1980s. However, it is possible that the literature had an indirect effect by influencing policy makers, political leaders, and the general debate.

Chapter 3 – The Federal Reserve's reaction function

The idea that the Federal Reserve and its main policy setting body, the Federal Open Markets Committee (FOMC), reacted to particular economic conditions was initially investigated by Havrilesky (1967) and Christian (1968). These authors found that the FOMC responded to inflation and unemployment. The next innovation came from Bernanke and Blinder (1992), who argued that the FOMC had a fundamental change in policy from 1979 to 1982 by focussing on the money supply.

These results are not surprising. Paul Volcker publicly announced the switch to the money supply in late 1979 and responding to inflation and unemployment could be regarded as the bread and butter of economic policy. In other words, the FOMC could be expected to officially admit to these methods. However, the literature has gone further, making claims about FOMC decisions that the FOMC has not admitted to. These are that: the FOMC learnt from stagflation (Sargent et al 2006); the FOMC made a mistake by over-estimating the output gap in the late 1960s and 1970s, resulting in looser policy than it might have intended (Orphanides 2003); and that the FOMC generally became more conservative after 1982, compared with pre-1979 (Sims and Zha 2006), especially by being more inflation averse (Clarida et al 2000).

This chapter examines the evidence in favour of these theories by developing reaction functions across four dependent variables: the quarterly federal funds rate; the annual federal funds rate; decisions to tighten policy; and decisions to loosen policy. A variable is robust if it is statistically

significant for both the first two dependent variables and at least one of the second two dependent variables. Regression models were developed for these cases including typical independent variables such as inflation expectations, the money supply, the Volcker disinflation period (Q4 1979 to Q3 1982), and an output measure. The deficit and presidential signalling were also included.

In some cases, the point of the regressions is to determine whether the FOMC responded differently to particular variables before 1979 and after 1982. In other cases, where the variable represents change over time, the test is whether this variable is statistically significant.

There is evidence for Orphanides' 2003 theory of real time mistakes in estimating the output gap. It usually fits the data better than the unemployment rate. There is no evidence for learning, as proposed by Sargent et al (2006) and the evidence for greater inflation aversion (Clarida et al 2000) is thin. Rather, the data better supports less aversion to the output gap after 1982. This shift is consistent with the advice of Volcker (1990), who argued that giving a central bank a single focus on prices would prevent inflation getting out of control. It is also consistent with the advice of Orphanides (2003), who argued that the real time output gap was difficult to measure, and so central banks would be better off concentrating on inflation. The advice of Volcker and Orphanides is in fact illegal; the Federal Reserve's legislation requires it to pursue full employment. The Fed appears to have taken the next best option of reducing its emphasis on jobs.

Considering the current literature, the results are closest to Sims and Zha (2006), who found that the Federal Reserve became more conservative after 1982, but not drastically so, and certainly not sufficient to face down another inflation outbreak such as the 1970s. The conclusion is that the Federal Reserve is not an inflation hawk and appears better suited to times of price stability, rather than inflation crises.

Chapter 4 – Historical case studies of Germany, the US and the UK

This chapter seeks to compare the explanatory power of two theories: that CBI, or legal constraints, set the boundaries for politicians and central banks; and the theory that political constraints governed their actions instead. The technique is to follow through the chain of events in three leading democracies that had different inflation experiences in the 1970s and determine which theory best fits the data.

In the US, Presidents spent the 1970s trying different costless ways of reducing inflation, but the problem only got worse and they could generate little support from Congress or the wider

community. In July 1979, Carter announced that the Chair of the Federal Reserve, William Miller, would become the Treasury Secretary. This vacancy at the Fed caused a run on the dollar and Jimmy Carter was forced to appoint Paul Volcker as Chair of the Federal Reserve to restore confidence. Volcker advised Carter before his appointment that he would pursue tighter policy, but Carter had no other options. With less than 18 months before the next election, Carter had little room to move and Reagan won handsomely.

In 1981 and 1982, Reagan gave Volcker the minimum required support to do the job. This meant he could pursue his own generous fiscal deficits. It also meant that, by doing it early in the electoral cycle, he had more choices and did not have the issue imposed on him. Ultimately, Reagan was able to have his cake and eat it by running a popular fiscal policy, delegating an unpopular but effective monetary policy, and claiming credit for the results afterwards.

In the UK, various governments also sought different costless ways of reducing inflation. The context here was different because high rates of union membership and the large amount of power unions enjoyed through protected strike action meant that inflation had a large cost-push component. So the inflation problem was entwined with a union problem. Labour's attempts to reduce union power in the late 1960s were derailed by union interests within the party. Ted Heath failed against the miners' strikes in the early 1970s and the subsequent Labour government took a softly-softly approach with the unions, until "the Winter of Discontent" in 1978 and 1979 ruined its election chances.

