



# Central Bank Independence and Economic Performance: What Does the Evidence Show?

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## Summary

Keeping an economy growing over the long run at rates sufficient to provide full employment for labor and capital with low inflation or a stable price level has been an important goal for economic policy. Money and monetary policy have figured importantly in achieving this goal. Currently, it is argued, central bank independence is important to achieving this end.

Many small factors contribute to central bank independence, and so the literature does not yield a consistent definition of it. Rather, the emphasis is on three aspects of independence, the degree to which

- (1) the governing board of the central bank is isolated from the political process;
- (2) central banks can refuse to finance government budget deficits; and
- (3) price stability has primacy as the ultimate goal of central bank activity.

Various indices of central bank independence have been compiled and used in empirical work to see how closely independence is related to such important performance characteristics of an economy as the rate of inflation, the growth of output, investment, and real interest rates.

For industrial countries, central bank independence indices embodying definitions (2) and (3) appear to be closely related to low inflation and low variability of inflation without having any effect on output and its variability, investment, and real interest rates. In particular, factor (2) seems to be driving the results, and the various measures of factor (1) have a negligible effect, a finding that the authors tend to neglect. Since the Federal Reserve cannot directly finance the U.S. government, factor (2) is not an issue for Congress. However, the results obtained with an index embodying (3) are of relevance to the conduct of monetary policy in the United States. These results may be used to support efforts to redefine the objective of monetary policy to focus it exclusively on price stability.

Critics of these studies point to three major methodological problems and one empirical problem. First, causation may be opposite to that posited. The desire for economic stability, for example, may lead to independent central banks. Thus, causation should run the other way around (or it may run in both directions). Second, central bank independence may arise because an important and influential constituency in a democratic society favors low inflation. Thus, the ultimate reason why inflation is low in some countries is the strength of important constituencies who favor low inflation. And these studies fail to measure this pressure. In a sense, they have captured only the proximate reason for low inflation, not the ultimate reason. Third, questions have been raised about the way that the authors transform non-numeric characteristics of independence into quantitative results. Finally, the data on which some of these empirical estimates are based are tainted in the sense that the samples commingle observations from the fixed and flexible exchange rate periods. The performance of central banks is quite different in each regime regardless of how its stated objective reads. This report will be updated periodically.

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## Introduction

Keeping an economy growing at a rate compatible with the full utilization of resources over the long run in an environment in which price inflation is stable has been an age-old goal for macroeconomic policy. Monetary policy and the institutional arrangements for carrying it out have long been regarded as important to achieving this goal. Such has been the importance accorded money in this respect, that numerous monetary arrangements and policies have been proposed which, if adopted, their proponents argue, would make such a goal attainable. These arrangements include the gold standard, the real bills doctrine, a compensated dollar, 100% reserve requirement banking, a fixed growth rate rule for the money supply, a bimetallic standard, a currency board, free floating exchange rates and inflation targeting, to name but a few in what Professor Stanley Fischer has called “the unending search for monetary salvation.”<sup>1</sup> The current policy prescription in fashion among economists that promises to promote such a goal is termed central bank independence (hereafter CBI) which, although it has several possible definitions, has come increasingly to focus on institutional arrangements, as well as the central bank’s “mandate and ability to focus single mindedly on the attainment of price stability.”<sup>2</sup>

The high inflation in the western world in general during the 1970s, and the difference in the inflation experience of individual industrial countries which were, on the whole, subjected to similar external economic shocks, motivated some economists to investigate the possible linkage between the rate of inflation and the institutional and political arrangements governing the establishment and functioning of central banks. A major conclusion of these studies is that CBI is an important part of the explanation for why some countries have had much lower inflation rates on average than others. The more “independent” the central bank, these studies conclude, the lower tend to be the average rate of inflation and volatility of inflation experienced by that country. The reason for these results is that independence supposedly enhances the credibility of the central bank and increased credibility gives rise to reinforcing behavior via the expectations of economic agents, be they consumers, suppliers of labor and capital, or firms supplying output. Thus, shifts in central bank policy are transmitted more rapidly into changes in wages, interest rates, and prices and, thus, output and employment, than would be the case in the absence of strong credibility. A minority of the studies even claims that the better governance, lower inflation, and greater macroeconomic stability provided by CBI have a positive effect on economic growth.<sup>3</sup>

Some newer studies question the methodology underlying these results, and claim that the relationship between inflation and CBI is weaker than the early studies found. The evidence is mixed on whether central bank independence has a cost in terms of lower output growth or greater output variability.

These empirical studies have not gone unnoticed by policy makers. In some ways, the Federal Reserve is more independent than many of its peers. In other ways, it is less. For example, some studies have defined a price stability goal as enhancing independence, and there has been periodic

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<sup>1</sup> See Stanley Fischer, “The Unending Search for Monetary Salvation,” *NBER Macroeconomic Annual*, edited by B. Bernanke and J. Rotemberg, 1995, pp. 275-286.

<sup>2</sup> Alex Cukierman, “The Economics of Central Banking,” in Wolf Holger (ed.), *IEA, Contemporary Economic Issues - Macroeconomics and Finance*, vol. 5 (The MacMillan Press, 1998), pp. 37-82.

<sup>3</sup> For a more complete discussion of the theory behind central bank independence, see CRS Report RL31056, *Economics of Federal Reserve Independence*, by (name redacted).

congressional interest in giving the Fed such a goal<sup>4</sup>. If CBI proponents are correct, the Fed's independence could be enhanced at little cost and much benefit to the U.S. economy.<sup>5</sup>

## The Inflation Prone 1970s

As **Table 1** shows, the decade of the 1970s stands out in the post-World War II era as one of especially high inflation, although the inflation experience of individual countries is by no means similar even though they were as a group subjected to a similar range of external economic shocks, especially the two major increases in world oil prices.

The differences in average inflation rates among these nations motivated a number of economists to investigate the possible role played by the institutional and political arrangements governing the establishment and functioning of central banks, since increases in the supply of money are an essential element in explaining inflation.<sup>6</sup>

**Table 1. Average Annual Inflation Rate in the Industrial Countries, 1950-2006**

(data in percentages)

	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2006
United States	1.8	2.3	7.1	5.6	3.0	2.8
United Kingdom	3.5	3.6	12.6	7.4	3.7	1.5
Austria	6.8	3.3	6.1	4.0	2.4	1.9
Belgium	1.9	2.7	7.1	5.1	2.2	2.1
Denmark	3.8	5.3	9.3	7.1	2.1	2.1
France	6.2	3.8	8.9	7.8	1.9	2.0
Germany	1.1	2.4	4.9	2.9	2.3	1.7
Italy	2.9	3.4	12.5	11.8	4.1	2.5
Netherlands	3.8	4.2	7.1	3.1	2.5	2.6
Switzerland	1.1	3.1	5.0	3.3	2.4	1.0
Canada	2.4	2.5	7.4	6.7	2.2	2.3
Japan	3.1	5.4	9.1	2.5	1.2	-0.4
Greece	6.5	2.0	12.3	20.1	11.1	3.4
Ireland	3.9	4.0	12.7	9.9	2.3	3.6
Portugal	0.7	4.0	17.1	18.2	6.0	3.1
Spain	6.2	5.8	14.1	10.6	4.2	3.3

<sup>4</sup> See CRS Report 98-16, *Should the Federal Reserve Adopt an Inflation Target?*, by (name redacted) and (name redacted); and CRS Report RL31702, *Price Stability (Inflation Targeting) as the Sole Goal of Monetary Policy: The International Experience*, by (name redacted) and (name redacted).

<sup>5</sup> With its focus on the relevance of the research to domestic monetary policy, this report will not review the empirical evidence on the effects of central bank independence in the developing world.

<sup>6</sup> Most of the studies reviewed in this report were carried out before the founding of the European Central Bank in 1999, which greatly reduced the number of advanced countries with an independent monetary policy.

	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2006
Australia	6.5	2.5	9.8	7.6	2.5	3.3
New Zealand	5.0	3.2	11.4	12.5	2.0	2.7
Mean	3.7	3.5	9.7	8.1	3.2	2.2
Standard Deviation	1.99	1.08	3.28	5.04	2.17	0.96

**Source:** For 1950-1989: Consumer prices compiled by the International Monetary Fund and reported in Grilli, Masciandaro, and Tabellini. *Political and Monetary Institutions and Public Financial Policies in the Industrial Countries. Economic Policy*. October 1991, p. 344. For 1990-2006: Consumer Prices compiled by International Monetary Fund. Statistical computations made by CRS.

If central banks (hereafter CBs) played an important role in the differences in national inflation rates, they did so for one of two reasons, according to the theoretical literature that was developed at the time. An inflationary bias on the part of CBs was attributed either to a requirement that they provide government with revenue (via the inflation tax) or to a desire on the part of the government to reduce unemployment through a monetary surprise or unanticipated shock. Since the United States government derives very little revenue from the inflation tax, any inflation bias on the part of the Federal Reserve must be attributed to a desire by the government to reduce unemployment.

