

Patricia S. Pollard

Patricia S. Pollard is an economist at the Federal Reserve Bank of St. Louis. Heather Deaton and Richard D. Taylor provided research assistance.

Central Bank Independence and Economic Performance

IN RECENT YEARS MANY countries have adopted or made progress toward adopting legislative proposals removing their central banks from government control, that is, making them independent. Between 1989 and 1991, New Zealand, Chile and Canada enacted legislation that increased the independence of their central banks. The 1992 Treaty on European Union (Maastricht Treaty) requires European Community (EC) members to give their central banks independence as part of establishing the European Monetary Union. As a result, EC countries that do not yet have strongly independent central banks have introduced legislation or announced their commitment to make their central banks more independent.¹ Furthermore, in recent months the governments of Brazil and Mexico have announced their intentions to introduce legislation to create more independent central banks.

In view of these developments, it might seem reasonable to conclude that unambiguous links had been established between economic perfor-

mance and the degree of central bank independence. Interestingly, however, the two post-World War II star performers among the industrialized economies—Germany and Japan—have different levels of central bank independence. The German Bundesbank is viewed as one of the most independent central banks in the world, whereas the Bank of Japan is seen as more subject to government control. Thus the contrast between the movement to grant central banks more independence and widely different degrees of independence across the major economies raises several questions. Among these are: Why is the idea of an independent central bank popular? Are there economic benefits of having an independent central bank?

This paper examines empirical and theoretical studies of central bank independence to address these questions. Empirical researchers have devised measures of independence to focus on the relationship between central bank independence and a country's economic performance. Theoretical studies have modeled the strategic be-

¹To meet the level of independence prescribed by the Maastricht Treaty, a central bank must be prohibited from taking instructions from the government. The term for central bank governors must be set at a minimum of five years, although it can be renewed. In addition, the central bank must be prohibited from purchasing debt instruments directly from the government (that is, in the primary market) and from providing credit facilities to the government. Both Denmark and the United Kingdom have reserved the right to decline membership in the European Monetary Union. Thus neither country has introduced

legislation to ensure conformity of their central banks with the Maastricht provisions.

For a detailed analysis of the institutional status of the central banks of the EC countries, see the Committee of Governors of the Central Banks of the Member States of the European Economic Community (1993).

havior of monetary and fiscal policymakers to be able to compare an economy's performance when policymakers cooperate in setting policies with its performance when they do not cooperate.

The next section of this paper presents a survey and evaluation of empirical studies. Next, theoretical studies are presented and evaluated. The final section examines the extent to which these studies either explain the current movement toward greater central bank independence or highlight unresolved questions in this debate.

EMPIRICAL STUDIES: CENTRAL BANK INDEPENDENCE AND ECONOMIC PERFORMANCE

Inflation and Central Bank Independence

As a broad generalization, interest in central bank independence was motivated by the belief that, if a central bank was free of direct political pressure, it would achieve lower and more stable inflation.² Bade and Parkin (1985) conducted one of the first empirical studies of this link. The authors used data for 12 Organization for Economic Cooperation and Development (OECD) countries in the post-Bretton Woods era and measured the degree of central bank independence according to the extent of government influence over the finances and policies of the central bank.³ The degree of financial influence on the central bank was determined by the government's ability to set salary levels for members of the governing board of the central bank, to control the central bank's budget and to allocate its profits. The degree of policy influence was determined by the government's ability to appoint the members of the central bank governing board, government representation on this board, and whether the government or the central bank was the final policy authority. Countries were given a rank of one through four in each category, with four being the highest level of central bank independence.

Bade and Parkin concluded that the degree of financial independence of the central bank was

not a significant determinant of inflation in the post-Bretton Woods period. Policy independence, however, was seen as an important determinant of inflation because the two countries with the highest degree of policy independence (Germany and Switzerland) had inflation rates significantly below those of all other countries in the sample. They found no significant differences in inflation performance among countries with lower rankings of independence in the post-Bretton Woods era.

Alesina (1988) used the Bade and Parkin (1985) index but added the following four countries: Denmark, New Zealand, Norway and Spain. He found, as hypothesized, that there was generally an inverse relationship between average inflation rates and the level of central bank independence.

Grilli, Masciandaro and Tabellini (1991) created two indexes of central bank independence—one based on economic measures of independence (with a scale ranging from zero to eight), and the other based on political measures of independence (with a scale ranging from zero to seven).⁴ The political factors were similar to those identified by Bade and Parkin. The economic factors considered were the ability of the government to determine the conditions under which it can borrow from the central bank and the monetary instruments under the control of the central bank. The data set comprised 18 OECD countries over the period 1950–89.⁵ For the period as a whole, Grilli, Masciandaro and Tabellini found that economic independence was negatively related to inflation. Political independence also had a negative correlation with inflation, but the relationship was not statistically significant. Breaking the data into four decade-long subperiods, they found that neither measure of independence had a significant effect on inflation in the first two decades. In the 1970s both measures of independence were significant, whereas in the 1980s only the economic independence measure was significant.

Alesina and Summers (1993) calculated a measure of central bank independence by averaging the indexes created by Bade and Parkin,

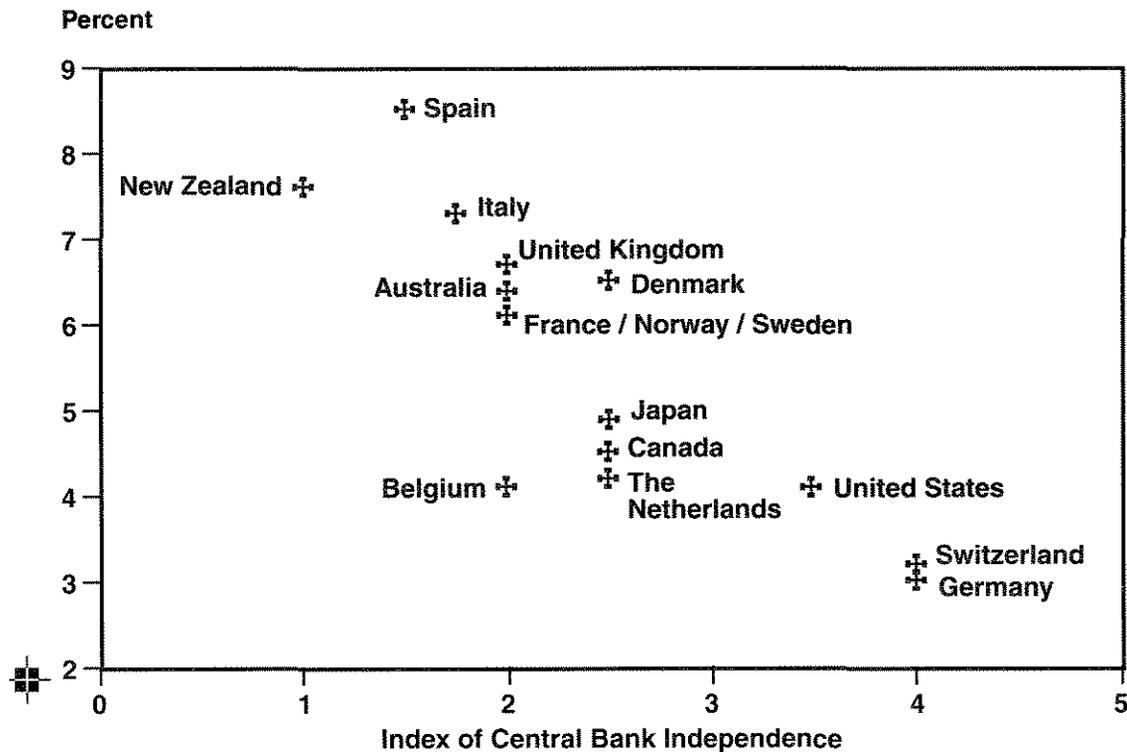
²Buchanan and Wagner (1977) point out that even an independent central bank may not be immune from political pressures and thus exhibit an inflationary bias.