Margaret Thatcher combined the inflation crisis and union problems to deal with both simultaneously at the beginning of her tenure. She put a range of industrial relations changes through Parliament, reducing unions' powers during strikes and appointed supporters to key economic positions in Cabinet. From 1981, she harmonised both monetary and fiscal policy to be anti-inflationary. Thatcher had the political momentum and she won the 1983 election easily after the Falklands War. Thatcher then defeated the miners in their strike of 1984-85 through a combination of the earlier legal changes and learning the lessons of Ted Heath's experiences.

Germany had experienced a key political conflict over inflation before the 1970s. In 1955-56, the Bank deutsches Lander (BdL) commenced its first tightening of monetary policy in response to inflation. Adenauer sought to delay and weaken this process to support the industrial base of his party (the Christian Democrats), but his two key economic ministers, Ludwig Erhard and Fritz Schaffer, supported the BdL. Adenauer publicly criticised the BdL for tightening policy, but was then roundly criticised in the German media for making these comments. Adenauer did not venture into economic policy thereafter.

In the first oil shock, Helmut Schmidt as the Finance Minister for the Social Democrats put out a joint media release with the Bundesbank and committed to keeping inflation below 10 per cent, which duly occurred after a prompt tightening of monetary policy. In the second oil shock, the Bundesbank raised interest rates, but it and other commentators argued that fiscal policy was too loose. The Social Democrats' junior coalition partner, the Free Democrats (liberals), proposed a significant tightening of fiscal policy. The Social Democrats were not willing to accommodate this, so the Free Democrats changed their support to the Christian Democrats under Helmut Kohl. The Christian Democrats tightened fiscal policy and the Bundesbank cut rates while inflation subsided.

CBI theory can explain some of these developments, for example why inflation was lower in Germany than in the US, and why the UK had higher inflation than both. But it cannot explain *when* the disinflations occurred. In all three cases, political events brought about the disinflations: the 1979 election in the UK; the Free Democrats switching allegiance to the Christian Democrats; and the markets forcing Volcker on Carter, with Volcker receiving parsimonious support from Reagan afterwards. If politicians are meant to be the problem, CBI theory has little to say about them.

These case studies also suggest two new theories. Looking to the UK experience, the first theory is that class division exacerbates inflation problems. This is partly due to the cost-push effects of wage increases, but is also due to a winner-takes-all approach to policy, rather than a stable, longer-term method. The second theory looks especially to the US experience, where the disinflation was conducted by the central bank while fiscal policy was expansionary. The theory is that CBI is a predictor of *who* will disinflate. Unlike growth, the costs and benefits of inflation cut across a society differently. In most cases, cutting inflation at the expense of growth will not produce a universal gain for a leader. The best circumstances under which a leader can conduct a disinflation but distance themselves from it is if it is managed by a legally independent central bank.

Chapter 5 – Inflation and the economic vote

This chapter partners Chapter 4. If there was a political drive to disinflate in developed countries, then one way of corroborating this would be to examine whether there was a direct link, such as a correlation between inflation and the vote. The chapter seeks to explain the government vote in elections in 22 developed countries from 1956 to 2009.

The literature on the economic vote got under way in the 1970s, when inflation, output, and the relationship between them were headline issues. Accordingly, papers on the economic vote found a correlation between inflation and the vote for the government. These days, however, papers rarely include inflation as an independent variable. This is presumably because a correlation with the government's vote is absent.

The key innovation of the paper is to divide elections into four categories and to test for variation across them. The categories are determined by clarity of responsibility and future time reference (clear/unclear and strong/weak). Since Powell and Whitten (1993), many papers have sought to analyse an economic vote in the context of whether there is clarity of responsibility; that is whether the government has sufficient control so that it makes sense to hold it accountable for economic performance. The chapter measures it by whether the government was in coalition or not.

The concept of future time reference is based on linguistic relativity, which is the idea that the structure of language is correlated with different ways of thinking and making decisions. Some languages such as English and French have strong future time reference and clearly mark the future tense, for example "it *will* rain tomorrow". Other languages such as German and Japanese have weak future time reference and mark the future by context, a rough translation being "it rains tomorrow." The intuition is that a speaker of a language with strong future time reference will differentiate the future more and discount it more, leading to poorer long term decisions. For example, Chen (2013) found that speakers of languages with weak future time reference saved more and made better health decisions.

These two distinctions are expected to be relevant to the economic vote. Firstly, an economic vote is expected where there is clarity of responsibility. Secondly, countries with weak future time reference would be expected to be concerned about long term stability, and therefore place significant weight on inflation. High or unpredictable inflation would compromise or threaten their savings. So while elections in both the clear strong and clear weak categories might respond to output or employment, the chances of an inflation response would be higher in the clear weak category.