It is widely believed that a short run tradeoff exists between inflation and unemployment, known as the Phillips curve. The ability of monetary policy to reduce unemployment in the short run is a well known fact amply demonstrated in the United States and elsewhere. It is generally attributed by economists to the shift in policy being a surprise or unexpected event, since anticipated monetary changes would have been incorporated into wage and price expectations. Since it is also widely believed by economists that the employment effects of such monetary surprises are only temporary, their longer run consequence is a higher inflation rate.<sup>7</sup> Hence, central banks that try to exploit the tradeoff described by the Phillips curve, for whatever reason, will impart an inflationary bias to their national economies.<sup>8</sup> From an economic point of view, cycles produced by monetary surprises are suboptimal and this serves to underpin policy designed to create and fortify bank central independence devoted to stability. CBI proponents believe that independent central banks were less likely to attempt to exploit the Phillips curve tradeoff, and would provide their economies with lower inflation rates as a result.

## The Methodology of the Studies

The basic methodology of the academic studies involves the use of linear regression which is a statistical technique that attempts to estimate mathematically how important central bank independence and various parameters of that independence are to such important indicators of

<sup>7</sup> This suggests that the longer run Phillips curve is vertical—that no permanent tradeoff exists between unemployment and the rate of inflation.

<sup>8</sup> It is believed by some that such a bias exists in the United States. A theory of political business cycles has come into existence and claims that the U.S. government has influenced Federal Reserve policy such that prosperous economic conditions are engineered to coincide with presidential elections in order to favor incumbents. For a discussion of the political business cycle literature, see Thomas Willet, ed., *Political Business Cycles*, Duke University Press, 1988.

economic performance as the rate of inflation, the variability of inflation, the growth rate of output, the variability of the growth rate of output, and real interest rates.<sup>9</sup>

To make such computations, the above definitions of central bank independence must be turned into something that can be measured.

## **A Measurable Definition of Central Bank Independence**

The major studies that have attempted to measure CBI, with an objective of constructing a ranking of CBs by the degree of their measured independence, begin by looking at the legal provisions of their charters. They do so because the charter is supposed to set forth what its framers intended. Thus, the charter usually specifies the policy objective or objectives of the CB, the procedure for the appointment of the governor or governing body of the CB, the period of tenure of these officials, the conditions under which they can be removed, the procedures for resolving conflicts between CB officials and political authorities, and the monetary instruments under the control of the CB.

### **Bade and Parkin (1985)**

Bade and Parkin (hereafter BP) is the first study to construct a CBI index.<sup>10</sup> They defined what they call the **financial** and **policy** characteristics of CB charters. As shown below, the less influence the government has on the CB, the higher is the rank given that CB. The scale for each of the two sets of characteristics runs from 1 to 4. They use a sample of 12 countries in their study.<sup>11</sup>

The four financial characteristics are the following:

1. Government approves the budget of the CB, determines the board members' salaries, and the allocation of its profits;
2. The CB determines its own budget allocations, but the government determines the board members' salaries and the allocation of its profits;
3. The CB determines its budget and board members' salaries while the allocation of its profits are determined by statute; or
4. The CB determines its budget, board members' salaries, and profit allocation.

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<sup>9</sup> A more complete, but elementary explanation of "linear regression" is given in the **Appendix**. There, one will also find an elementary explanation of "statistical significance" and "goodness of fit or  $R^2$ ." An appreciation of all three will aid in understanding what these studies accomplish.

<sup>10</sup> See Robin Bade and Michael Parkin, *Central Bank Laws and Monetary Policy*, mimeo, University of Western Ontario, 1985. This study remains unpublished. The index contained in the discussion above is taken from Michael Parkin, "Domestic Monetary Institutions and Deficits," in *Deficits*, edited by Buchanan, Rowley, and Tollison, Basil Blackwell, (London: 1986), p. 310-331.

<sup>11</sup> In terms of **Table 1**, BP exclude from consideration the CBs in Austria, Denmark, Greece, Ireland, Portugal, Spain, and New Zealand. They include Sweden in their sample, a country that is not included in **Table 1**.

The four policy characteristics are the following:

1. The government is the final policy authority, has officials on the CB board, and appoints all board members;
2. Like (1) but with no government officials on the CB board;
3. The CB is the final policy authority, but all appointments to the CB board are made by the government; or
4. Same as (3) except some appointments to the board are made independently of the government.

The German and Swiss CBs are the most independent CBs in their sample. They give each a 4 rating for the financial and policy characteristics of their charters. They give the U.S. Federal Reserve a financial rating of 2 and a policy rating of 3.

### **Grilli, Masciandaro, and Tabellini (1991)**

Grilli, Masciandaro, and Tabellini (hereafter GMT) construct two CBI indexes, which distinguish between the political and economic independence of CBs.<sup>12</sup> They define political independence to mean the ability of the CB to define its policy objectives free from government influence. Any institutional or legal feature or custom that enhances this ability increases the political independence of the CB. Economic independence is defined to mean that the CB has the freedom to choose the instruments with which to pursue its final goal or goals.

Their index of political independence gives equal weight to eight factors. The maximum score a central bank can obtain is eight, which requires a “yes” answer to each question. Such a score suggests a highly independent CB, according to GMT. The eight questions are

1. Is the CEO of the CB appointed by a body other than the government?
2. Is the CEO’s term more than five years?
3. Are the other governing board members appointed by a body other than the government?
4. Are their terms for more than five years?
5. Is there an absence of mandatory provisions for government representatives to serve on the governing board?
6. Is there an absence of a requirement that the government must approve monetary policy?
7. Is there a provision that the CB pursues a goal of price stability?

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<sup>12</sup> Vittorio Grilli, Donato Masciandaro, and Guido Tabellini, “Political and Monetary Institutions and Public Financial Policies in the Industrial Countries,” *Economic Policy*, October 1991, p. 342.



8. Are there charter provisions that strengthen the CB's position in conflicts with the government.

They give the U.S. Federal Reserve a score of 5 out of a possible 8 (the reason being that “no” answers are given to the first three questions). Both the German and Dutch CBs get a rating of 6, the highest, while the Swiss CB gets a 5.

Seven factors, each also given an equal weight, are used to measure the degree of economic independence and they are heavily dependent on the degree to which the CB is obliged to finance government budgets. Briefly, five of the seven factors are the degree to which direct credit to the government is not automatic, given at market interest rates, for temporary periods of time, and in limited amounts; whether the CB does not participate in the primary market for public debt, and whether the CB can set its own discount rate. The other two factors are related to the regulatory obligations of the CB. According to this index, the Federal Reserve obtains a score of 7 (as do the CBs of Switzerland, Germany, and Canada).

### **Cukierman; Cukierman, Webb, and Neyapti (1992)**

A more complex set of indexes has been developed in several papers by Cukierman; Cukierman, Webb, and Neyapti (hereafter CWN); and Cukierman and Webb.<sup>13</sup> The first index these authors compile consists of 16 legal characteristics taken from CB charters and involves both political and economic factors. These sixteen characteristics are, in turn, grouped into four clusters related to the appointment, dismissal and legal term of the CB's CEO; the institutional location of the final authority for monetary policy and procedures for resolving conflicts between the CB and government; the degree to which price stability is the primary objective of policy; and the limits that restrict government from borrowing from the CB. The individual components are not equally weighted and each country's CB receives an overall rating in the index that falls between 0 and 1. It is possible to separate this complex index into various subindexes that correspond closely to the distinction made by GMT between political and economic independence, a separation that is, in fact, made by CWN for computation purposes.

The United States ranks as the fifth most independent bank on their index, out of 21 advanced economies. The Germans and Swiss are most independent in their index as well. Areas in which the United States is ranked as lacking independence include the relatively short term of the chairman, the executive branch's ability to unconditionally dismiss the Fed's chairman, the multiple goals of Fed policy, the Fed's lack of influence over the government budget process, and the Fed's ability to buy government securities on the primary market. It is useful to note that while several of these factors are legally allowed, they are unlikely to ever occur in practice. This is a drawback of indices based on the legal code—statute may not correspond with practice.