³The 12 OECD countries are Australia, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom, and United States.

⁴In both measures the scale is increasing in the level of independence.

⁵Grilli, Masciandaro and Tabellini add Austria, Denmark, Greece, New Zealand and Portugal to Bade and Parkin's group of countries and eliminate Sweden.

Figure 1
Average Inflation: 1955-1988



Source: Alesina and Summers (1993).

and Grilli, Masciandaro and Tabellini.⁶ The countries included were the same as in Bade and Parkin with the addition of Denmark, New Zealand, Norway and Spain. The sample period was 1955–88.⁷ As in the previous studies, they found a negative correlation between the level of central bank independence and the rate of inflation (figure 1). They also found that the more dependent a central bank was, the greater the variability in inflation (figure 2). This, they argued, was a result of a correlation between the level and variability of inflation.

Cukierman (1992) provided an extensive analysis of central bank independence and its rela-

tionship to inflation performance using data for 1950–89. Unlike previous studies, he used not only legal measures of central bank independence, but also practical measures of the level of independence. One such measure was the frequency of turnover of the central bank governors. Another measure of practical independence was based on answers from a questionnaire completed by qualified individuals at the central banks.⁸ Cukierman's analysis is the most comprehensive to date, not only because it incorporates information about the actual level of independence a central bank enjoys in practice, but also because it includes a sample of 70 countries.⁹ Cukierman concluded that "central

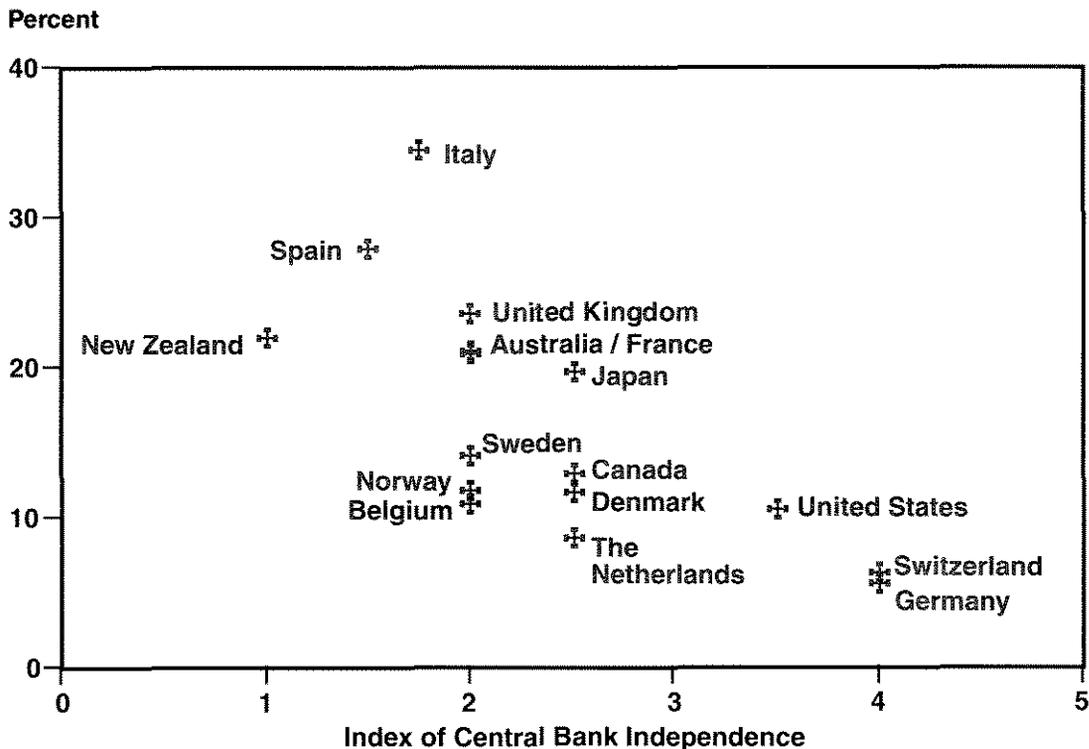
⁶See Bade and Parkin (1985) and Grilli, Masciandaro and Tabellini (1991).

⁷See Alesina (1988). Alesina and Summers report that the results of their study are the same if the data period is restricted to 1973–1988, the post-Bretton Woods era.

⁸The sample period for the questionnaire data was 1980–89.

⁹The questionnaire data were available for only 24 countries.

Figure 2
Variance of Inflation: 1955-1988



Source: Alesina and Summers (1993).

bank independence affects the rate of inflation in the expected direction."¹⁰ This result was also found by Cukierman, Webb and Neyapti (1992).¹¹

Central Bank Independence and the Real Economy

Although most of the empirical work focused on the relationship between central bank independence and the rate of inflation, some studies examined the link between indepen-

dence and economic output. If an independent central bank can produce lower inflation than a dependent central bank, does this come at the cost of lower output? Conversely, are dependent central banks attempting to exploit a short-run Phillips Curve relationship, accepting higher inflation in order to achieve higher output?