Interestingly, elections tended to fall into two categories. Countries whose main language had strong future time reference tended to have elections with clarity of responsibility. Where a country's main language had weak future time reference, their elections tended not to have clarity of responsibility; that is they usually had governing coalitions. This arrangement produces policy stability because more parties share power more often. "Winner take all,"

which occurs more often in countries where the main language has strong future time reference, is correlated with large policy swings. This may be a chance effect, or it is possible that voters prefer policy stability where the main language has weak future time reference.

Statistical tests confirmed that the four categories usually behave differently. For example, the coefficient for the government's previous vote, when the government's current vote is regressed on to it, is over 0.8 for the two unclear categories, but this coefficient in the clear strong category is 0.61. A variable for the real economy (real per capita growth less unemployment) is statistically significant for the clear strong category, but in none of the other categories, and so on.

This real economy variable is an important new development. It performs better across the four categories than unemployment, growth, or benchmarked growth (a comparison of a country against an international benchmark, in this case the median). It is also a justifiable approach because it measures both point in time and movement over time, similar to how corporations are evaluated by a statement of financial position (point in time) and a statement of financial performance (over time).

Another new finding from the chapter is the interesting behaviour of the coefficients for the dummy variable of an early election (measured as occurring six months or more before the scheduled date). In the clear categories, this variable is never statistically significant. Since these governments are not in coalition, they can choose their election date, presumably for electoral benefit. The lack of statistical significance for this variable suggests that the electorate perceives the tactic and there is no benefit to the government. In the unclear strong category the coefficient was negative and statistically significant and in the unclear weak category it was positive and statistically significant. The proposed explanation here is that the electorates are making a judgement about how the government parties have managed their coalition. In the unclear weak category, electorates prefer stability so they also prefer governments to run their full term. The positive coefficient here may be a way of penalising all other parties (except the lead government party) for destabilising conduct. In the unclear strong category, an early election may be perceived as the lead government party's inability to manage the coalition, or as a sign of weakness, with the appropriate penalty.

Returning back to the thesis, the important result is that the government vote in the clear weak categories varies inversely with benchmarked inflation; that is, how a country compares against an international benchmark (in this case the median). No other category shows an inflation effect. Concluding, it is not possible to say there was a universal voter backlash against inflation

in developed countries; only three of the 22 countries in the study had the majority of their elections in this category (Norway, Sweden and Japan). So if we believe there was a political backlash against inflation in developed countries, then it occurred through some other mechanism than elections, such as through elites.

Chapter 6 – The correlation between inflation and CBI

The classic case of CBI delivering low inflation is developed countries in the 1970s and 1980s. Indeed, after conducting a meta-analysis in 2010, Klomp and de Haan found that studies were most likely to find a correlation between CBI and inflation when they covered OECD countries in the 1970s. This chapter conducts a study of the variables that are correlated with inflation for 21 OECD countries from 1973 to 1990, in other words when a correlation between CBI and inflation is most likely.

A key issue in studies of CBI and inflation is whether CBI is endogenous and how to manage it (Fernandez-Albertos 2015). The chapter initially regresses CBI on cultural, political and institutional ("secondary") variables and finds that strong bicameralism and a hyperinflation experience are correlated with various CBI measures. These are used as instruments in 2SLS regressions.

Inflation was regressed on a range of CBI measures, lagged inflation, economic variables, and secondary variables. Starting with the largest effect size, the variables with a robust correlation with inflation were: past inflation, real growth, a decreasing time trend, oil prices, and currency shifts. The chapter shows that inflation was very much correlated with economic variables. The exception was the annual trend variable, which had a coefficient of -0.16. This reflects policy learning or shifting expectations over the 18 year study period.

The best performing CBI variable was the composite measure from Franzese (1999). It was statistically significant and was negative in OLS regressions with lagged inflation, and economic variables and lagged inflation. It performed similarly in a 2SLS regression with lagged inflation. However, it became positive in a 2SLS regression with lagged inflation and economic variables. It was not statistically significant in OLS or 2SLS regressions with lagged inflation, economic and secondary variables. All the other measures of CBI fared worse.

One observation from the chapter is that the effect size of CBI is small. In the regressions, its coefficient was usually between -2 and -3, which we will set at -2.5 for the sake of argument. This is for a variable that is measured between 0 and 1 and has a standard deviation of 0.15. If a meaningful shift in the variable were 0.5, for example, then a high level of CBI would have

decreased a country's inflation during the 1970s and 1980s by 1.25 per cent. During the Great Inflation, many developed countries had inflation rates over 10 per cent, compared with a typical target rate of 2 per cent. So at its best, CBI would have only made a marginal effect on inflation performance.

