The Case for Central Bank Independence *

1. Introduction

An important issue in the process towards a European Monetary Union is the position of the European System of Central Banks (ESCB). At its meeting in Maastricht in December 1991, the European Council decided that the primary objective of the ESCB shall be to maintain price stability. The ESCB shall have a relatively independent position, similar to the Deutsche Bundesbank. Many economists have argued that the institutional set-up of a central bank may influence economic outcomes.[1] On the basis of a review of existing research and some new evidence, the case for an independent ESCB is discussed in this paper. In our empirical work, three different measures of central bank independence are used to examine whether the consequences of central bank independence are dependent upon the choice of the independence measure.

The paper is organized as follows. In the next section the relationship between the level of inflation and central bank independence is discussed, while in the third section the issue of inflation variability is examined. The fourth section reviews the impact that central bank independence may have on the level and financing of government budget deficits. The fifth section explores the relationship between central bank independence and economic growth. The final section provides some concluding comments.

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* The authors would like to thank Willem Buiter, Sylvester Eijffinger, Lex Hoogduin, Ad van Riet and Elmer Sterken for their comments on a previous version of this paper.

[1] See, for example, BADE and PARKIN (1988), ALESINA (1989) and GRILLI *et al.* (1991).

2. Central Bank Independence and the Level of Inflation

It is widely believed that countries with an independent central bank have lower inflation than countries with a central bank which comes under direct control of the government (Parkin, 1987; Alesina and Summers, 1991). Why would central bank independence yield lower inflation? According to the older public choice view there exist strong political pressures on the monetary authorities to behave in accordance with the government's preferences. As Buchanan and Wagner put it:

> "A monetary decision maker is in a position only one stage removed from that of the directly elected politician. He will normally have been appointed to office by a politician subject to electoral testing, and he may even serve at the pleasure of the latter. It is scarcely to be expected that persons who are chosen as monetary decision makers will be the sort that are likely to take policy stances sharply contrary to those desired by their political associates, especially since these stances would also run counter to strong public opinion and media pressures... 'Easy money' is also 'easy' for the monetary manager.." (1977, pp. 117-18).

Monetary tightening aggravates the budgetary position of government: the reduction in tax income brought by a temporary slow-down of economic activity, possibly lower receipts from the inflation tax and the short-run increase in the interest burden on the public debt worsen the deficit. So "easy money" may be preferred by the government. Indeed, there exists some evidence that even the relatively independent Federal Reserve sometimes caters to the desires of the President and/or the Congress.[2] This evidence is either based on close inspection of the contacts between the polity and the central bank (see, *e.g.*, Havrilesky, 1988; Akhtar and Howe, 1991) or exists by testing whether monetary policy turns expansive before elections take place as predicted by Nordhaus's (1975) political

[2] It is generally assumed that Congress exercises little or no systematic control of the Federal Reserve. However, GRIER (1991) provides evidence that changes in the leadership of Congress committees dealing with monetary policy are significantly correlated with monetary base growth. KANE (1980) views Congress and the Federal Reserve as having an implicit bargain: the Federal Reserve accepts blame for a bad economy in return for a grant of independence. However, when monetary policy causes too much electoral pain to Congress, the Federal Reserve must reverse course. For a critique on both views see BECK (1988).

business cycle theory (see, for example, Allen, 1986).[3] The impact of elections on U.S. monetary policy has been investigated quite extensively. The results are mixed (De Haan and Zelhorst, 1991). It is, of course, clear that the more independent a central bank is, the less it is under the spell of political influences.

A similar line of reasoning, as in Buchanan and Wagner (1977), is present in the literature originating with Barro and Gordon (1983), in which the traditional case for monetary policy rules is strengthened, based on the view that governments have an inherent tendency to misuse instruments at their disposal. Discretionary policy makers face an incentive to inflate the economy to achieve short-run reductions in unemployment. In Barro and Gordon's new-classical framework, repeated use of this instrument will raise inflationary expectations, causing higher inflation without eventually affecting the unemployment level. A policy rule is, therefore, clearly superior. An important institutional mechanism to enforce policy rules could be provided by independent agencies, like the central bank, which are not subject to each government's discretion. An independent central bank would, in this analysis, lead to lower inflation rates.[4] Neumann (1991) argues that the provision of a constitutional status of independence to the central bank is an effective device for government to commit itself to price stability over an infinite time horizon.