Grilli, Masciandaro and Tabellini (1991) found no systematic effect of central bank independence (using either of their two indicators) on the growth rate of real output. Alesina and

¹⁰Cukierman did not actually use the rate of inflation, but the rate of depreciation of the real value of money, defined by the following formula:

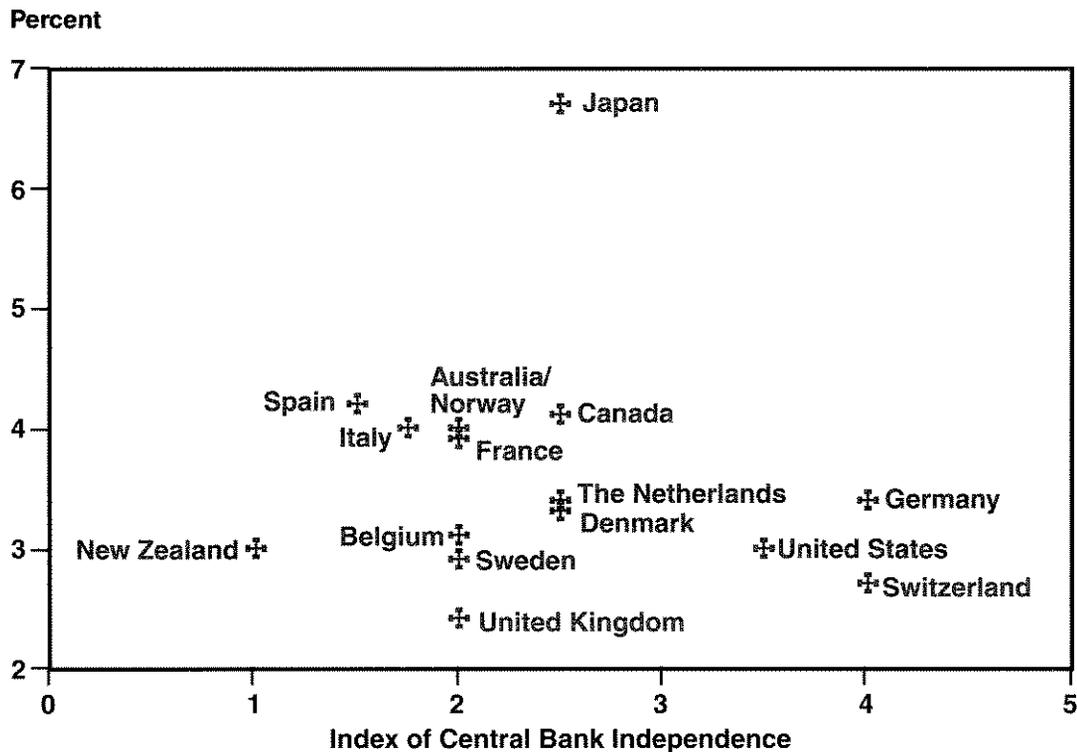
$$d_t = \frac{\pi_t}{1 + \pi_t}$$

where π_t is the inflation rate in period t . The use of d , as noted by Cukierman, moderates the effects of hyperinflation on the results.

¹¹Capie, Mills and Wood (1992) also studied the link between inflation and central bank independence. Their data set consisted of 12 countries, with the data series beginning between 1871 and 1916 and ending in 1987. Central

banks were classified as either dependent or independent according to the extent of their control over monetary policy. The authors examined the relationship between the status of the central bank and inflation over the entire sample period and four subsample periods—pre-World War I, the Interwar Years, Bretton Woods and post-Bretton Woods. Periods of hyperinflation, however, were excluded from the data. In all sample periods, the countries with independent central banks were in the low inflation group. Nevertheless, some of the dependent central banks were also in this group. The authors concluded that independence may be a sufficient condition for low inflation but not a necessary one.

Figure 3
Average Real GNP Growth: 1955-1987



Source: Alesina and Summers (1993).

Summers (1993) likewise found no correlation between average economic growth or the variability of growth and the level of central bank independence (figures 3 and 4).¹²

De Long and Summers (1992) looked at the relationship between central bank independence and output per worker while trying to eliminate differences between countries that were due solely to convergence effects.¹³ To do this, they examined the growth rate of real gross domestic product (GDP) per worker during 1955-90, controlling for the level of GDP per worker in 1955.¹⁴ This procedure showed a positive rela-

tionship between central bank independence and economic growth.¹⁵ More precisely, they found that holding constant the 1955 level of real output per worker, a unit increase in their index of central bank independence was associated with a 0.4 percentage point increase in growth per year.¹⁶

In contrast, Cukierman, Kalaitzidakis, Summers and Webb (1993) found that output growth in industrialized countries was unrelated to central bank independence even after controlling for structural factors that might influence growth. The factors they considered were the initial level

¹²The results are the same if per capita gross national product (GNP) is used rather than GNP.

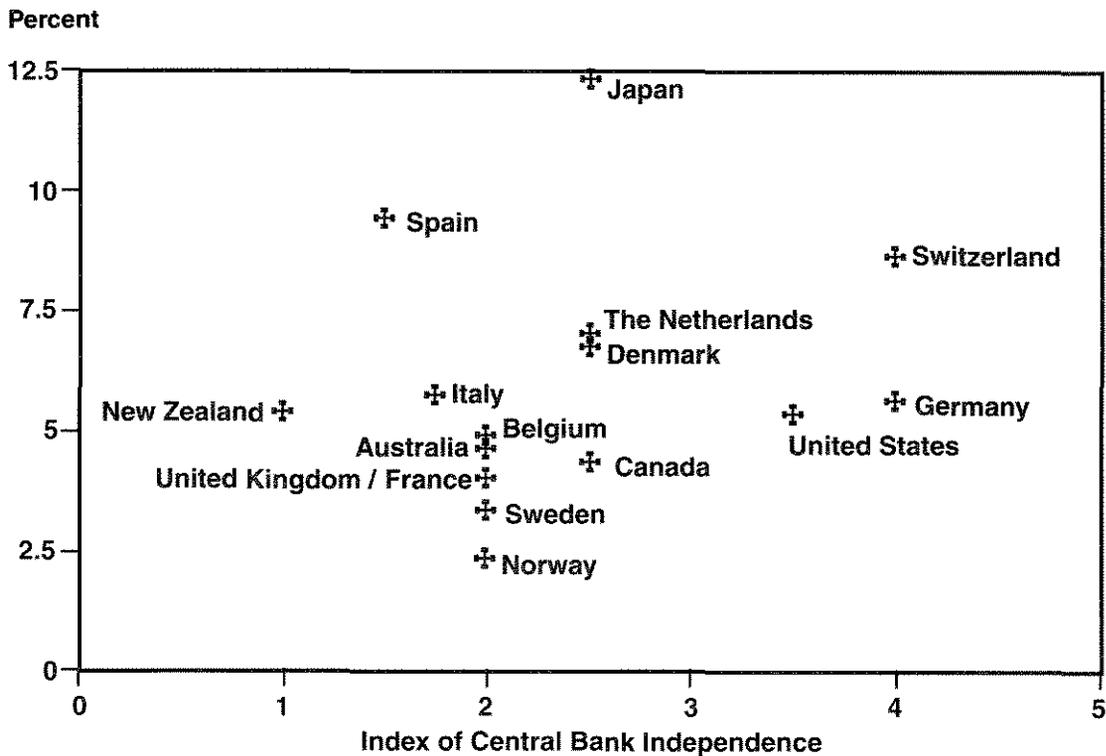
¹³Standard neoclassical growth models suggest that growth rates of economies tend to converge over time. Thus given two countries, the one with the lower per capita output will have a higher growth rate than the other until their levels of real output per capita converge.

¹⁴GDP per worker levels are based on the Summers and Heston (1991) estimates, which use purchasing power parity conversions.