From the start, the CBI research program faced an uphill battle because, in the 1970s and 1980s, there were very few changes in countries' CBI measures. This produced cross-sectional variation with little time series variation. Therefore, researchers had a challenging task in separating out what were CBI effects and the extent CBI was transmitting the effects of other variables. After CBI changes in the 1990s, the study by Acemoglu et al (2008) had data with both time series and cross-sectional variation and found no correlation in developed countries between CBI and inflation. This chapter is consistent with their paper and, given these results, it is difficult to accept CBI as a credible theory.

Conclusions

There are two perspectives to the Great Inflation in the 1970s and 1980s. Technically, it was a failure because many developed countries came close to losing control of their currencies, despite enough economic theory being available to support good technical policy. But it was politically constructive because coalitions were forming to address inflation and the broader society was catching up to economic theory. This indicates the importance of political leadership, in particular the ability to accelerate the acceptance of technical solutions to a problem. The three case studies in this thesis demonstrated political leadership at various points.

One aspect of politics that is not often acknowledged is its role in unifying communities and harnessing human co-operation. People are social creatures. It is obvious that, all else being equal, a group that co-operates better will enjoy better outcomes. What this thesis proposes is that the co-ordination effect far outweighs the economic gains from better policy. The CBI literature, and much of economics and perhaps other fields, assume that societies will hold together when placed under the stress of technical reforms. The election of President Trump, and other populist episodes, cast doubt on this assumption.

The CBI solution to inflation attempts to force an analytical solution on a society that either hasn't made up its mind about inflation, or has a significant sector blocking change. The most likely outcome of a central bank "going it alone" will be similar to Arthur Burns' experience in

the US; doing what can be done but never really getting there. If the central bank goes too far, the institution or its leadership risk being replaced.

In countries with high levels of CBI, central banks become key players. Originally designed to address issues around government finance and the stability of the money supply, their central role in the economy – a financial factotum backed by government – has meant that they have been well-placed to take on other roles. Sometimes this has included financial sector regulation, but it has almost always included monetary policy.

Monetary policy has two important effects. By changing the supply of credit it affects economic activity, which can reduce inflation or prevent an asset price bubble. But, depending on what other countries are doing, it can also change demand for the home country's currency and therefore change its exchange rate. This affects how the country trades. It also affects the price of imports, which has inflation effects.

Unlike the universal good of increased growth, these effects impose simultaneous costs and benefits across a society. They also have political consequences, in particular expressed as the following questions: what should monetary policy aim to achieve; and who should be responsible for it? The first question has a substantial technical basis. The current consensus appears to be that long run price stability, of say 2 per cent annual inflation, is preferred, and activist policy that could deliver a boom/bust cycle should be avoided. This was the technical consensus for most of the post-war period, except for the 1960s.

The answer to the second question is much more political. The government of the day bears some responsibility for all policy outcomes, unless there is a clear reason why not. Delegation to a technical agency reduces this responsibility, but does not absolve a government from it. If poor outcomes persist, voters may expect the government of the day to wind up the agency or replace its leadership. Other factors could mitigate responsibility, for example if the government comprised a coalition (clarity of responsibility), if the issue involved overseas events, if the decision was obviously technical, or the decision was made by an agency with a long history of bipartisan activity in the field, such as the judiciary.

One day, monetary policy may be "obviously technical," but this is still some time off. Therefore monetary policy still has a political component, some of which will remain under delegation. Further, although many countries have electoral systems that regularly deliver coalitions, this is not guaranteed. So any government potentially has some responsibility for monetary policy.

Viewed from the perspective of political responsibility, CBI is implausible. So it should not be surprising that this thesis has found other problems across the CBI literature. Its assumptions do not think through the delegation decision. Delegation is also important for tackling endogeneity. This thesis has argued that CBI reflects, and is part of, many other social and institutional factors. Finally, CBI theory assumes that social cohesion will continue despite the implementation of unpopular policies.

Given the lack of evidence for a robust relationship between inflation and CBI, we should ask whether any theories can be substituted in its place. Riker (1980) argued that institutions do not necessarily block preferences, but that they slow down the convergence between outcomes and preferences. Therefore, CBI might be correlated with less variability in inflation. CBI might also lead to more stability in a finance sector, perhaps increasing the sector's output or employment. Finally, the comparative case study in this thesis raised the possibility that CBI increases the likelihood that disinflations will be conducted through monetary policy instead of fiscal policy. All these theories are worth pursuing.

CBI has generated a broad literature because it has combined so many interesting and important issues: whether politicians make good technical decisions, how technical agencies get created, what is good monetary policy, and the relationship between technical agencies and political leaders. Hopefully, this thesis has brought insight to some of them.

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