A third argument to explain why central bank independence may affect inflation has been put forward by Sargent and Wallace (1981). They distinguish between fiscal and monetary authorities. If fiscal policy is dominant – *i.e.* if the monetary authorities cannot influence the size of the government's budget deficit – money supply becomes endogenous. If the public are no longer able or willing to absorb additional government debt, the monetary authorities will be forced to finance the deficit by money creation. If, however, monetary policy is dominant, the fiscal authorities will be forced to reduce the deficit (or repudiate part of the debt).

[3] Recent work by CUKIERMAN and MELTZER (1988) and ROGOFF and SIBERT (1988) shows that NORDHAUS's (1975) insights, which were based on a model with a non-vertical long run Phillips curve, survive even when voters are not myopic as long as they have imperfect information.

[4] TOMA (1982) argues, however, that the central bank tries to maximize its discretionary budgets, which causes excessive money growth. Since the central bank officials cannot directly pocket these earnings, they consume them in the form of high salaries, lavish offices, travel budgets or excessive number of employees. BOYES *et al.* (1988) report further evidence for this point of view.

The preceding analysis suggests that central bank independence may affect inflation across countries. In the upper part of Table 1 some simple regressions of the level of inflation in 18 OECD countries and central bank independence are shown.[5] Our first measure of central bank independence is based upon the measure used by Grilli *et al.* (1991 – see the Appendix for further details). In the period 1961-69 the coefficient of the independence dummy is not significantly different from zero. Given the fixed exchange rate regime, this is hardly surprising. It is quite clear that central bank independence exerts a negative influence on the level of inflation in the other periods.[6] The lower part of Table 1 shows the estimation results using Alesina's (1989) and Eijffinger and Schaling's (1992) measures for central bank independence. The number of observations is reduced to 14 and 11 OECD countries, respectively. As shown in the Appendix, the correlation between the various independence measures is low, indicating that different aspects of central bank independence are taken into account. The Alesina and Eijffinger-Schaling measures yield similar outcomes as the modified Grilli measure.

The results reported in Table 1 are in accordance with the conclusions of existing research.[7] Two objections may, however, be made against this type of analysis. First, inflation is not directly controlled by the monetary authorities and, second, factors other than central bank independence may be responsible for cross-country inflation differences. In response to the first criticism, we have replaced the inflation rate in our regressions by excess money growth, which is defined as the growth rate of the monetary base minus the growth rate of real GDP. The results are very similar to those reported in Table 1 and are, therefore, not shown. In response to the second criticism, we have re-estimated the model for excess money growth for the 1980s and have added three other explanatory variables: the number of government changes (freq), the number of government changes after which economic policy was changed significantly (sign), and the government budget deficit expressed as a fraction of GDP (def).[8] As explained by Grilli *et al.* (1991), the first two variables reflect political stability and polarization which the authors found to be important in explaining cross-country inflation differences. The results are reported in Table 2. It is clear that the coefficient of the Grilli-central bank independence dummy remains significantly different from zero, confirming our previous results.

[5] Inflation is measured as the increase of the GDP deflator and is taken from the IMF's *International Financial Statistics Yearbook* 1990.

[6] When a dummy variable is added to differentiate between EMS countries and non-EMS countries it appears that the coefficient of this dummy is negative, but not significantly different from zero. The coefficient of the independence dummy hardly changes (–1.19).

[7] See BADE and PARKIN (1988), ALESINA (1989), GRILLI *et al.* (1991) and ALESINA and SUMMERS (1991).

[8] The data on freq and sign are taken from Grilli *et al.* (1991); data for government deficit are from the OECD's *Economic Outlook*, June 1991. Data for the monetary base are taken from the IFS (line 14).

TABLE 1

CENTRAL BANK INDEPENDENCE AND THE LEVEL OF INFLATION

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	4.85	14.79	16.68	12.11
	(0.83)	(1.41)	(2.56)	(1.17)
Independence dummy	–0.11	–0.73	–1.22	–0.69
	(0.11)	(0.19)*	(0.35)*	(0.16)*
adj. R^2	–0.00	0.43	0.39	0.53
SE	1.32	2.25	4.07	1.87
Intercept	4.82	14.34	12.87	10.75
	(0.91)	(1.41)	(1.87)	(0.88)
Alesina dummy	–0.26	–2.28	–2.62	–1.78
	(0.39)	(0.47)*	(0.78)*	(0.37)*
adj. R^2	–0.04	0.64	0.44	0.63
SE	1.43	1.73	2.73	1.38
Intercept	3.30	12.17	10.58	8.68
	(0.62)	(1.60)	(1.88)	(1.21)
ES dummy	0.19	–1.20	–1.57	–0.86
	(0.20)	(0.51)*	(0.60)*	(0.36)*
adj. R^2	–0.01	0.31	0.37	0.32
SE	0.88	2.27	2.67	1.59

Notes: Standard errors are in parentheses. An asterisk indicates that the coefficient is significantly different from zero at the 95% confidence level. See the Appendix for details on the independence dummies.