¹⁵This study does not take into account that the degree of independence of the central bank of New Zealand changed dramatically in 1989. Furthermore, all of the studies, with the exception of Alesina (1988), do not take into account that there was an institutional change in the structure of the Bank of Italy in 1981 that increased its independence. The latter change, however, was not as substantial as the former.

¹⁶De Long and Summers regress the average growth rate of GDP per worker over the period 1955-90 on GDP per worker in 1955 and the central bank independence index.

Figure 4
 Variance of Real GNP Growth: 1955-1987



Source: Alesina and Summers (1993).

of a country's GDP, its initial enrollment rates for primary and secondary education, and changes in its terms of trade. The authors did find, however, using the turnover rate of central bank governors as a proxy for independence, that central bank independence did have a positive effect on growth in developing countries.

The difference in the results for industrialized countries versus developing countries, they argue, may imply that "dependence on political authorities is bad for growth only when the level of independence is sufficiently high."¹⁷ Central bank independence is higher in all the industrialized countries than in most of the developing countries.

Central Bank Independence and Fiscal Deficits

Another area of empirical study has been the relationship between central bank independence

and fiscal deficits. The motivation for these studies is the belief that independent central banks should be better able to resist government efforts to have them monetize deficits. Thus governments realizing that there may be some limit on their ability to issue bonds continuously to finance deficits may decide to limit deficit spending.

Parkin (1987) investigated this question for the same 12 countries as Bade and Parkin for the period 1955-83.¹⁸ He found that there was some evidence of a negative relationship between central bank independence and the long-run behavior of government deficits as a percent of gross national product (GNP). The deficits of Switzerland and Germany, the countries with the highest levels of central bank independence, had long-run equilibrium values near zero with little variance. However, other countries, notably France, that had low levels of central bank in-

¹⁷See Cukierman, Kalaitzidakis, Summers and Webb (1993), p. 42.

¹⁸See Bade and Parkin (1985).

dependence also had small long-run deficits as a percent of GNP.

Masciandaro and Tabellini (1988) looked at fiscal deficits as a percent of GDP in Australia, Canada, Japan, New Zealand and the United States during the period 1970–85.¹⁹ They found that New Zealand, which had the lowest level of central bank independence of the five countries during this period, had the highest fiscal deficit as a percent of GDP. The United States, however, with the highest level of central bank independence among this group of countries, had a deficit/GDP ratio similar to those of the other countries.

Grilli, Masciandaro and Tabellini (1991) found that there was generally a negative correlation between the deficit/GNP ratio and the degree of central bank independence. However, if political factors, as well as central bank independence, were included in their regression, the latter variable was insignificant.²⁰ Thus they conclude that an independent monetary authority apparently does not discourage the government from running fiscal deficits.

A further examination of the relationship between fiscal deficits and central bank independence, which is consistent with the work done by Alesina and Summers and De Long and Summers, is presented here.²¹ Using the same index of central bank independence and the same 16 countries as these previous papers, there is some evidence of a negative correlation between average deficits as a percent of GDP and central bank independence for the period 1973–89, as shown in figure 5.²² The degree of independence, however, is not a statistically significant (at $\alpha = .05$) determinant of the deficit/GDP ratio. The variability of deficits as a percent of GDP is also negatively correlated with central bank independence (figure 6) and

this relationship is statistically significant.

EVALUATION OF THE EMPIRICAL STUDIES

At first glance, these studies seem to indicate that a country that wants to lower its inflation rate and do so without hurting growth should create an independent central bank. Such a central bank apparently could also help reduce fiscal deficits and increase output. These benefits would explain the recent popularity of independent central banks. Thus Grilli, Masciandaro and Tabellini commented:

Having an independent central bank is almost like having a free lunch; there are benefits but no apparent costs in terms of macroeconomic performance.²³

Alesina and Summers (1993) went a step further in concluding their findings: "Most obviously they suggest the economic performance merits of central bank independence."²⁴

A more careful analysis of these studies, however, indicates weaknesses that highlight the need for further evidence before one should believe that creating an independent central bank will improve a country's economic performance. The following four weaknesses are considered: 1) the difficulty in measuring central bank independence; 2) the possibility of a spurious relationship between independence and economic performance; 3) the possible endogeneity of central bank independence; and 4) the inclusion of the fixed exchange rate period in the sample data of some of the studies.

The measures of central bank independence used in empirical studies have been determined by establishing a set of factors thought to be relevant for independence and then analyzing central bank charters and laws for compliance with these factors. With the exception of the in-

¹⁹The deficits are as a percent of GNP for Japan.

²⁰These political factors include the frequency of government changes, significant changes in the government and the percent of governments in a given period supported by a single majority party.

²¹See Alesina and Summers (1993) and De Long and Summers (1992).

²²The 1989 ending date was chosen because of the change in the status of the Bank of New Zealand, which occurred in 1989. All data are from the International Monetary Fund, *International Financial Statistics*.

²³See Grilli, Masciandaro and Tabellini (1991), p. 375.

²⁴See Alesina and Summers (1993), p. 159. Even the press has picked up the banner of central bank independence. A recent headline in *The Washington Post* proclaimed: "More Independence Means Lower Inflation, Studies Show." See Bery (1993).