The legal nature of the charter may not be the ultimate measure of CBI. In the words of Prof. Cukierman: “The basic objective difficulty in characterizing and measuring CB independence is that it is determined by a multitude of legal, institutional, cultural, and personal factors, many of

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<sup>13</sup> See Alex Cukierman, *Central Bank Strategy, Credibility, and Independence: Theory and Evidence*, The MIT Press, 1992. Alex Cukierman, Steven B. Webb and Bilin Neyapti, “Measuring the Independence of Central Banks and Its Effect on Policy Outcomes,” *The World Bank Economic Review*, vol. 6, no. 3, 1992, pp. 353-398, and Alex Cukierman and Steven Webb, “Political Influence on the Central Bank: International Evidence,” *The World Bank Economic Review*, vol. 9, no. 3, 1995, pp. 397-423.

which are difficult to quantify and some of which are unobservable to the general public.” Hence, CWN compile a second index based on a survey of the opinion of monetary experts in CBs about the true nature of the independence of their institutions.<sup>14</sup>

As a third CBI index, CWN use the turnover rate of CB CEOs, and Cukierman and Webb use such an index in a political context relating turnover to major political changes. This index is thought to be more illustrative in the developing world, since frequent turnover in the advanced economies is rare.

## **Debelle and Fischer (1994)**

Debelle and Fischer (DF) disagree semantically with the CBI literature, and devise their own variation on the GMT index.<sup>15</sup> Recall that one aspect of GMT’s definition of political independence is the presence of a price stability goal. DF argue that defining a price stability goal as enhancing independence is inconsistent. By imposing a strict and measurable goal on the central bank, the government restricts the CB’s latitude to shape monetary policy as it sees fit. Put another way, if the CB decided that temporarily directing monetary policy at growth rather than inflation was in the nation’s interest, under a price stability goal, it would not be “independent” to pursue that goal. The rest of the literature (with the exception of DF) argues that a price stability goal enhances independence by giving the CBs an institutional buffer against political interference in pursuit of “monetary surprises.” Nevertheless, the definition of a price stability goal as an aspect of political independence is well-established and consistently used in the CBI literature and will be adhered to in this report.

Because of their disagreement with GMT, DF create their own CBI index consisting of three parts. They use a *political independence index* based on the GMT definition of political independence excluding the price stability goal. The price stability goal is placed in its own index called goal independence. In contrast to the rest of the literature, they define a CB as having *goal independence* if there is no price stability goal, and lacking goal independence if price stability is the sole goal of monetary policy. They make no effort to measure other factors that could deprive a CB of goal independence, such as a fixed exchange rate regime, although they acknowledge that such factors would have that effect.

The third part of the DB index is referred to as *instrument independence*. They describe instrument independence as meaning that the CB can achieve its ultimate goal or goals in any way it chooses, whether the government or the CB has assigned those goals. Thus, for example, it could exercise discretion in how rapidly the money supply was permitted to grow or it could fix interest rates at whatever level it thought was necessary. It would not be obliged to finance the government (a common constraint on many central banks), follow a fixed rule for increasing the money supply, keep interest rates low, or maintain a fixed exchange rate.<sup>16</sup> They use GMT’s

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<sup>14</sup> A limitation of this index is that it applies only to the decade of the 1980s, whereas the index computed from their analysis of the legal charters of the CBs is available on an aggregate and decade by decade basis for the period 1950-1989.

<sup>15</sup> See Guy Debelle and Stanley Fischer, “How Independent Should a Central Bank Be?” in J. Fuhrer editor, *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, Federal Reserve Bank of Boston Conference Series No. 38, 1994, pp. 195-225.

<sup>16</sup> There has been a longstanding debate among economists over whether monetary policy should be conducted on the basis of discretion or rules. In a broader sense, the desirability of central bank independence must be seen in the context of this debate.

*economic independence* index, excluding factors related to the CB regulatory duties, as their measure of instrument independence. Curiously, this measure of instrument independence relates to only two of the factors they mention: the CB's freedom to set interest rates and the absence of a requirement that the CB finance the government's budget deficit.

While goal and instrument independence (as well as political and economic independence) are conceptually distinct, there are circumstances in which if one is mandated the other is mandated as well. One could not, for example, impose a goal of price stability on a CB while simultaneously imposing on it a requirement to finance a government budget deficit. It would also be illogical to impose on a CB the requirement that it keep the money supply growing at a constant percent per year or to keep the exchange rate constant vis-a-vis other currencies while requiring it to finance a budget deficit.

**Table 2. Measured Independence of Key Central Banks: A Comparison of Studies**

	<b>Bade and Parkin (most independent=4)</b>	<b>GMT (most independent=16)</b>	<b>Cukierman (most independent=1)</b>
United States	3	12	0.48
United Kingdom	2	6	0.27
Austria	n/a	9	0.61
Belgium	2	7	0.17
Denmark	2	8	0.50
France	2	7	0.24
Germany	4	13	0.69
Italy	1.5	5	0.25
Netherlands	2	10	0.42
Switzerland	4	12	0.64
Canada	2	11	0.45
Japan	3	6	0.18
Greece	n/a	4	0.55
Ireland	n/a	7	0.44
Portugal	n/a	3	0.41
Spain	1	5	0.23
Australia	1	9	0.36
New Zealand	1	3	0.24

**Source:** Alesina and Summers (1993), Grili, Masciandaro, and Tabellini (GMT, 1991), Cukierman, Webb, and Neyapti (1992)

**Note:** Bade and Parkin ranks as measured by Alesina and Summers (1993). GMT index is sum of political index and economic index.

## What Does the Evidence Show?

The literature on central bank independence is extensive. The discussion below is not comprehensive, but focuses on a few of the key papers in depth to give a flavor for the literature as a whole. It concludes with the results of two literature reviews that give an overview of the literature's general findings.

### Bade and Parkin (1985)

BP used both their Financial and Policy indexes, compiled for 12 CBs and covering the period 1955-1983, in their pioneering study of the effect of CBI on inflation.

The major conclusion of this study is stated by Parkin:

“In studying the relationship between central bank types and inflation performance it was discovered that just one of the central bank categories stands out as delivering significantly different—and lower—inflation than the others. This is a policy type 4—central banks that are independent in the two senses that the central bank is the final monetary authority and has power to make some of the Board appointments (Germany and Switzerland). Differences in financial types are in no significant way associated with differences in inflation performance and variations over the first three policy types are also associated with no significant differences in inflation behavior.”<sup>17</sup>

The study established that Switzerland and Germany, the only two policy type 4 countries, have an average inflation rate that was less than half as high as the other 10 countries in their sample. While these results are interesting and served to kindle research in this topic, they should be read with great care. In establishing their results, BP commingle observations from two different international exchange rate regimes. The relevance of this factor is discussed in the *Methodological Criticisms* section below.

### Grilli, Masciandaro, and Tabellini (1991)

GMT compute the degree of political and economic independence, as defined above, for each of the 18 countries listed in **Table 1**.<sup>18</sup> The scatter of observations for each measure of independence becomes the data set for the two independent variables used in their regressions. The dependent variable is the average inflation rates for these same countries. Individual regressions are computed on data averaged over the decades of the 1950s, 1960s, 1970s and 1980s and for the entire period 1950-1989.

They find that their measure of economic independence is inversely related to average inflation rates in a statistically significant way during the decade of the 1970s and 1980s and over the entire period 1950-1989. Political independence is inversely related to inflation over all four periods and the entire period, but it is only statistically significant over the decade 1970-1979.

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<sup>17</sup> Michael Parkin, “Domestic Monetary Institutions and Deficits,” in *Deficits*, edited by Buchanan, Rowley, and Tollison, Basil Blackwell (London: 1986), p. 321.

<sup>18</sup> See Vittorio Grilli, Donato Masciandaro, and Guido Tabellini, “Political and Monetary Institutions and Public Financial Policies in the Industrial Countries,” *Economic Policy*, October 1991, pp. 342-392.

The authors interpret these results to mean that since the degree of central bank independence is negatively related to the average rate of inflation in a statistically significant way, “monetary institutions matter.”

Although this general conclusion may be true, the GMT results must be interpreted carefully. Those from the entire period, 1950-1989, are of questionable value because, like the Bade and Parkin results, they are derived from data taken from two quite different international exchange rate regimes, the Bretton Woods regime of fixed exchange rates and the subsequent era of floating exchange rates (for a discussion, see the section on methodological criticisms). It is interesting in this respect that the GMT results show that neither economic nor political independence is statistically significant in explaining the inflation performance of the 16 countries in their sample during the decades 1950-1959 and 1960-1969. This is what one might reasonably expect during the fixed exchange rate era.

Contrary to the conclusion of the authors, the results for 1970-1979 and 1980-1989 suggest that the inflation performance of these countries is not so much related to the policy goal and methods of choosing CB governors and their terms of office (their measure of political independence) as it is to the requirement that the CB not be used to finance the government’s budget deficit, their measure of economic independence. The political independence variable is not statistically significant for the 1980-1989 period and is only weakly significant for the 1970-1979 period.<sup>19</sup> Thus, regardless of the CB’s degree of political independence, countries that maintain reasonable budget balance or have good prospects of financing their budget deficits from private saving, may remove the pressures from their CBs, making it possible for the CBs to concentrate monetary policy on achieving low inflation.<sup>20</sup>

One aspect of the GMT inflation-CB independence results is of interest. They are able to explain a high proportion of the difference in the inflation experience of their sample group of countries with their central bank independence variables. For the decades of the 1970s and 1980s, the R-squared ranged from .66 to about .75 (and for the period 1950-1989, nearly .8).