TABLE 2

CENTRAL BANK INDEPENDENCE AND EXCESS MONEY GROWTH, 1980-1989

Explanatory variables:				
Intercept	0.18	0.17	0.14	0.14
	(0.04)	(0.05)	(0.04)	(0.06)
Independence dummy	–0.013	–0.012	–0.010	–0.010
	(0.005)*	(0.006)*	(0.005)*	(0.006)
Freq		0.0009		
		(0.005)		
Sign			0.014	
			(0.011)	
Def				–0.42
				(0.47)
adj. R^2	0.24	0.19	0.28	0.25
SE	0.06	0.06	0.06	0.06

3. Central Bank Independence and Inflation Variability

The preceding analysis suggests that central bank independence may reduce pre-election manipulation of monetary policy. If true, central bank independence may also result in more stable money growth and, therefore, less inflation variability. There is a related argument as to why an independent central bank may result in less inflation variability. Politicians not only strive to remain in office as long as possible, they are also partisan and wish to deliver benefits to their constituencies (Hibbs, 1987). There are indications that the pattern of unemployment and inflation tends to be systematically related to the political orientation of governments. Whereas right-wing governments generally give a high priority to lower inflation, left-wing governments are generally more concerned about unemployment. Existing evidence provides support for the view that the redistributional consequences of inflation provide an incentive for the left to be expansionary and for the right to be inflation-fighting (Alesina, 1989).[9] This implies that if there were a

[9] In the traditional partisan model there is an exploitable trade-off between inflation and unemployment. Recently a "rational partisan theory" has been put forward (see, for example, ALESINA and SACHS, 1988) which implies that differences between policies adopted by left- and right-wing governments are transitory and should occur immediately after the change of government.

regular change of government the inflation variability would be high, especially if the monetary authorities were dominated by elected politicians. However, a relatively independent central bank will not change its policy after a new government has been elected. So central bank independence may reduce inflation variability (Alesina, 1988).

Another reason why central bank independence may affect inflation variability has been put forward by Milton Friedman (1977) to explain why there exists a positive correlation between rates of inflation and variability of inflation across countries and across time for a given country.[10] In Friedman's analysis, a government may temporarily pursue a set of policy goals (output, employment) that leads to a high inflation rate, which induces strong political pressure to reduce it. The relationship between the level and the variability of inflation has been extensively investigated. Chowdhury (1991) has re-examined this issue for a sample of 66 countries for the 1955-85 period. His results indicate the presence of a significant positive relationship between the inflation rate and its variability. Figure 1 shows the scatter diagram for the level of inflation and its standard deviation for the 18 countries in our sample. Figure 1 clearly suggests the presence of a positive correlation between inflation and its variability for the periods after the demise of the Bretton-Woods system, but not for the period 1961-1969.