Figure 5
Average Deficit as a Percent of GDP: 1973-1989

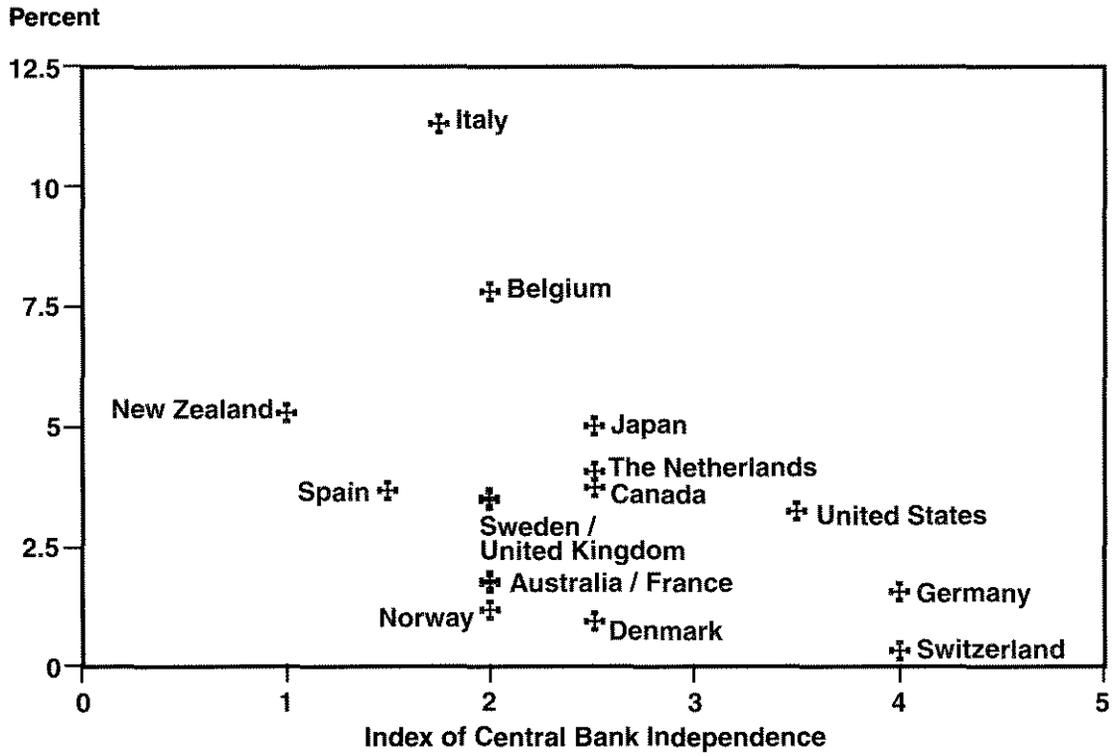
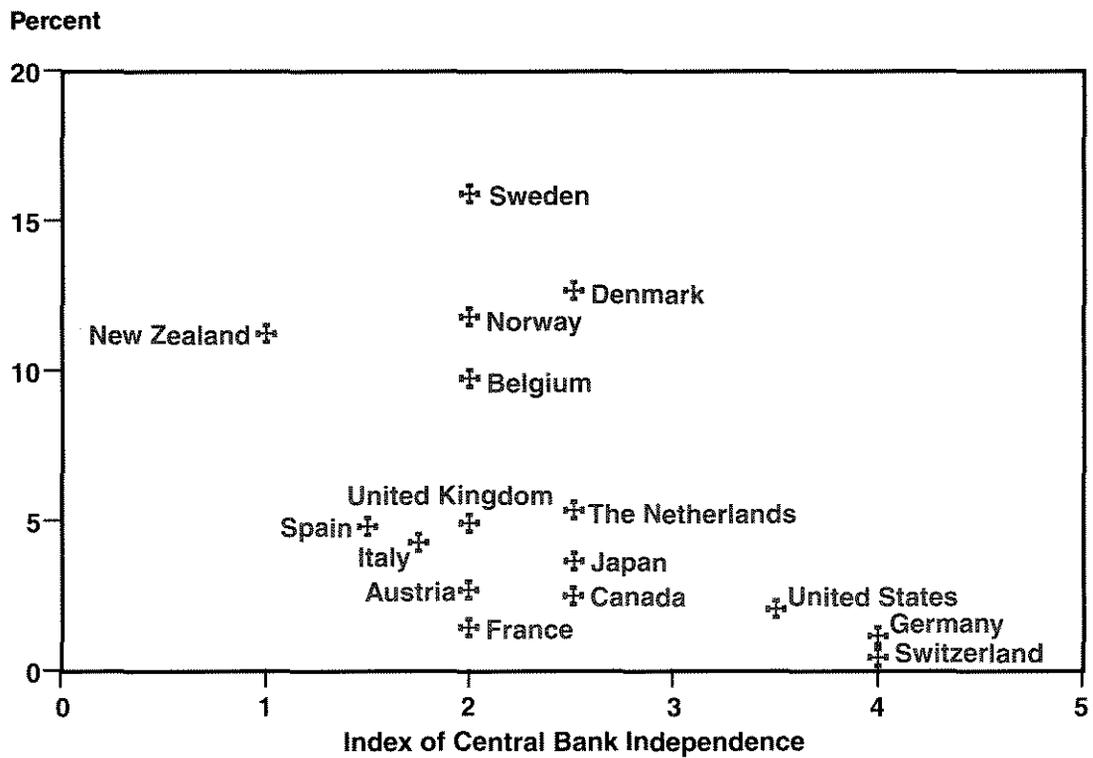


Figure 6
Variance of Deficit as a Percent of GDP: 1973-1989



dex created by Cukierman, all of the indexes of independence apply equal weight to each factor. For instance, the Grilli, Masciandaro and Tabellini index based on political measures of independence gives a country one point if no one on the central bank board is appointed by the government and one point if the policy formulated by the central bank does not require approval by the government. Although the latter certainly places a greater constraint on the actions of the central bank than the former, the two are treated the same empirically.

Another concern is that the studies are based on a legal measure of independence that may not reflect a bank's *de facto* level of independence. If there is a difference between legal and practical independence, studies based on the former type of measures may provide misleading results. Cukierman (1992), in an attempt to address this possibility, uses central bankers' responses to a questionnaire to determine the actual degree of independence in the 1980s. He finds that the correlation between the legal index and this practical index of independence is 0.33 for developed countries, 0.06 for developing countries and 0.04 overall.²⁵ This finding indicates, as Cukierman notes, that a legal index of independence is not useful for studying developing countries. It also indicates that a legal index may be a weak measure of actual independence for the developed countries.

There also may be bias in the factors selected to measure independence. For example, Grilli, Masciandaro and Tabellini include: "statutory requirements that central bank pursues monetary stability amongst its goals" in their index.²⁶ Likewise, a central bank is more independent under Cukierman's system if price stability is its only objective than if price stability is one of a number of objectives or not an objective at all. Using the goal of price stability as a measure of central bank independence may result in a bias between the measure of independence and the inflation rate.

The problems in developing precise measures of central bank independence are less important, however, if there is a consensus in ranking central banks within broad levels of independence. Table 1 lists 16 OECD countries along with their

Table 1
Comparison of Relative Rankings of Central Bank Independence

	Alesina	Alesina and Summers	Cukierman
Australia	14	8	7
Belgium	5	8	14
Canada	5	4	5
Denmark	5	4	4
France	5	8	9
Germany	1	1	2
Italy	13	14	12
Japan	3	4	15
Netherlands	5	4	6
New Zealand	14	16	10
Norway	5	8	16
Spain	14	15	13
Sweden	5	8	10
Switzerland	1	1	1
United Kingdom	5	8	7
United States	3	3	3

relative rankings as given by Alesina, Cukierman, and Alesina and Summers.²⁷ All agree that Switzerland and Germany have the most independent central banks of the countries studied. There are, however, a few countries which are ranked quite differently by the authors. For example, Japan has the second lowest level of independence of all 16 countries, according to Cukierman, whereas Alesina, and Alesina and Summers give it a much higher level of independence.

This discrepancy over the degree of independence of the Bank of Japan is not due solely to differences in factors considered in measuring independence. The index used by Alesina is based on the criteria of independence created by Bade and Parkin (1985). The index used by Alesina and Summers is constructed by averaging the indexes created by Alesina, and Grilli, Masciandaro and Tabellini. Bade and Parkin claim that the Bank of Japan is independent from the government in formulating and implementing monetary policy, and Grilli, Masciandaro and Tabellini claim that there are no provisions for handling policy conflicts between the Bank of Japan and the government. In contrast, Cukierman claims that the Bank of Japan and the government formulate policy jointly and

²⁵The correlations are based on the weighted indexes. Giving each factor related to independence an equal weight in the indexes results in a correlation of 0.01 for developed countries and 0.00 for developing countries.