The reason this result is interesting is that increases in the supply of money are widely acknowledged to be the proximate cause of inflation since a continuous rise in the price level, the essence of inflation, is generally only possible with a continuous rise in money growth relative to the growth of output. If the degree of central bank independence is the ultimate cause of inflation,

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<sup>19</sup> Being weakly significant means that one is willing to set the risk of accepting as true a false hypothesis at something above 5 chances in 100.

<sup>20</sup> The conclusions of the GMT study are derived from a comparison of data over a number of years on their measures of central bank independence and various measures of economic performance. This same conclusion on the relationship of central bank independence and the control of inflation has been derived from considering several episodes of hyperinflation. Each of the episodic studies cited below concluded that an important reason for the successful stabilization of the affected economies was a provision in the stabilization law that central banks not be used to finance governments and the faithful adherence by these governments to that law. See Thomas Sargent, “The End of Four Big Inflation,” in *Inflation Causes and Effects*, edited by R. Hall, University of Chicago Press, (Chicago: 1982), pp. 41-97; William Bomberger and (name redacted), “The Hungarian Hyperinflation and Stabilization,” *Journal of Political Economy*, vol. 91, no. 5, October 1983, pp. 801-824; (name redacted), “The Greek Stabilization of 1944-46,” *American Economic Review*, vol. 74, no. 5, December 1984, pp. 1067-1074; and (name redacted) and Thomas Woodward, “The Taiwanese Hyperinflation and Stabilization of 1945-1952,” *Journal of Money, Credit, and Banking*, vol. 21, no. 1, February 1989, pp. 90-105. From the perspective of these earlier episodic studies, the present work on central bank independence and low inflation has little to offer that is new.

these regressions are able to explain a great deal. The evidence adduced by some other investigators reported below is not this strong.

A final aspect of their work that has attracted attention is that central bank independence has no adverse effects on the crucial performance parameters of the economy. The improved inflation performance that supposedly comes with CB independence does not come at a cost of lower output growth or greater variation in that growth for both measures of CB independence are statistically insignificant in explaining both these parameters of performance (see their table 16, p. 374).

## **Alesina and Summers (1993)**

Alesina and Summers (hereafter AS) create an index that is a combination of the BP policy index and the two indexes of GMT.<sup>21</sup> The GMT combined index of political and economic independence for each CB is converted to the BP range of 1 to 4 and is then averaged with the BP Policy index for that same central bank to produce the AS index of central bank independence. The U.S. Federal Reserve rates a 3 on the BP Policy index, a 12 on the combined GMT index, and a 3.5 on the AS index.<sup>22</sup>

Alesina and Summers use a sample of 16 developed countries (virtually the same sample as that in **Table 1**) with data spanning the period 1955-1988. They conclude: "... the monetary discipline associated with central bank independence reduces the level and variability of inflation but does not have either large benefits or costs in terms of real macroeconomic performance."<sup>23 24</sup>

These conclusions are drawn from a series of scatter diagrams, one for each measure of economic performance. The variable common to each scatter diagram is their CBI index. The index they use, as explained above, is a combination of the BP policy index and the sum of both of the GMT indexes converted to a BP scale of 1 to 4.

As with the previous study, it is possible to argue that the conclusions drawn by AS are at best tentative in nature. This is so for several reasons. First, these results are established by looking at scatter diagrams. There is no attempt to control for other factors that could be driving the results.

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<sup>21</sup> See Alesina, Alberto and Summers, Lawrence H. Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence. *Journal of Money, Credit, and Banking*, vol. 25, no. 2, May 1993, pp. 151-162. Some of the empirical work in this paper is based on the update of the BP index made by Alesina to include additional countries. See his *Macroeconomics and Politics in NBER Macroeconomics Annual for 1988*, edited by Stanley Fischer (Cambridge, MIT Press, 1988), pp. 17-52.

<sup>22</sup> These various indexes are highly correlated with each other. Work by Posen shows that the rank correlation coefficients of the BP, GMT converted to a BP scale, and the AS indexes to the Cukierman index are, respectively, .65, .62, and .62 (on a scale of -1 to +1). See Adam Posen, "Central Bank Independence and Disinflationary Credibility: A Missing Link," *Federal Reserve Bank of New York Staff Reports*, no. 1, May 1995, p. 34.

<sup>23</sup> Meaning that CBI has little or no effect on average real GNP growth, the variance of real GNP growth, average per capita GNP growth, the variance of per capita real GNP growth, average unemployment, the variance of unemployment, the average real interest rate and the variance of real interest rates. While these findings suggest no longer run relationship between CBI and these measures of performance, the finding of Posen (1988) (see below) is of interest: CBI apparently does not lead to an improved disinflation performance.

<sup>24</sup> This latter finding is important because it supports a fundamental proposition of economics, the so-called *neutrality* of money. This is the view that changes in the growth rate of money can affect real variables such as income growth and unemployment in the short run, while in the longer run it affects only the rate at which the price level and nominal wages rise and the level of market interest rates.

No empirical evidence that the posited relationships are statistically significant is presented. Even if they are significant, there is no evidence presented about the importance of CBI to the measures of economic performance.<sup>25</sup> Second, the data are averaged across exchange rate regimes. As noted above, the constraints placed on CB behavior by a fixed exchange regime are quite different from those placed by a flexible rate regime. Third, since AS use the combined GMT index, and GMTs measure of economic independence dominates that index, their results may be showing that a constraint placed on CB financing of government is the important factor explaining the behavior of their measures of economic performance; more so than those elements, for example, that are designed to isolate the governing boards of CBs from political interference. It may well be a misstatement to conclude, as they do, that greater CBI is conducive to low inflation without any deleterious effect on other characteristics of economic performance. A more qualified statement focusing on constraints placed on CB lending to governments may be more consistent with their evidence.

### **Cukierman, Webb, and Neyapti (1992); Cukierman, Kalaitzidakis, Summers, and Webb (1993)**

This study is based on a very large sample of central banks conveniently grouped by the authors into those for industrial and those for developing countries. The group of industrial countries is similar to those listed in **Table 1** and used by BP, GMT and AS. The results reported below are only for the industrial subsample of central banks. The data apply to a combined period running from 1950 to 1989.<sup>26</sup>

The first test uses linear regression to explain the inflation behavior among the industrial countries in which the major explanatory variables are the disaggregated components of their first or legal CBI index and the turnover rate of CB CEOs, their third index.<sup>27</sup> Fearful that statutory CBI measured by their index may not be honored in practice, they hypothesize that the turnover rate for the central bank's CEO may give an indication of CBI in practice.<sup>28</sup> Not a single variable

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<sup>25</sup> The authors rely on scatter diagrams—they do not compute regressions. For that reason, we do not know if the relationship between CBI and inflation is statistically significant. That is, we do not know if the variance in the relationship renders it indistinguishable from zero. We also have no  $R^2$  measure. It may be, for example, that their measure of CBI is statistically significant in explaining the inflation behavior of these countries, but that it only explains a very small part of that behavior.

<sup>26</sup> Although their study covers both the floating and fixed exchange rate regimes, in a sense this factor is controlled for by including variables to capture differences in each decade.

<sup>27</sup> Actually, CWN do not use the inflation rate as the variable whose behavior they try to explain. Rather, they use a transformed variable that represents the rate of depreciation of money. The reason is that an average inflation rate for a group of countries can be distorted if one or several countries have very high inflation rates.

<sup>28</sup> This approach is further explored in Cukierman and Webb (1995). The approach in this study is to judge political influence by how closely political transitions of various types are related to the frequency and timing of changes in the CEOs of central banks. Given various assumptions about the length of time in which this occurs, Cukierman and Webb compute an index of the nonpolitical turnover of the CEO. In addition, an index of CB political vulnerability is also computed. The data cover a large number of countries during the period 1950-1989. Unfortunately, they do not run separate regressions for industrial and developing countries. They do try to control for developing countries by using a technique to enter them as a separate independent variable.

For the entire group of countries they find that both of the new indexes have a positive effect on the transformed inflation rate (see above for an explanation) as well as its variability. They also find that the fixed exchange rate period had a negative effect on the inflation rate (which is statistically significant). The overall  $R^2$  for these regressions ranged from .34 to .41. They also find that their two new measures of CB independence yield mixed results in explaining real economic growth. The results depend on the index and the size of the sample. Only the vulnerability index affects real (continued...)

in these two indexes is statistically significantly different from zero (at conventional 1% to 5% levels of significance).