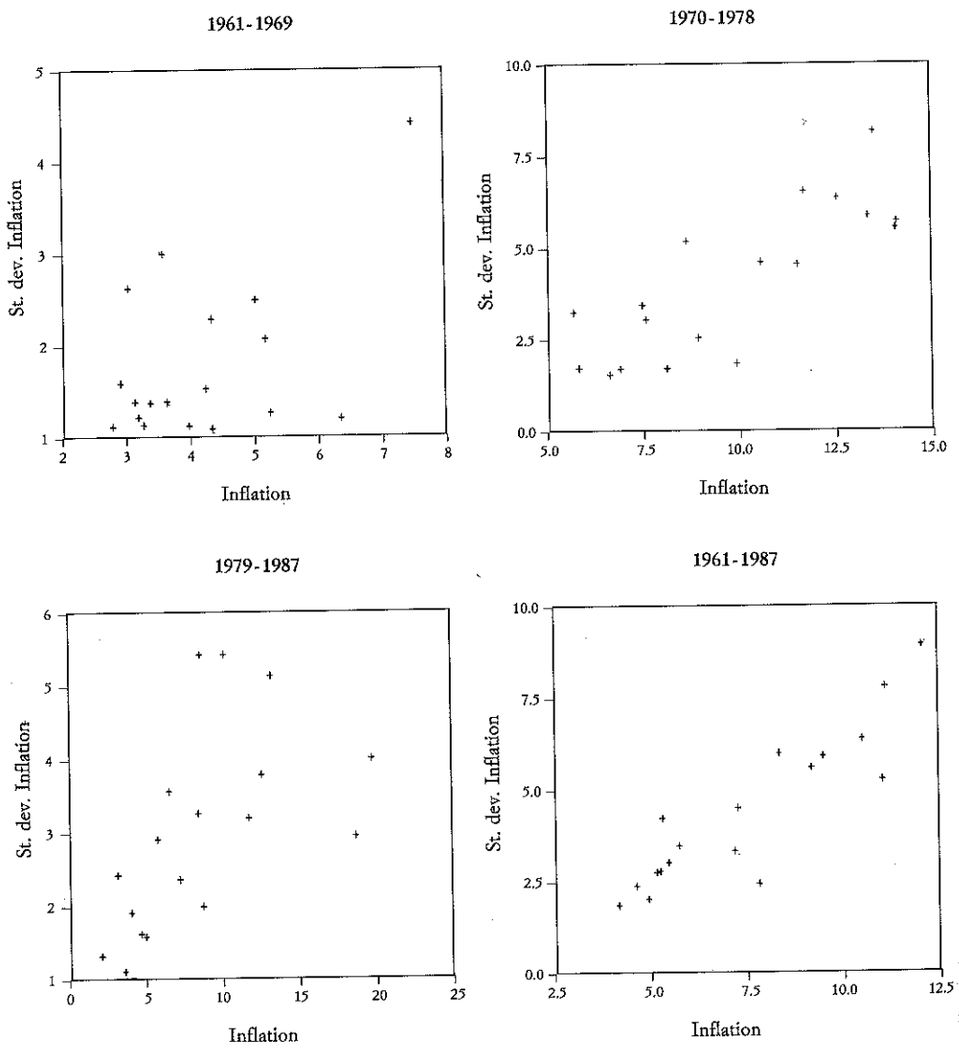
If inflation is low due to the independence of the monetary authorities, one would also expect that central bank independence yields a lower level of inflation variability. Using the Grilli-independence measure this is indeed the case for the entire sample period (upper part of Table 3). With one exception, this conclusion also holds for the sub periods. Similar results are reached when the Alesina and the Eijffinger-Schaling dummies are used (lower part of Table 3).[11] The differences that do occur are not due to differences in sample size. When we re-estimated the equation applying the Grilli-dummy for the Alesina and Eijffinger-Schaling groups of countries, similar results were reached. Our outcomes are in contrast to

[10] The discussion of the relationship between the level of inflation and its variability received an important impulse from OKUN (1971) who conducted a cross-country study of 17 industrial economies for the period 1961-68. His results indicated that countries with high average inflation have more widely fluctuating inflation rates.

[11] We have also used the average absolute change of inflation as measure of inflation variability, but this does not change our outcome, which is in accordance with the findings of CHOWDHURY (1991).

the findings of Bade and Parkin (1988), who found no evidence for reduced inflation variability, but accord with the conclusions of Alesina and Summers (1991).

FIGURE 1



4. Central Bank Independence and Government Budget Deficits

An important test case for the independence of the central bank is whether they accommodate government budget deficits. Burdekin and Wohar (1990) have examined for eight countries whether deficit accommodation is more prevalent in countries with dependent central banks. They conclude that deficit accommodation occurs in at least three of the five countries with dependent central banks, while the most independent central banks (in Germany, Switzerland and the U.S.) do not accommodate deficits. These results accord with the pattern of deficit accommodation reported by Demopoulos *et al.* (1987) and Burdekin and Laney (1988), but are in contrast to the conclusions of other studies such as Giannaros and Kolluri (1985), Protopapadakis and Siegel (1987) and Barnhart and Darrat (1988) who found no evidence for a link between budget deficits and money growth, even in countries with a relatively dependent central bank.[12]

We have examined whether central bank credit to government, measured as the growth of the central bank's net claims on central government scaled by GDP, is influenced by central bank independence. Net claims are defined as central bank claims less government deposits with the central bank. The results are reported in Table 4. When the modified Grilli measure of central bank independence is used, it follows that relatively independent central banks provide less credit to government to finance budget deficits. However, when the Alesina and the Eijffinger-Schaling dummies are used, there is no support for this point of view (lower part of Table 4). These divergent outcomes are caused by differences in sample size. When we re-estimated the equations using the Grilli-independence measure for the Alesina and Eijffinger-Schaling groups of countries, respectively, it turned out that the coefficient of the Grilli-independence measure was insignificant in all regressions (not shown).