²⁶See Grilli, Masciandaro and Tabellini (1991), p. 368.

²⁷The measure of independence developed by Cukierman is based on more factors than the measure used by Alesina, and Alesina and Summers. Thus Cukierman's rankings are more delineated than the other two.

further notes that in the case of a policy conflict, the executive branch of the government has final authority.²⁸

Since most of the empirical studies consider only central bank independence as a determinant of economic performance, it is possible that if other factors are accounted for, these results could be spurious. Grilli, Masciandaro and Tabellini attempt to account for other factors that could affect the rate of inflation by including political variables. They find that after accounting for political factors, central bank independence was still negatively related to inflation in the countries studied over the period 1950–89. The incorporation of political variables is a step in the right direction, but other factors also should be considered. As noted by Cukierman, “monetary policy is generally sensitive to shocks to government revenues and expenditures, employment, and the balance of payments.”²⁹ The types of shocks that a country experienced over the sample period and the reaction of the central bank to these shocks can affect its economic performance. A study by Johnson and Siklos (1992) found that the reactions of central banks (as measured by changes in interest rates) to shocks to unemployment, inflation and world interest rates were not closely related to standard measures of central bank independence.

Empirical use of these indexes may be problematic if central bank independence is an endogenous variable in the sense that countries with a commitment to price stability may have a greater propensity for independent central banks. If this is true, the mere establishment of an independent bank without a commitment to price stability will not bring inflation benefits to a country. In fact, a public aversion to inflation predates the establishment of many independent central banks. This was true for the creation of the Bundesbank and more recently with respect to central banks in Chile and New Zealand. New Zealand had one of the highest inflation rates of all industrialized countries in the 1980s. In 1989 legislation was passed to increase the independence of its central bank substantially. This

change is often credited with bringing inflation down to near zero. Though the legislation certainly formalized the country's commitment to price stability, New Zealand had succeeded in reducing its inflation rate from nearly 16 percent in 1987 to 6 percent before the creation of an independent central bank.

In theory, the degree of independence of a central bank should not be a determinant of a country's inflation performance under a fixed exchange rate system because monetary policy cannot be set exogenously.³⁰ During the Bretton-Woods era, it is not clear that any central bank (with the possible exception of the U.S. Federal Reserve) could be considered independent in the sense of an ability to pursue an independent monetary policy.³¹ Thus the empirical finding of a negative relationship between independence and inflation when the sample period extends over both the Bretton Woods and post-Bretton Woods eras may indicate a flaw in these studies. To assess the effect of central bank independence on inflation, the data used in these studies could be divided into two periods. If no evidence of a relationship between independence and inflation is found in the Bretton Woods period, this would strengthen the underlying argument of these studies that central bank independence is a primary determinant of a country's inflation performance.³² If, however, evidence is found of a relationship between central bank independence and inflation in the Bretton Woods period, this would conflict with theory and could indicate that the empirical findings are spurious.

THEORETICAL MODELS OF FISCAL AND MONETARY POLICY INTERACTIONS

In contrast to the empirical studies, the theoretical studies of central bank independence and economic performance concentrate on the conflicts that can arise when monetary and fiscal policy are delegated to independent institutions. In this literature an independent central bank is one that does not cooperate with the fiscal au-

²⁸Aufricht (1961) reproduces the Bank of Japan charter and subsequent changes in its governing regulations, which support the conclusion reached by Cukierman.

²⁹See Cukierman (1992), p. 438.

³⁰See McCallum (1989), pp. 285–88, for an explanation of the limitations on monetary policy under a fixed exchange rate system.

³¹Indeed, the primary argument in favor of a flexible exchange rate system was that such a system would permit individual countries to pursue independent monetary policies. See, for example, Friedman (1953) and Johnson (1969).

³²This is Grilli, Masciandaro and Tabellini's finding (1991).

thorities in setting economic policy. A dependent central bank is one that cooperates with the fiscal authority in setting policy.

In examining the theoretical implications of central bank independence, this paper focuses on models in which the policymaking process is decentralized.³³ The basic framework of these models is as follows. The government controls fiscal policy, and the central bank controls monetary policy. Both parties set goals for the economy (generally inflation and output targets) and assign priority to these goals. The goals and priorities may differ across the policymakers. Each institution uses the instruments available to it in an attempt to reach its goals. In most models the central bank controls the growth rate of the monetary base and the government controls fiscal spending. There is an underlying model of the economy that indicates how fiscal and monetary policy will affect the relevant economic variables. All of the models assume that there are no stochastic shocks to the economy.

The government and the central bank can either cooperate in implementing their policies or choose not to cooperate. If they do not cooperate, they either can set policies simultaneously, or one party can set its policies first and the other then adopts its policies in reaction to these.

Consider Andersen and Schneider's (1986) simple model in which the government and the central bank establish targets for inflation and output.³⁴ The further the actual level of output and rate of inflation are from their respective targets, the more disutility each authority receives. Thus, using the following equations, each authority can be modeled as setting policy to minimize its respective loss functions:³⁵

$$(1) L_f = a_f(y - y_f)^2 + b_f(\pi - \pi_f)^2 \quad a_f \geq b_f$$

$$(2) L_m = a_m(y - y_m)^2 + b_m(\pi - \pi_m)^2 \quad b_m \geq a_m$$

$$(3) \pi_f \geq \pi_m, y_f \geq y_m$$

where:

L_f is the fiscal authority's loss function

L_m is the monetary authority's loss function

y is output

π is inflation

y_f is the fiscal authority's output target

y_m is the monetary authority's output target

π_f is the fiscal authority's inflation target

π_m is the monetary authority's inflation target

a is the weight placed on the output target

b is the weight placed on the inflation target

Andersen and Schneider compare the economic outcomes under cooperation vs. noncooperation given three different models of the economy. The first model is Keynesian in nature. This is a short-run model with price sluggishness so that even anticipated changes in policy affect aggregate demand. The level of output and the rate of inflation prevailing in the economy are affected by both fiscal and monetary policies, which can be shown in a simple reduced form model with the following equations: where f is the fiscal policy instrument and m is the monetary policy instrument.³⁶

$$(4) y = \gamma_0 f + \gamma_1 m \quad 0 < \gamma_1 < \gamma_0$$

$$(5) \pi = \theta_0 f + \theta_1 m \quad 0 < \theta_0 < \theta_1$$

In the second model, which Andersen and Schneider refer to as Keynesian-New Classical, anticipated monetary policy is neutral; it can affect only inflation. Thus in a world of certainty, equation (4) becomes the following:

$$(6) y = \gamma_0 f$$

In the third model, the economy is New Classical in nature, characterized by perfect price flexibility and rational expectations. Anticipated policy, both fiscal and monetary, affects only inflation, not output. The economy is modeled by the following equations:

$$(7) \pi = \eta_0 f + \eta_1 m$$

³³There have been studies concentrating solely on monetary policy that have shown that better economic outcomes result from the policymaker placing a greater weight on inflation than society as a whole. Rogoff (1985) argues that these results indicate the economic benefits of central bank independence. These studies ignore the interaction of fiscal and monetary policy in determining economic outcomes and thus are not discussed here.