However, when the measure of legal independence is entered in its aggregated form, it is statistically significant while the index of CEO turnover is not (at conventional levels).<sup>29</sup> This tells us that for industrial countries, the rate of inflation experienced by the group is negatively related to CWN's measure of CBI that is derived from the legal aspect of the bank's charters. (The  $R^2$ s for these regressions are in the .25 to .35 range.) As the authors conclude: "Laws do make a difference." But what laws do they have in mind? Those that ensure that the banks' governors are independent from political influence or those that circumscribe lending by the CB to the government or various firms and enterprises? Or both? Actually, it turns out to be those associated with lending to the government.

CWN take from the legal index those components pertaining to limits on CB lending to the government or to various firms and enterprises. This subindex is similar to the GTB index of economic independence. After additional regressions, they conclude that this subindex drives the result for the industrial countries. "The other components of the legal independence variable—CEO, policy formation, and objectives—do not make any significant contribution to explaining inflation (in industrial countries)." In this regard their findings are similar to those of GBT for a smaller sample of developed countries. Unfortunately, they provide neither the coefficient value of this variable nor the  $R^2$  of the equation. They do tell us that the variable is statistically significant, however.

As an additional test, CWN explore what relationship exists between inflation variability (or uncertainty) and CBI.<sup>30</sup> For the industrial countries, neither the aggregated legal CB index or the turnover rate of CB CEOs is statistically significant at conventional 1% to 5% levels of significance.

The basic study by CWN has been extended by Cukierman, Kalaitzidakis, Summers and Webb to investigate the effect of central bank independence on other performance indicators of the economy: output growth, investment, and real interest rates. They find that neither the legal independence index nor the index of CB CEO turnover helps explain the variations in growth rates over the period 1965-1989 within this group of industrial countries. They do find, however, that the legal independence index has a significant negative effect on the variability of real interest rates and, if Ireland is excluded from the sample, a significantly positive effect on the level of real interest rates. The last result is contrary to expectations. The authors speculate that it

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(...continued)

interest rates; the  $R^2$ , however, is only 0.05. See Alex Cukierman and Steven B. Webb, "Political Influence on the Central Bank: International Evidence," *The World Bank Economic Review*, vol. 9., no. 3. 1995, pp. 397-423.

<sup>29</sup> It may seem curious that disaggregated components of an index may not be statistically significant when each is treated as an independent variable, yet they can still be significant when combined and entered as a single independent variable. This may happen if the individual components of an index are themselves highly correlated. An assumption of linear regression is that the independent variables are not themselves correlated. When they are, the statistical significance of the individual independent variables can be reduced (a problem known as multicollinearity). If serious, the variables can appear to be statistically insignificant when they are, in fact, statistically significant. This is apparently what has occurred here.

<sup>30</sup> Generally, economists suppose that a more variable inflation rate is correlated with higher inflation rates. And more variability creates more uncertainty among economic agents and it is this greater uncertainty that is the real cost that inflation imposes on an economy.



is due to the use of the short term rate on saving deposits as a proxy for a more market oriented short term rate.<sup>31</sup>

## **Debelle and Fischer (1995)**

DF are interested in adducing evidence on whether CBs with no goal independence, but with economic independence, as they define each term, have a better inflation record than those with goal independence and no economic independence.

They create four indexes from those constructed by GMT and CWN to provide a range of evidence on this issue.

Their first index is formed by using only one feature of the GMT political independence index: the presence of a statutory requirement that the CB pursue monetary stability as a goal. They classify this index as goal independence, and classify banks as less independent if their mandate is more restricted (e.g., price stability as the sole goal). This is the opposite usage from the other indices in this report. The remainder of the GMT political independence index is their second index. Their third index consists of five components of the GMT economic independence index (they leave out the two components pertaining to the supervisory responsibilities of CBs). Their fourth index is the overall CWN index.

DB run five regressions for the 17 countries listed in **Table 1** covering the years 1950-1989. The only variable that is consistently statistically significant is the abbreviated GMT index of economic independence, confirming the results found in the other studies that central bank financing of the government's budget deficit is the most important cause of inflation. The first DF index is statistically significant only when it is the sole independent variable in the regression. It is not significant when it is one of several independent variables in a regression.<sup>32</sup> The adjusted R<sup>2</sup> for these regressions is approximately 0.45. Note also that these results are obtained from data that are averaged across different exchange rate regimes.

## **Froyen and Waud (1995)**

Froyen and Waud (hereafter FW) begin by noting that two of the leading macroeconomic models can provide an explanation for a short run trade-off between inflation and output (unemployment). Their interest is whether CBI can play a role in explaining this tradeoff. They use two CBI measures: (1) the Alesina and Summers index which, as noted above, is the derived from the BP policy index and the adjusted total GTM index converted by AS to a BP scale, and (2) the legal central bank index computed by Cukierman.<sup>33</sup>

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<sup>31</sup> See Alex Cukierman, Pantelis Kalaitzidakis, Lawrence H. Summers, and Steven B. Webb, "Central Bank Independence, Growth, Investment, and Real Interest Rates," in *Central Bank Independence, Growth, Investment, and Real Interest Rates*, Carnegie Rochester Conference on Public Policy, vol. 39, Autumn 1993, pp. 1-46.

<sup>32</sup> As noted above, this does not preclude it from being statistically significant if it is strongly correlated with other independent variables, in this case, the abbreviated index of economic independence. DF present no evidence on the rank correlation between these two indexes. Thus, we have no evidence on whether a multicollinearity problem is present in these estimates.

<sup>33</sup> They also use an additional index computed by Cukierman, but it does not figure prominently in their discussion. It is omitted from this discussion.

For their sample, they use the same 16 industrial countries used by AS with observations spanning the period from the mid-1950s through the 1980s.

For the entire sample period, they find that the two measures of CBI play no role in the tradeoff. The calculated regression coefficients of the two variables are not statistically different from zero. When the sample is confined to the observations subsequent to 1972 (essentially the flexible exchange rate period), the results are quite different. Both measures of CBI are statistically different from zero and both show that CBI improves the tradeoff. That is, for a given change in aggregate demand, the growth in output is larger and the inflation rate is lower in countries with more independent central banks (with independence as measured above). Moreover, the fit of the regression line to the data is improved dramatically (with the  $R^2$  increasing from .48 to .64 and .54).

The authors are quick to point out, however, that the results are consistent with the view that greater central bank independence may have resulted in a less activist monetary policy and, because of that, a better output-inflation tradeoff. Were this improved tradeoff to have been exploited, policymakers may soon find out, according to FW, that it is no better than in those countries where more activist policy has been exercised.

Note that the findings in this study may have little to do with activist monetary policy or its absence. What precisely the AS index measures is uncertain. The index is not broken down by FW to show whether certain aspects of the index were driving the results. For example, it could be that the improved inflation-output tradeoff is the result of some central banks' not having to finance the budget deficits of government or provide finance to certain classes of borrowers. It may have little to do with such factors as the independence of central bank governors from the political process.

## **Fuhrer (1997)**

Fuhrer uses linear regressions to test the influence of central bank independence on inflation, the variability of inflation, and economic growth when holding other macroeconomic conditions constant. He performs his calculations using both the Cukierman weighted CBI index and the Alesina-Summers (AS) index. His regressions cover the period 1950-1989, making his calculations vulnerable to the critique that they intermingle different exchange rate regimes.<sup>34</sup>

For OECD countries, the relationship between inflation and CBI as defined by Cukierman is statistically insignificant in both bivariate regressions and when holding other macroeconomic conditions constant.<sup>35</sup> In the bivariate regression, the  $R^2$  is only .016, meaning that over 98% of the variation in the data cannot be explained by CBI. Using the AS countries and definitions, Fuhrer replicates AS's findings that in a bivariate regression the CBI-inflation relationship is statistically significant, albeit with an  $R^2$  of only .084. However, Fuhrer demonstrates that when controlling for other macroeconomic factors, the CBI-inflation relationship becomes statistically insignificant and the  $R^2$  becomes very high. In some regressions, the sign on the CBI variable is positive, suggesting that great CBI *increases* inflation. Fuhrer's research suggests that the strong

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<sup>34</sup> Jeffrey Fuhrer, "Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the Next Millennium?" *New England Economic Review*, January 1997, p. 19.

<sup>35</sup> A bivariate regression is one in which the dependent variable (in this case, inflation) is explained in terms of only one other variable (CBI). A multivariate regression explains the dependent variable in terms of several other variables.

relationship between CBI and low inflation promoted by Alesina and Summers is an artifice of the data.

Fuhrer derives similar results when estimating the relationship between CBI and the variability of inflation. Measured by the Cukierman index, the relationship is statistically insignificant in all regressions and in one specification, the sign is unexpectedly positive rather than the negative. In the bivariate regression, the  $R^2$  is .026. For the AS countries and definitions, the sign is correct for all specifications and statistically significant in the bivariate regression. But when controlling for other macroeconomic factors, the statistical significance of CBI disappears. This suggests that the relationship between CBI and inflation found by other authors may be due to the correlation of CBI with factors that the other authors excluded.