Central bank independence may also affect the size of the government budget deficit (Tabellini, 1986). A credible commitment not to inflate away the debt and not to provide monetary financing of

[12] DE HAAN and ZELHORST (1990) report that even in developing countries there is only limited evidence for a clear link between budget deficits and money growth.

TABLE 3

CENTRAL BANK INDEPENDENCE AND INFLATION VARIABILITY

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	2.77	7.15	4.15	7.58
	(0.51)	(1.02)	(0.82)	(1.00)
Independence dummy	–0.15	–0.46	–0.18	–0.49
	(0.07)*	(014)*	(0.11)	(014)*
adj. R^2	0.18	0.37	0.08	0.40
SE	0.81	1.63	1.31	1.61
Intercept	2.80	5.32	4.13	5.98
	(0.53)	(0.96)	(0.85)	(0.69)
Alesina dummy	–0.51	–0.80	–0.59	–1.03
	(0.22)*	(0.40)*	(0.35)	(0.29)*
adj. R^2	0.25	0.18	0.12	0.47
SE	0.83	1.50	1.24	1.08
Intercept	1.42	5.21	4.32	5.46
	(0.30)	(1.06)	(0.92)	(0.84)
ES dummy	–0.01	–0.61	–0.56	–0.66
	(0.10)	(0.34)	(0.29)	(0.27)*
adj. R2	–0.11	0.18	0.20	0.33
SE	0.43	1.50	1.31	1.19

Notes: Standard errors are in parentheses. An asterisk indicates that the coefficient is significantly different from zero at the 95% confidence level.

the deficit may strengthen the government's incentive to balance its budget.[13] Grilli *et al.* (1991) found no evidence for this point of view. Leone (1991) concludes that the experience of countries with chronic fiscal deficits seems to indicate that the establishment of limits on central bank lending to the government has not been sufficient to guarantee fiscal discipline. However, Parkin (1987) concludes that the

[13] The so-called "divorce" of July 1981 which freed the Italian central bank from the obligation to purchase all unsold public debt was partly motivated by the desire to moderate fiscal policy (TABELLINI 1987).

TABLE 4

CENTRAL BANK INDEPENDENCE AND CENTRAL BANK FINANCING OF GOVERNMENT BUDGET DEFICITS

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	0.0055	0.0186	0.0232	0.0150
	(0.004)	(0.006)	(0.007)	(0.004)
Independence dummy	–0.0002	–0.0018	–0.0023	–0.0013
	(0.0005)	(0.0008)*	(0.0010)*	(0.0006)*
adj. R^2	–0.05	0.18	0.23	0.17
SE	0.007	0.010	0.011	0.007
Intercept	0.0060	0.0124	0.0079	0.0099
	(0.005)	(0.005)	(0.004)	(0.003)
Alesina dummy	–0.0009	–0.0037	–0.0020	–0.0024
	(0.0020)	(0.0022)	(0.0015)	(0.0014)
adj. R^2	–0.07	0.12	0.06	0.15
SE	0.007	0.008	0.005	0.005
Intercept	0.0083	0.0096	0.0043	0.0068
	(0.006)	(0.007)	(0.003)	(0.004)
ES dummy	–0.0011	–0.0019	–0.0007	–0.0008
	(0.0018)	(0.0022)	(0.0010)	(0.0014)
adj. R^2	–0.07	–0.03	–0.05	–0.07
SE	0.008	0.010	0.004	0.006

Notes: Standard errors are in parentheses. An asterisk indicates that the coefficient is significantly different from zero at the 95% confidence level.

two countries in his sample that have the most independent central bank (Germany and Switzerland) have deficit processes with little uncertainty and steady state values that are very close to zero. Masciandaro and Tabellini (1988) examine five countries (Australia, Canada, Japan, New Zealand, and the United States) and find that New Zealand which had (until recently) the least independent central bank also had the highest average of deficits.

Table 5 shows the outcomes of regressions of the government budget surplus scaled by GDP and the dummies for central bank independence. It is quite clear that central bank independence matters for the level of government budget deficits. During the period 1979-1989 most countries had rapidly growing budget deficits, but in countries with an independent central bank deficits increased less. As the middle part of Table 5 shows, it makes a difference when the Alesina dummy is used: in the period 1979-87, for instance, the coefficient of the independence dummy is no longer significantly