³⁴Generally it is assumed that the government places more weight on meeting its output target than its inflation target, whereas the opposite holds for the central bank. Further-

more, it is generally assumed that the inflation and output targets set by the government are greater than or equal to the targets set by the central bank.

³⁵The quadratic nature of the loss functions, which is standard in the macroeconomic game theory literature, implies that deviations on either side of the targets produce an equal loss to the policymaker.

³⁶The restrictions in equations (4) and (5) imply that fiscal policy has a greater (lesser) effect on output (inflation) than does monetary policy.

$$(8) y = \pi - \pi^e$$

$$(9) \pi - \pi^e = \eta_0(f - f^e) + \eta_1(m - m^e),$$

where y now refers to output relative to capacity and the superscript e refers to the expectation of the variable. Output can be increased above capacity only through unanticipated inflation, and unanticipated inflation can occur only through unanticipated changes in fiscal policy, monetary policy or both.

The relevant issue for policy is the size of the loss to each policymaker under cooperation and noncooperation. Cooperation in the determination of monetary and fiscal policies is modeled by the government and the central bank choosing the policy variables (f and m) to minimize a weighted average of their loss functions:

$$(10) \min_{f,m} L_c = \rho L_f + (1-\rho)L_m \quad 0 \leq \rho \leq 1$$

$$= \rho[a_f(y - y_f)^2 + b_f(\pi - \pi_f)^2] + (1-\rho)[a_m(y - y_m)^2 + b_m(\pi - \pi_m)^2],$$

where the weight placed on each loss function is determined by the relative bargaining strength of the two parties. Solving this minimization problem yields the equilibrium values for output and inflation, which can be substituted into the loss functions for the government, equation (1), and the central bank, equation (2), to determine the loss to each.

As noted above, noncooperation can be modeled in two ways. In the first, fiscal and monetary policies are chosen simultaneously; that is, the government selects a level of spending to minimize its loss function, equation (1), taking as given the actions of the central bank. At the same time, the central bank chooses the growth rate of the monetary base to minimize its loss function, equation (2), taking as given the actions of the government. This structure is referred to as a Nash game and the resulting equilibrium is called a Nash equilibrium. In a Nash equilibrium, neither authority, taking the actions of the other as given, can decrease its loss by unilaterally changing its policy.

In the second model of noncooperation, one policy is set before the other is determined. This process is known as a Stackelberg game, and the policymaker who moves first is known

as the Stackelberg leader, whereas the other policymaker is known as the Stackelberg follower. The leader chooses its policy, and the follower sets its policy in reaction. Furthermore, the leader, in choosing its policy, knows how the follower will react.

Although the equilibrium level of output and the rate of inflation vary depending on which model of the economy is used, in all three models the cooperative solution is Pareto superior to the noncooperative solution. This result is invariant to the structure of noncooperation—Nash or Stackelberg. The performance of the economy is better under cooperation in the sense that the losses to the government and the central bank are each lower than they are under noncooperation. This result holds even if the government and the central bank each place the same weight on meeting their inflation targets relative to their output targets ($a_f = a_m$ and $b_f = b_m$) but maintain different targets.

Andersen and Schneider summarize these results by noting the following:

When we have two independent authorities who act in their own selfish interest, then we quite often observe a conflict over the "right" policy direction. This result should be kept in mind when quite often the argument is put forward that an independent monetary authority should be created. ... Two independent policymakers do not automatically guarantee a policy outcome which is preferred to other outcomes under different institutional solutions.³⁷

Alesina and Tabellini (1987) show that adding one more target to the loss functions of the government and the central bank also does not change the nature of the results. Noncooperation is once again suboptimal.

Adding a time dimension to the model also does not change the basic result that cooperation can improve the outcome from the perspective of both policymakers. Pindyck (1976) presents one of the first dynamic models analyzing the strategic interaction of monetary and fiscal policy. He argues that the

separation of monetary and fiscal control may considerably limit the ability of *either* authority to stabilize the economy, particularly when the conflict over objectives is at all significant.³⁸

Petit (1989) examines the issue of policy coordination in a continuous time model. The

³⁷See Andersen and Schneider (1986), p. 188.

³⁸See Pindyck (1976), p. 239.

government sets targets for output and inflation, giving higher priority to output. The central bank targets inflation and the level of international reserves, giving higher priority to inflation.³⁹ As is standard, the government sets the level of public expenditures to minimize its loss function, whereas the central bank sets the growth of the monetary base to minimize its loss function.

In this model, policies are set at the beginning and are unchanged over the period considered. Once again, cooperation is Pareto superior to the Nash and the Stackelberg equilibriums. Furthermore, cooperation in this dynamic system leads to a decrease in the variability of the targets (particularly prices and international reserves), and raises the speed of adjustment of the system. The latter indicates that, given a shock to the system, the economy will return more quickly to its long-run values of output and inflation if the government and the central bank are coordinating their policies. Thus Petit concludes that policymakers should coordinate their policies.⁴⁰

Other studies concentrate on the interaction of the government and the central bank in financing fiscal deficits where the deficit must be financed through bonds, seignorage or both.⁴¹ Under the assumption that there is some limit on the ability of a government to continually issue bonds to finance its deficit, the need for inflation revenues becomes important.⁴² Sargent and Wallace (1981) conducted the seminal research on this question and showed that if the government embarks on a path of unsustainable deficits, the central bank might eventually be forced to inflate to fund the deficits. If the public realizes that the government debt is on such a path, it will expect inflation to increase, which may cause inflation to increase

well before the debt limit has been reached.⁴³ This outcome is a result of the government being able to set its policies and the central bank having to react to those policies (a Stackelberg game).⁴⁴

In general, a conflict over the public debt can arise at any time when the government and the central bank are allowed to adopt independent policies. Tabellini (1986) develops a dynamic model in which the central bank sets targets for changes in the monetary base and the stock of outstanding public debt while the government sets targets for the fiscal deficit net of interest payments and the stock of outstanding public debt. The target value of public debt is the same for both authorities. In choosing the level of the monetary base and the fiscal deficits, the two authorities are constrained by the government's dynamic budget constraint.⁴⁵ The stock of public debt as a proportion of income is considered too high by both the fiscal and monetary authorities. In the noncooperative setting, however, each authority ignores the benefit to the other of its own actions to reduce the level of debt. In the cooperative setting these benefits are internalized, resulting in a lower level of debt.