Fuhrer's regressions between CBI and economic growth casts doubt on others' evidence that CBI offers a "free lunch" by allowing a country to achieve lower inflation without lower growth. Again, most of the evidence is statistically insignificant, but in most of the regressions there is a negative relationship between CBI and growth, including the two specifications in which CBI is statistically significant. All of the growth regressions were characterized by low  $R^2$  values, suggesting that the determinants of growth are more complex and poorly understood than the determinants of inflation and inflation variability.

### **Campillo and Miron (1997)**

Campillo and Miron test the effects of CBI on inflation when controlling for a number of other variables thought to influence inflation, such as political instability, openness to trade, and per capita income using cross-sectional analysis.<sup>36</sup> They use the CBI index created by Cukierman, Webb, and Neyapti. Their measurement of inflation is the average rate from 1973 to 1994, thus avoiding the problem of commingling exchange rate regimes discussed above. For 18 high-income countries, CBI has a large, negative, and statistically significant effect on inflation.<sup>37</sup>

### **Posen (1998)**

One of the main arguments in favor of CBI is that it should increase the credibility of the central bank. Credibility is presumed to have beneficial effects on a country's macroeconomic performance. Specifically, it is often assumed that greater credibility will make disinflationary episodes (periods when the central needs to tighten policy to lower the inflation rate) have less of a negative effect on the economy. But Posen argues that central bank independence has two countervailing effects on the costs of disinflation.<sup>38</sup> First, there is the usual effect chronicled above: greater central bank credibility leads to individuals adjusting their inflationary expectations more quickly to a change in monetary policy. When prices adjust more quickly,

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<sup>36</sup> Marta Campillo and Jeffrey Miron, "Why Does Inflation Differ Across Countries?" in Christina Romer and David Romer, eds., *Reducing Inflation, Motivation and Strategy*, University of Chicago Press, (Chicago: 1997), Ch. 9.

<sup>37</sup> Interestingly, when developing countries are included in the sample, Campillo and Miron find that CBI has an even larger, statistically significant, and *positive* effect on inflation. This suggests either the findings for industrial countries are not particularly robust or the effectiveness of CBI is drastically different in the developing world than the industrialized world.

<sup>38</sup> Adam Posen, "Central Bank Independence and Disinflationary Credibility: A Missing Link?" *Oxford Economic Papers* 50, 1998, pp. 335-359.

disinflation becomes less costly: tighter money supply leads to a smaller decline in output. But Posen argues that there is a second effect working against the first: if individuals believe that CBI makes variable inflation less likely, they would be more willing to use nominal contracts to set wages and prices. As the use of contracts becomes more prevalent, prices and wages are less able to adjust. In essence, people worry less about inflation when it is low, and so expectations adjust more slowly. This would make a disinflation more costly because output must fall more to make prices adjust. Because of these countervailing effects, he argues, it is not evident whether greater credibility improves macroeconomic performance.

Posen uses a series of regressions to explore these questions. He defines CBI by the Cukierman-Webb-Neyapti index and his observations are based on 17 OECD countries from 1950 to 1989, with one observation for each decade. First, he tests the hypothesis that CBI makes disinflations less costly. He attempts to separate the two countervailing effects by adding a separate variable for nominal wage rigidity. The CBI variable is highly statistically significant, but it has the wrong sign: increasing CBI makes disinflation much more costly in terms of higher unemployment.<sup>39</sup> However, few other variables are controlled for and the adjusted  $R^2$  tend to be moderate, ranging from 0.249 to 0.517.

Posen then tests the hypothesis that CBI makes nominal wages more rigid. The results tend not to be statistically significant and have low and even negative adjusted  $R^2$ s. Moreover, the sign of the CBI variable is not consistent across different specifications: in some cases, CBI increases wage rigidity, in other cases it decreases rigidity. A major problem with these tests, as Posen concedes, is that there is no consensus around a straightforward method for measuring nominal wage rigidity, and competing measures are not closely correlated to each other. But the inconclusive evidence that CBI increases nominal wage rigidity actually strengthens the case for CBI, since it suggests that the fear that greater CBI would make disinflation more costly is not a strong enough factor to be measurable.

Posen also empirically tests whether greater CBI makes disinflations faster because expectations adjust more quickly when central banks are more credible. The evidence here is inconclusive, with very low (sometimes negative) adjusted  $R^2$ s and a relationship between CBI and the length of disinflation that is mostly statistically insignificant.

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<sup>39</sup> These findings are supported by Debelle and Fischer as well as others. See Guy Debelle and Stanley Fischer, "How Independent Should a Central Bank Be?" in J. Fuhrer editor, *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, Federal Reserve Bank of Boston Conference Series No. 38, 1994., pp. 203-205. Cukierman offers a rebuttal in Alex Cukierman, "Does A Higher Sacrifice Ratio Mean That Central Bank Independence Is Excessive?" *Annals of Economics and Finance*, vol. 3, 2002, p. 1. Brumm and Krashevski dispute Posen's results (among others). They claim that much of the empirical work done in this area is deficient in two major ways. First, they claim that Cukierman's index of central bank independence, based on legal criteria, is contaminated by serious measurement error (meaning that it is likely to be a poor index for actual central bank independence—a fact acknowledged by Cukierman). Second, the regressions are OLS (based on ordinary least squares). On the basis of econometric tests, they believe this to be inappropriate. When both shortcomings are addressed, Brumm and Krashevski adduce evidence that the more independent the central bank, the lower the cost in terms of lost output and employment to reduce inflation. See Brumm, Harold J. and Richard S. Krashevski, "The Sacrifice Ratio and Central Bank Independence Revisited." *Open Economics Review*, vol. 15, 2004, pp. 385-402. The negative relationship was also confirmed by Diana and Sidiropoulos, who were interested in the relationship between central bank independence and inflation persistence. See Diana, Giuseppe and Moise Sidiropoulos, "Central Bank Independence, Speed of Disinflation, and the Sacrifice Ratio," *Open Economics Review*, vol. 15, 2004, pp. 385-402. A potential shortcoming of both studies is that they commingle the data from fixed and flexible exchange rate regimes.

## **Literature Surveys by Eijffinger and de Haan (1996); Berger, de Haan, and Eijffinger (2001)**

In recent years, the literature on central bank independence has multiplied. In 1996, Eijffinger and de Haan surveyed 17 empirical studies on the effects of CBI on inflation that included developed countries.<sup>40</sup> (Six of the 17 studies are discussed at length in this report.) Fifteen of the 17 studies found that CBI lowers inflation, while the other two found that the relationship was not significant. Some of the studies confirm that the link between CBI and inflation was weaker during the Bretton Woods period (prior to the early 1970s), when the primary objective of central banks was the maintenance of fixed exchange rates, and inflation stability was a secondary objective. Of the studies that examined the relationship between CBI and inflation variability, seven found that CBI decreases variability, two found that it did not, and three had mixed results. Most of the studies that examined the relationship between growth and CBI found no relationship.

In 2001, Berger, de Haan, and Eijffinger surveyed 30 more empirical studies written since the 1996 survey on central bank independence that include developed economies. They describe the literature as “extensive evidence suggesting that CBI helps to reduce inflation,” particularly for advanced economies.<sup>41</sup> Of the 30, 15 of the studies reviewed reaffirm that CBI lowers inflation. However, eight studies did not find a link between inflation and CBI, or found that the correlation is caused by some third variable. (Three studies had mixed results and four did not address the question.) Some studies found that CBI has a more (statistically and economically) robust effect on inflation in certain time periods than others and for certain measures of CBI. While the newer studies confirm the findings of the earlier ones on balance, scholarly dissent on the CBI issue is growing.

## **Summary of Empirical Findings**

The independence of CBs is now touted as important in a country’s quest for low inflation. A number of studies have established the relationship, and claim that it occurs without deleterious effects on such important indicators of economic performance as real output growth, the variability of that growth, investment, and the level and variability of real interest rates.

There are, however, a number of different definitions attached to the term “central bank independence.” As the different indexes show, the term encompasses a range of meanings from the methods of selecting and isolating the governing board from political influence, to determining the CB’s objectives, and whether CBs can be used to finance government budget deficits.

The review of the empirical evidence suggests that for industrial countries a case can be made that the rate of inflation is negatively related to those provisions of CB charters that circumscribe CB lending to governments.<sup>42 43</sup> It is difficult to make a case, however, for factors such as the

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<sup>40</sup> Sylvester Eijffinger and Jakob de Haan, “The Political Economy of Central Bank Independence,” *Princeton Special Papers in International Economics*, no. 19, May 1996.