TABLE 5

CENTRAL BANK INDEPENDENCE AND GOVERNMENT BUDGET DEFICITS

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	–0.03	–0.05	–0.12	–0.07
	(0.01)	(0.02)	(0.02)	(0.02)
Independence dummy	0.002	0.003	0.008	0.005
	(0.001)	(0.002)	(0.003)*	(0.002)*
adj. R^2	0.06	0.07	0.30	0.31
SE	0.015	0.026	0.034	0.023
Intercept	–0.03	–0.05	–0.08	–0.06
	(0.01)	(0.01)	(0.03)	(0.01)
Alesina dummy	0.007	0.010	0.014	0.013
	(0.003)	(0.006)	(0.011)	(0.005)*
adj. R^2	0.35	0.12	0.06	0.35
SE	0.009	0.022	0.036	0.018
Intercept	–0.02	–0.04	–0.06	–0.04
	(0.01)	(0.02)	(0.03)	(0.02)
ES dummy	0.003	0.006	0.007	0.005
	(0.002)	(0.005)	(0.009)	(0.005)
adj. R^2	0.10	0.03	–0.05	–0.01
SE	0.009	0.023	0.040	0.023

Notes: Standard errors are in parentheses. An asterisk indicates that the coefficient is significantly different from zero at the 95% confidence level.

different from zero. This is not caused by the exclusion of some high deficit countries (Greece, Ireland, Portugal) in the Alesina sample. When we re-estimated the equation using the Grilli independence measure for the Alesina sample of countries, the results are almost exactly the same as for the sample of 18 countries. The coefficient of the independence dummy for the period 1979-87 is 0.007, significantly different from zero. In the regressions in which the Eijffinger-Schaling dummy is used (lower part of Table 5), the coefficient is always insignificantly different from zero. This is also not caused by differences in sample size.

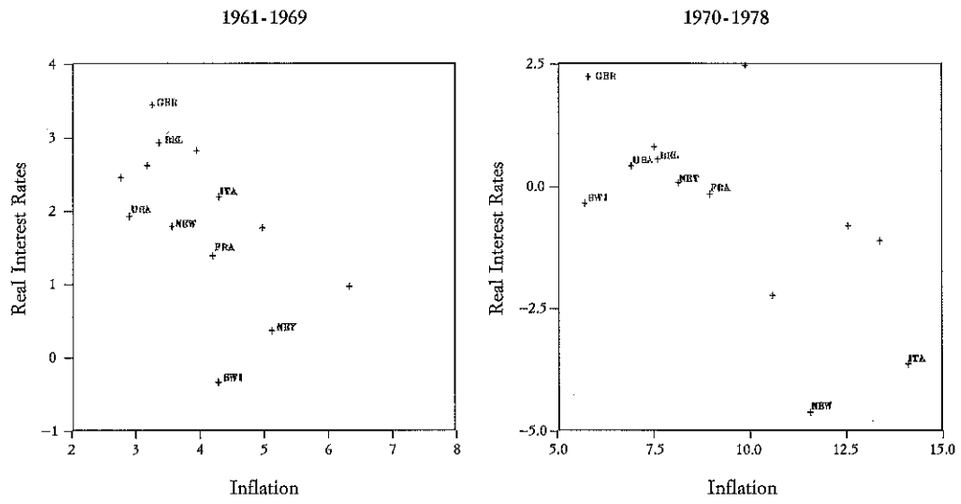
5. Central Bank Independence and Economic Growth

With respect to the effect of central bank independence on economic growth, two opposing views have been put forward in the literature. Some authors have argued that the real interest rate depends upon money growth, *i.e.* they assume that the Fisher hypothesis does not hold due to the Mundell-Tobin effect. A low level of inflation which is caused by restrictive monetary policy results in high real interest rates, which may have detrimental effects on the level of investment, and hence on economic growth. There seems to be evidence in favour of the first part of the argument: countries with a low level of inflation have high *ex post* real interest rates (figure 2).

There are, however, also some arguments as to why central bank independence may promote economic growth. First, an independent central bank may be less prone to political pressures and therefore behave more predictably, which may enhance economic stability and economic growth. Second, many economists, especially those involved in central banking, believe that even moderate rates of inflation impose significant economic costs on society. Recently Grimes (1991) and Fischer (1991) have provided evidence supporting the view that inflation is harmful to economic growth. One channel by which this effect may operate is increased inflation uncertainty. As previously pointed out, there exists a strong link between the level and the variability of inflation. High variability may lead to high

inflation uncertainty which, in turn, may affect economic growth. As shown, central bank independence reduces inflation variability. If this reduction in inflation variability also leads to lower inflation uncertainty it may have a positive effect on economic growth. The empirical evidence on the relationship between inflation variability

FIGURE 2



and inflation uncertainty on economic growth is, however, not very supportive for this point of view. Using annual data for 24 countries, Logue and Sweeney (1981) find no evidence for a significant negative impact of inflation variability on real growth. A similar conclusion is reached by Jansen (1989). Engle (1983) has found little evidence for a link between the relatively high rates of inflation experienced by the United States in the 1970s and inflation uncertainty. However, Cukierman and Wachtel (1979), for example, report a positive correlation between the rate of inflation and the dispersion on inflation forecasts gathered from the Michigan and Livingston inflation surveys. Recently Evans (1991) has published evidence which is consistent with the point of view that uncertainty about the long-term prospects for inflation is strongly linked to the actual rate of inflation.