Tabellini (1987) and Loewy (1988) provide two more examples of models examining the conflict between central banks and governments over fiscal policy. Both show that such a conflict can lead to an increase in government debt. As noted by Blackburn and Christensen (1989), a conflict will always arise between a central bank whose goal is to maintain price stability and a government whose objective is to increase output and is pursuing this goal by running a stream of large deficits. Such a macroeconomic program is infeasible; one party will have to revise its strategy (give in). The conflict creates

³⁹The target for international reserves reflects a balance of payments objective.

⁴⁰Hughes Hallett and Petit (1990) also model the interaction of fiscal and monetary policy in a dynamic setting, reaching this same conclusion.

⁴¹Seignorage is the revenue received from the creation of money. It occurs because base money costs only a fraction of its face value to produce.

⁴²As the public debt grows, there may be increasing concern among bondholders that the government will be unable to repay the bonds.

⁴³As Sargent and Wallace note, if money demand today depends on inflationary expectations, then the price level today is a function of not only the current money supply, but also expectations of the future levels of the money supply.

⁴⁴The concern that undisciplined fiscal policies could result in inflation was recognized by the EC in drafting the Treaty on European Monetary Union. In the regulations concerning the proposed European Central Bank, the bank is prohibited from financing fiscal deficits of the member countries.

As pointed out by Sargent and Wallace, and expounded on by Darby (1984), the need for the central bank to monetize government debt through an inflationary policy is based on the assumption that the rate of growth of the real economy is less than the real rate of interest.

⁴⁵Note that monetary base and fiscal deficits in this model are both instruments and targets.

problems for the economy because of the uncertainty over the future course of policy: the public can expect higher inflation or higher taxes, depending on which policymaker gives in.⁴⁶

EVALUATION OF THE THEORETICAL LITERATURE

The theoretical studies indicate that noncoordination of fiscal and monetary policies will result in a suboptimal economic performance from the perspective of both the government and the central bank. Policy targets are more closely met when coordination occurs. Thus an independent central bank is not conducive to achieving better policy outcomes.

However, the theoretical work, like the empirical studies, has its weaknesses. One criticism is that the models are too simplistic. Neither the preference structures of the two authorities, nor the models of the economy, are completely specified. Furthermore, most of the models operate in a world of certainty. Policy, however, is not made in a world of certainty. Extrinsic uncertainty—shocks to the economy—can drive a wedge between the implementation of policy and its outcome. Intrinsic uncertainty—lack of knowledge of the preferences of a policymaker—is incorporated only in Tabellini and Loewy's models.⁴⁷ As these two models illustrate, adding uncertainty can increase the policy conflict between an independent central bank and fiscal authority.

In addition to assuming certainty, the models also omit one important player in these policy games—the public. Public perception of the credibility of a macroeconomic program is important to its results because the public can limit the ability of policymakers to take advantage of an inflation/output tradeoff. If an independent central bank can increase the public perception of the credibility of policy, this in turn should produce better economic results.⁴⁸

Another deficiency of this literature is its failure to address the feasibility of the policymakers' goals. The output goals set by the govern-

ment, for example, may not be sustainable without accelerating inflation. Tax and expenditures plans, which lead to a stream of deficits, may also raise questions about the sustainability of fiscal policy. In this environment, an independent central bank could be useful if its credible commitment to price stability forced the government to evaluate the sustainability of its policy goals. In contrast, centralization of policies might reduce the long-run economic performance of a country when the government's focus is short-run performance.

CENTRAL BANK INDEPENDENCE AND THE ECONOMY—WHAT DO WE KNOW?

This paper began with two questions: Why is the idea of an independent central bank as popular as it is? Are there economic benefits to be gained from having an independent central bank? Unfortunately, the empirical and theoretical studies surveyed do not provide clear answers. The empirical studies find that there is a negative correlation between central bank independence and long-run average inflation. They also show a negative correlation between independence and long-run average government deficits as a percent of GDP. In general, they find no evidence of a positive correlation between output growth and central bank independence. These results all point in the same direction yet do not provide unequivocal evidence that an independent central bank will lower inflation and government deficits and raise a country's output.

In sum, these empirical studies provide evidence of a negative correlation between central bank independence and inflation and central bank independence and fiscal deficits, but they do not provide evidence of causality. Countries with an aversion to inflation may formalize this aversion through the creation of an independent central bank. If this is true, it is the inflation aversion, not the independence of the central bank, that is the primary causal factor behind the low inflation result. The empirical measures themselves are biased toward the finding that

⁴⁶A government may adopt a strategy of running deficits, through decreasing taxes, to force future governments to cut expenditures. Under this strategy, the government would prefer an independent central bank, which will refuse to monetize the deficits and thereby increase the likelihood that fiscal spending will be reduced. See Sargent (1985) for a discussion of this type of strategy.

⁴⁷See Tabellini (1987) and Loewy (1988). In Tabellini's model the government is initially unaware of the preferences of the central bank. In Loewy's model both parties are initially unaware of the preferences of the other.

⁴⁸This issue has been studied in the literature that focuses only on monetary policy. See Blackburn and Christensen (1989) for a survey of this literature.

independence promotes low inflation. This is because the measures place much weight on legal requirements that a central bank pursue price stability and place this goal above all others. Cukierman is explicit in stating that his measure of independence:

is not the independence to do anything that the central bank pleases. It is rather the ability of the bank to stick to the price stability objective even at the cost of other short-term real objectives.⁴⁹

Given such a definition of independence, it is not surprising that independence is equated with low inflation.

Theoretical studies indicate that an independent central bank can increase policy conflicts with the government whenever the preferences of the two differ and, in so doing, worsen the economic performance of a country. These studies, however, do not provide overwhelming support for the idea that countries should place monetary policy in the hands of the executive or legislative branches of government. The simple structure of these models ignores some factors that affect the outcome of policy decisions—for example, the role of the public and the overall credibility of policy. Central bank independence may enhance credibility and thus the overall effectiveness of a policy program.

In sum then, in the empirical studies, emphasis on price stability and freedom to pursue this goal are primary determinants of independence. In the theoretical studies independence is equated with noncooperation between the fiscal and monetary authorities in policy implementation. These different definitions of independence may partly explain the different results. Furthermore, countries that may be classified as independent using the empirical definition may be classified as dependent using the theoretical definition. New Zealand is one such example. The 1989 Reserve Bank of New Zealand Act made price stability the *only* goal of the central bank, and the central bank is free to adopt policies to achieve that goal. Thus according to the empirical definition of independence, the 1989 act created an independent central bank in New Zealand. The central bank's inflation target, however, is established by the government for a multi-year period. The governor of the central bank signs an agreement pledging the bank to adopt policies to meet this target. Such coopera-

tion between the monetary and fiscal policy-makers is consistent with a dependent central bank in the theoretical models.

Altogether these studies indicate that we are far from fully understanding the role of central bank independence in producing favorable economic outcomes.

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⁴⁹See Cukierman (1992), p. 370.

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