<sup>41</sup> Helge Berger, Jakob de Haan, and Sylvester Eijffinger, “Central Bank Independence: An Update of Theory and Evidence,” *Journal of Economic Surveys*, vol. 15, no. 1, 2001, p. 3.

<sup>42</sup> There is also a large literature focusing on the effects of CBI in developing countries that is beyond the scope of this (continued...)

selection of the governing board and its isolation from the political process or use of inflation targeting.<sup>44</sup> Although evidence from DF suggests that a formal price stability goal may be of some importance to the established relationship, it is not robust.

Thus, the evidence for industrial countries supports a highly selective use of the term “central bank independence.” Based on this evidence, it would, perhaps, be more accurate to say that when a nation’s treasury has only limited access to the resources of its central bank, low inflation is likely to result. Moreover, the CBI literature has been criticized in a number of ways that are described in the next section.

## General Methodological Criticisms of the Empirical Work

An econometric study is only as good as the assumptions underlying it. Legitimate questions have been raised about the way these studies have been conducted that casts doubts on their findings.

### Direction of Causation

The empirical work reviewed above suggests the direction of causation prevailing in the minds of their authors. The estimating equation the authors use to establish their empirical results reflects this view. Clearly, in these studies, movements or differences in the various CBI indexes are viewed as explaining or causing, in part, the different behavior observed across industrial countries in the inflation rate, the variance in that rate, output growth, the variance in output growth, investment, real interest rates, etc.

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(...continued)

report. See Prakash Lougani and Nathan Sheets, “Central Bank Independence, Inflation, and Growth in Transition Economies,” *Journal of Money, Credit, and Banking*, vol. 29, no. 3, August 1997, p. 381; Wojciech Maliszewski, “Central Bank Independence in Transition Economies,” *Economics of Transition*, vol. 8, no. 3, November 2000; Luis Jacome, *Legal Central Bank Independence and Inflation in Latin America During the 1990s*, International Monetary Fund, Working Paper no. 1/212, December 1, 2001; Bernd Sikken and Jakob de Haan, “Budget Deficits, Monetization, and Central Bank Independence in Developing Countries,” *Oxford Economic Papers*, vol. 50, no. 3, July 1998, p. 493; Jakob de Haan and Willem Kooi, “Does Central Bank Independence Really Matter? New Evidence for Developing Countries Using a New Indicator,” *Journal of Banking and Finance*, vol. 24, no. 4, April 2000, p. 643.

<sup>43</sup> In a comprehensive study of 163 central banks as of the end of 2003 disaggregated by the state of development of the respective countries, Arone, et. al., report on trends in CBI over the past several decades, the degree to which increased CBI has contributed to the improved inflation performance of most economies, and the lessons learned from this experience. Their empirical results show that increased independence (or, using their word, autonomy) has been one of several factors that has played a role in the improved inflation performance among the countries comprising the world economy (as has the nature of the exchange rate regime—fixed exchange rates improve the chances for obtaining low inflation). See, Arone, Marco, Laurens, Bernard J., Segalotto, Jean-Francois, and Martin Sommer, *Central Bank Autonomy: Lessons from Global Trends*, *IMF Working Paper* (April 2007).

<sup>44</sup> Carlstrom and Fuerst, using data from industrialized nations, report that the average rate of inflation experienced by countries whose central bank operate under an inflation target mandate since 1990 was 2.5%, compared to 2.9% for those countries without such a central bank mandate (both groups of central banks had about the same average level of independence). The inflation rate difference is not statistically significant, meaning that it is entirely consistent with pure chance. See Carlstrom, Charles T. And Timothy S. Fuerst, “Central Bank Independence: The Key to Price Stability?” *Economic Commentary*, Federal Reserve Bank of Cleveland, September 1, 2006.

While few individuals would doubt that political institutions, events, and developments can have a profound effect on how well an economy functions, many would argue that causation can, in fact, run in the opposite direction from that implicitly posited in the above studies or that two way causality may be present (which is, incidentally, acknowledged by the authors of these studies). Thus, for example, a fear of inflation can lead countries to establish and maintain very independent central banks and forbid them to directly or indirectly lend to government. To be more specific, as Walsh points out, “high inflation, if viewed as an indication of failed central bank policy, might lead to the replacement of the central banker—in this case high CEO turnover is not necessarily a reflection of low CB independence causing inflation.”<sup>45</sup>

Alternatively, a desire for economic stability can also cause political institutions to emerge and evolve in ways that ensure such an outcome.<sup>46</sup> In this case, CB independence can be thought of as being correlated with an omitted variable, “responsible governance,” that is the true cause of low inflation. If this is the case, governments who lack “responsibility” could make their central banks statutorily independent and still not achieve low inflation. For example, Posen theorizes that what matters most in achieving low inflation is effective support by an important constituency, such as the financial sector. One of the policy changes such a constituency might demand to achieve low inflation is central bank independence, attributing spurious causation to CBI.<sup>47</sup>

Thus, a general methodological criticism directed against all of these studies is that they have not demonstrated convincingly that causation runs in the direction they have hypothesized. Hence, institutional reforms along lines suggested by these authors may not yield the benefits suggested by this body of empirical work.

## Definition of Independence

Forder raises other methodological criticisms of the studies.<sup>48</sup> The studies all define independence by ranking the central banks on the basis of a number of legal characteristics. CBs that possess more of these characteristics are ranked as more independent. He argues that the studies arbitrarily look for legal characteristics of central banks that all low inflation countries happen to share. There is no *a priori* attempt to define which characteristics are necessary for independence and which characteristics are more important than others. He argues that the studies have tended to arbitrarily assume that characteristics uncorrelated to inflation are not important for

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<sup>45</sup> Carl Walsh, “Central Bank Strategies, Credibility, and Independence,” *Journal of Monetary Economics*, vol. 32, 1993, p. 296.

<sup>46</sup> Posen, for example, has made the case that the financial sector in many industrial countries, because it highly prizes price stability, has emerged as a major force persuading governments to establish and maintain independent CBs. Thus, it is the financial sector and its desire for price stability that causes that outcome to prevail. The means to achieve this end is an independent CB. See Adam Posen, “Why Central Bank Independence Does Not Cause Low Inflation: There Is No Institutional Fix for Politics,” in *Finance and the International Economy: No. 7*. O’Brien, Richard, ed. (Oxford: Oxford University Press, 1993), pp. 40-65; and Adam Posen, “Declarations Are Not Enough: Financial Sector Sources of Central Bank Independence” in *NBER Macroeconomic Annual for 1995*, edited by B. Bernanke and J. Rotemberg (Cambridge: MIT Press, 1995), pp. 253-274. There are, of course, other possible reasons a country would want a more independent CB. Many of these other factors are discussed and the empirical evidence offered about them evaluated in Sylvester Eijffinger and Jakob de Haan, “The Political Economy of Central Bank Independence,” *Princeton Special Papers in International Economics*, no. 19, May 1996.

<sup>47</sup> Adam Posen, “Declarations Are Not Enough: Financial Sector Sources of Central Bank Independence,” in Ben Bernanke and Julio Rotemberg, eds., *NBER Macroeconomics Annual* (Cambridge, MA: MIT Press, 1995).

<sup>48</sup> James Forder, “Central Bank Independence: Reassessing the Measurements,” *Journal of Economic Issues*, vol. 23, no. 1, March 1999, p. 23.

independence, and vice versa, making the studies self-fulfilling prophecies of the hypothesis that independence reduces inflation. For example, it is not clear that a price stability goal should be defined as independence since it limits the CB's discretion, but since it is correlated with low inflation, it bolsters the findings that independence matters. He points out that—besides Germany and Switzerland—there is no consensus among the different studies as to which countries have an independent central bank. If different studies cannot agree on what makes a CB independent, how can the studies prove that independence leads to low inflation?<sup>49</sup>

The strong relationship between independence and low inflation in Germany and Switzerland, and the absence of a strong relationship elsewhere, raises the question of whether there is some other factor that caused low inflation in those two countries. In fact, both countries had a long series of nearly balanced budgets during the period 1950s-1980s, removing a source of upward pressure on interest rates. Bernanke et al. offer another explanation: both countries targeted the growth rate of the money supply well before other countries had adopted restrictive mandates such as a sole goal of price stability.<sup>50</sup> Either of these factors, rather than independence, could be the true cause of their low inflation.