Grilli *et al.* (1991) and Alesina and Summers (1991) conclude that central bank independence has no effect on economic growth. Although central bank independence seems to be associated with lower output growth, the estimated effect is generally insignificant. We reach a similar conclusion (Table 6). It is clear that, whatever measure of central bank independence is used, its coefficient is insignificantly different from zero. Given the widespread belief that a restrictive monetary policy may be harmful for economic growth, it is remarkable that central bank independence apparently has so few detrimental effects on real growth.

We have examined whether central bank independence has any influence on the variability of economic growth, measured by the standard deviation of GDP growth. It is likely that some kind of trade-off exists between the variability of inflation and the variability of output growth. Rogoff (1985) provides, for instance, a model in which independent central bankers engage in fewer stabilization policies at the expense of more cyclical variability in economic activity. Table 7 contains the estimation results, using the standard deviation of GNP growth as measure of output variability. There is no support for the view that central bank independence yields higher output variability. When the Grilli dummy is used, its coefficient is significantly different from zero only once and then the coefficient has a negative sign. When the Alesina and Eijffinger-Schaling independence dummies are used, there is also no support for increased

TABLE 6

CENTRAL BANK INDEPENDENCE AND ECONOMIC GROWTH

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	6.84	4.88	2.39	4.70
	(1.07)	(0.67)	(0.45)	(0.60)
Independence dummy	–0.20	–0.17	–0.02	–0.13
	(0.15)	(0.09)	(0.06)	(0.08)
adj. R^2	0.11	0.13	–0.06	0.08
SE	1.71	1.06	0.71	0.96
Intercept	5.46	3.96	2.33	3.94
	(1.24)	(0.65)	(0.52)	(0.70)
Alesina dummy	–0.02	–0.27	–0.01	–0.11
	(0.52)	(0.27)	(0.22)	(0.30)
adj. R^2	–0.08	–0.04	–0.08	–0.07
SE	1.94	1.02	0.76	1.10
Intercept	5.55	4.49	3.11	4.38
	(1.43)	(0.65)	(0.54)	(0.80)
ES dummy	–0.05	–0.36	–0.27	–0.23
	(0.46)	(0.21)	(0.17)	(0.26)
adj. R^2	–0.10	0.16	0.12	–0.02
SE	2.03	0.92	0.77	1.13

output variability (lower part of Table 7). This confirms results reported by Alesina and Summers (1991).

6. Concluding Comments

This analysis would suggest that central bank independence matters. An important issue for future research is to explain the behaviour of a relatively independent central bank, *i.e.* what does the objective function of such a central bank look like, and why? In the

TABLE 7

CENTRAL BANK INDEPENDENCE AND ECONOMIC GROWTH VARIABILITY

Explanatory variables:	1961-1969	1970-1978	1979-1987	1961-1987
Intercept	2.14	3.54	1.61	3.18
	(0.39)	(0.46)	(0.36)	(0.34)
Independence dummy	–0.01	–0.12	0.03	–0.08
	(0.05)	(0.06)*	(0.05)	(0.05)
adj. R^2	–0.06	0.15	–0.04	0.10
SE	0.62	0.73	0.58	0.55
Intercept	1.97	2.09	2.18	2.43
	(0.42)	(0.37)	(0.41)	(0.32)
Alesina dummy	0.01	0.21	–0.17	0.06
	(0.07)	(0.16)	(0.17)	(0.13)
adj. R^2	–0.08	0.04	0.002	–0.06
SE	0.66	0.60	0.59	0.50
Intercept	1.44	1.89	2.36	2.19
	(0.48)	(0.46)	(0.44)	(0.36)
ES dummy	0.17	0.22	–0.21	0.12
	(0.15)	(0.15)	(0.14)	(0.12)
adj. R^2	0.02	0.11	0.11	0.001
SE	0.68	0.66	0.62	0.51

Notes: Standard errors are in parentheses. An asterisk indicates that the coefficient is significantly different from zero at the 95% confidence level.

literature reviewed in this paper, it is generally assumed that a central bank which is less prone to political manipulation will follow less inflationary policies and behave more predictably. It should be pointed out, however, that the first part of this argument does not necessarily imply the second part.

Our analysis suggests that an independent central bank yields lower inflation rates without economic sacrifices such as lower output. Does this mean that a central bank should be as independent as possible? The answer depends, of course, on the costs and benefits

of inflation. It is well known that the costs of inflation depend on the sources of the inflation, on whether it was anticipated and on the institutional structure of the economy (see Fischer and Modigliani, 1978, and Fischer, 1981). The benefits of inflation have generally been studied in a public finance context. Inflation implies proceeds for government due to the creation of high powered money ("seignorage") and/or reduction of the real value of its outstanding debt. Various authors have analyzed the optimal level of inflation. The less recent literature, of which Friedman (1971) is a well known example, only considers government revenue due to inflation. In more recent studies seignorage is treated like other taxes; optimal fiscal policy must minimize the social losses caused by various taxes under the restriction of the government budget constraint (Mankiw, 1987). Optimal fiscal policy considerations have been put forward by Dornbusch (1988) as an argument against European monetary integration (see also van der Ploeg, 1990). This view has been disputed by Gross (1990), who argues that the view that the loss of seignorage should be avoided rests on the assumption that outside the EMS these countries would choose the optimal amount of seignorage. As pointed out, however, there always exists a strong incentive for countries with a high level of public debt to use surprise inflation to reduce the real burden of servicing this debt. Furthermore, there is hardly any empirical support for the "optimal taxation" approach (see, for example Grilli *et al.*, 1991), so this argument against central bank independence does not seem to be well founded.

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APPENDIX

CENTRAL BANK INDEPENDENCE MEASURES

Country	Modified Grilli	Alesina	Eijffinger-Schaling
1. Australia	9	1	1
2. Austria	7	n.a.	n.a.
3. Belgium	5	2	3
4. Canada	9	2	1
5. Denmark	6	2	n.a.
6. France	5	2	2
7. Germany	12	4	5
8. Greece	4	n.a.	n.a.
9. Ireland	7	n.a.	n.a.
10. Italy	5	1/2	2
11. Japan	5	3	3
12. Netherlands	10	2	4
13. New Zealand	3	1	n.a.
14. Portugal	3	n.a.	n.a.
15. Spain	4	1	n.a.
16. Switzerland	10	4	5
17. United Kindom	6	2	2
18. United States	11	3	3

The modified Grilli measure is based on Table 12 and Table 13 of Grilli *et al.* (1991), measuring political independence (determined by: 1. the procedures for appointing board members; 2. the relationship between the governing board of the central bank and the government; and 3. formal responsibilities for monetary policy) and economic independence (determined by the influence of the government in deciding how much to borrow from the central bank and the nature of the monetary instruments under control of the central bank). The measure used in our empirical analysis consists of the total number of entries in both tables, except for the entries which are related to supervision of the banking system. Whether or not a central bank has any responsibility for bank supervision provides, in our view, no information as to its independence. Although it is, without doubt, true that the "lender of last resort" function of a central bank may conflict with its task of safeguarding the currency, transferring the task of banking supervision to another organization does not remove this potential conflict. Entries included are related to the appointment of the governing board, the relationship with government, constitution, and monetary financing of the government's budget deficit. A higher number of entries implies more independence. The Alesina independence measure is taken from Alesina (1989; 1988), while the measure of Eijffinger and Schaling is taken from

Eijffinger and Schaling (1992). The Alesina measure is based upon previous work by Bade and Parkin (1988), who distinguish between policy and financial independence. The degree of policy independence is determined using three criteria: (1) final responsibility for monetary policy; (2) the presence of a government official on the bank board; and (3) whether board appointments are made independent of government. Financial independence is also based upon three criteria: (1) the budgetary autonomy of the bank; (2) the determination of the board members' salaries; and (3) decision making on profit allocation. The Eijffinger-Schaling index is determined using three criteria: (1) responsibility for monetary policy; (2) the presence of a government official on the bank board; and (3) whether more than half of the board appointments are made independent of the government.

CORRELATION MATRIX OF THE VARIOUS INDEPENDENCE MEASURES

	Grilli	Alesina	Eijffinger-Schaling
Grilli	1.00		
Alesina	0.64	1.00	
Eijffinger-Schaling	0.47	0.82	1.00

J.D.H. - J.E.S.

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