Nor is there any attempt in many of the studies to evaluate whether the statutory independence granted to the banks is maintained in reality. For example, two different countries could grant their banks the same statutory autonomy from the elected government, but in practice one government could pressure the CB from behind the scenes to influence policy while the other respected its independence. In these studies, the two central banks would be ranked equally independent.<sup>51</sup> Cukierman and Webb try to get around this problem by looking at the turnover rate of the CB CEO and survey evidence, but the results from this study are inconclusive.<sup>52</sup> Survey evidence about specialists' perceptions of a central bank's independence have almost no correlation to CWN's legal definition of independence. This indicates that legal measures of statutory independence may be misleading.<sup>53</sup>

## **Econometric Shortcomings**

Finally, the studies could be questioned on econometric grounds. The studies assign numerical values to non-numerical legal characteristics. For example, for the question of how the chairman of the CB is appointed, CWN assign a value of 1 if appointed by the board of the central bank, 0.75 if appointed by the board, legislature, and executive, 0.5 if appointed by the legislature, 0.25 if appointed by the executive collectively, and 0 if appointed by one or two members of the executive. The studies then use the ordinary least squares method to regress those numerical values on inflation to test for correlation. The econometric problem with this method is that the

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<sup>49</sup> Mangano points out that 40% of the characteristics that define independence in the GMT index are not included in the Cukierman index, and 45% of the characteristics in the Cukierman index are not included in the GMT index. G. Mangano, "Measuring Central Bank Independence: A Tale of Subjectivity and Its Consequences," *Oxford Economic Papers*, vol. 50, 1998, p. 468.

<sup>50</sup> See Ben Bernanke et al, *Inflation Targeting* (Princeton, NJ: Princeton University Press, 1999), Ch. 4.

<sup>51</sup> James Forder, "On the Assessment and Implementation of 'Institutional' Remedies," *Oxford Economic Papers*, vol. 48, 1996, p. 39.

<sup>52</sup> Alex Cukierman and Steven B. Webb, "Political Influence on the Central Bank: International Evidence," *The World Bank Economic Review*, vol. 9., no. 3. 1995, pp. 397-423.

<sup>53</sup> Carl Walsh, "Central Bank Strategies, Credibility, and Independence," *Journal of Monetary Economics*, vol. 32, 1993, p. 295.



numerical values may not be proportionately related. For example, for a regression to be econometrically valid, a central bank that receives a grade of 2 should be twice as independent as a bank that receives a grade of 1, and have twice the estimated effect on inflation. But since the values are based on non-numeric characteristics, there is no way of knowing whether it is reasonable to assume that a CB with a grade of 2 would have twice the effect on inflation as a CB with a grade of 1. The weighting of the various characteristics will also be important in the regression results. It may be that only a couple of characteristics really define independence. If those factors are equally weighed with all characteristics, the index will not reflect true independence and the regression results will be biased.

Furthermore, there are econometric problems with the sample itself. If limited to advanced economies, then the sample will be small and homogeneous, and thus may not offer enough variation in terms of CBI and economic outcomes to yield meaningful regression results. If developing countries are included, the sample becomes large and diverse, but runs the risk of finding spurious correlation between inflation and CBI by omitting more important factors than CBI (corruption, weak legal system, market interference, etc.) that explain the diversity of economic outcomes.

## **Data Problems**

Finally, a time-series study is only valid if the relationship between the variables is stable over time. Much of the evidence is tainted because it is obtained from an analysis that commingles data from fixed and flexible exchange rate periods. And there is substantial reason to believe that the different exchange rate regimes can affect the permissible range of CB behavior. The fixed exchange rate regime was in existence from 1950 through the early 1970s, whilst subsequent years would have been in the flexible rate period. Under a fixed rate regime, central bank independence, as measured by BP and others, doesn't really mean much. Regardless of whether the central bank is directed to maintain a low inflation rate or a constant price level, it must, above all else, maintain a fixed exchange rate. So long as this goal has primacy, it is of little importance how its price level directive is framed. Under a flexible rate regime, an inflation goal can be pursued without the constraint of the exchange rate requirement. For the same reason, evidence obtained from European countries that fixed their exchange rate to the Deutschmark in recent decades should be discounted. It should also be noted that central bank independence changes over time in ways that some of the studies may not capture. For instance, the central banks of New Zealand and Great Britain have become much more independent over the last decade.

## **The Relevance of the Empirical Evidence to the Congressional Oversight of Monetary Policy**

Much has been made of the empirical finding that central bank independence is negatively associated with the rate of inflation and that this comes as a "free lunch" in terms of no adverse effects on some very important and desirable performance characteristics of an economy.

Yet, as demonstrated above, the phrase “central bank independence” is quite imprecise. As used in the literature, the phrase applies to three aspects of independence:

1. the degree to which the CB’s governing board is isolated from the political process;
2. the degree to which central banks can refuse to monetize public debt, i.e., finance the government;
3. the degree to which price stability has a primacy as the ultimate goal of central bank activity.

When these three aspects of independence were tested against the rate of inflation, for example, (1) and (3) were often combined into one variable. Only DeBelle and Fischer used meaning (3) as a separate independent variable. And they found that it had a negative role to play in explaining inflation that was sometimes statistically significant. Thus, the DF result lends some support to those who seek to redefine the mandate of the Federal Reserve, or in the words of DF, to take away goal independence from the Federal Reserve (the other indices would classify (3) as increasing independence). This, of course, presupposes that causality runs in the direction assumed by DF.

The variables included in (1) were seen to have no statistically significant effect on the indicators of economic performance. From this, one could conclude that to add the Secretary of the Treasury, for example, to the Board of Governors of the Federal Reserve would, presumably, have no measurable effect on the indicators of economic performance.

A variable designed to capture the essence of definition (2) did turn up in all of the studies as statistically significant. Presently, however, the Federal Reserve is forbidden to purchase other than seasoned U.S. government securities.<sup>54</sup> It cannot directly purchase new Treasury issues. The empirical studies suggest that this feature of U.S. law contributes to a low rate of inflation.

Proponents argue that the empirical evidence suggests that Congress may, in the discharge of its oversight responsibilities for monetary policy, want to make the policy goal of the Federal Reserve more specific. It may, they argue, wish to replace the current multi-goal directive with one directing the Federal Reserve to achieve and maintain price level stability, characteristic (3). Some would argue that the evidence is not robust enough, and the direction of causality is incorrect, to base such a policy change on, however.

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<sup>54</sup> Do not confuse financing the government with open market purchases, the major way by which the Federal Reserve conducts monetary policy and puts currency into circulation. Open market operations involve the purchase and sale of U.S. government securities with the objective of altering the reserve position of U.S. banks, and through it, money and credit conditions prevailing in the economy. The data show that these purchases have not been used as a means for financing the deficit of the federal government. Between 1980 and 1996, for example, federal debt held by the public rose by approximately \$3 trillion. During this same period, federal debt securities held by the Federal Reserve rose by about \$280 billion, or a little less than 10% of the increase. And most of these securities were required as backing for the paper currency put into circulation.

## **Appendix. A Primer on Some Elementary Principles of Regression Analysis**

The emphasis in much of the body of research reviewed above is to establish the importance of central bank independence as a factor explaining differences in the rates of inflation among countries as well as differences in other major indicators of economic performance. This is accomplished by the use of linear regression. To appreciate the conclusions reached by these researchers, it will be helpful to have an elementary understanding of this research tool.

Equations estimated by linear regression take their form from some hypothesized relationship in which the behavior of one or more variables (the independent variables) is held to influence some other variable (the dependent variable). The application of regression analysis involves fitting a straight line to a group of observations, usually a sample selected from the universe of those variables, that are suggested by the hypothesized relationship. The straight line is fitted such that the deviations of the actual observations from those suggested by the straight line are minimized. The value of the slope of that line then gives the effect of the independent variable (or variables) on the dependent variable.

While the calculated value of the slope of the line may be positive or negative (or even zero), its true value may not be statistically significantly different from zero. Because this is so, it will be necessary to briefly discuss what is meant by a calculated value being “statistically significant.”

To understand statistical significance, let us say that the calculated effect of the independent variable on the dependent variable is .10. Thus, changes in the independent variable by one unit change the dependent variable by .10. This assumes, of course, that the value .10 is really different from zero. Recall, that it was calculated, not from the universe of the independent variable, but from a sample taken from that universe. Thus, it is possible that our assumption that the true value of the effect of this variable on the dependent variable is different from zero is wrong. It is, however, possible to control for making this type of error—that is, for accepting as true a relationship that is, in fact, not true. It is common to set the control factor at 1 to 5 chances in 100 of accepting the hypothesis that the variable is different from zero when it is not. If the calculated value of the independent variable lies within a range that limits the error to 1% to 5%, it is said to be statistically significant (or statistically significantly different from zero).

Since the purpose of this study is to establish the importance of central bank independence as a factor affecting a range of variables by which we judge economic performance, one other summary statistic must be explained: goodness of fit or  $R^2$ .

The  $R^2$  is designed to measure the fraction of the variation of the dependent variable that is explained by the variation of the independent variable(s). The  $R^2$  ranges in value between 0 and 1. The higher the  $R^2$  is, the larger is the proportion of the variation in the dependent variable that is explained by the variation of the independent variable(s).

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