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Alberto Alesina; Roberta Gatti

The American Economic Review, Vol. 85, No. 2, Papers and Proceedings of the Hundredth and Seventh Annual Meeting of the American Economic Association Washington, DC, January 6-8, 1995 (May, 1995), 196-200.

Stable URL:
http://links.jstor.org/sici?sici=0002-8282%28199505%2985%3A2%3C196%3AICBLIA%3E2.0.CO%3B2-X

The American Economic Review is currently published by American Economic Association.

Independent Central Banks: Low Inflation at No Cost?

By ALBERTO ALESINA AND ROBERTA GATTI*

A widely held view suggests that politically independent central banks bring about relatively low and stable inflation rates.[1] A more debated question is whether one has to "pay" for this good outcome with more "real" instability.

In his seminal contribution, Kenneth Rogoff (1985) suggests that an independent and inflation-averse central bank reduces average inflation but, as a result, increases output variability; the "conservative" central banker reduces the inflation bias, due to the time-inconsistency problem, but stabilizes less.

However, Alesina and Summers (1993) do *not* find that, at least within the OECD countries, more independent central banks are associated with more variability of growth or unemployment. Thus, they conclude that *independent central banks bring about low inflation at no apparent "real" costs.* The point of this paper is to provide theoretical underpinnings to this finding, which is in contrast to Rogoff (1985).[2]

The basic idea is that one can isolate two sources of output variability. One is the "economic" variability induced by "standard" exogenous shocks that monetary policy is supposed to stabilize, for instance, money demand shocks or supply shocks. The second source of variability is "political" or, more generally, policy-induced. This is the variability introduced in the system by the uncertainty about the future course of policy. For instance, Alesina (1987) studies the effect of uncertain electoral outcomes in a model where the two contending parties have different preferences over inflation and unemployment.

An inflation-averse, independent central banker does not stabilize as much the "economic" variability, in order to keep inflation low and stable. This is Rogoff's point. However, by insulating monetary policy from political pressures, an independent central bank can reduce the "political" variability. The overall effect of independence on output variability is, thus, ambiguous. This result is consistent, at least prima facie, with the evidence in Alesina and Summers (1993) on the lack of correlation between central-bank independence and output variability. In fact, it is possible that when the politically induced output variability is predominant, a more independent central bank reduces average inflation *and* the variance of output.

I. Rogoff's Model

In a nutshell, Rogoff's (1985) model is as follows: Output (y) is given by

$$y_t = \pi_t - \pi_t^e + \varepsilon_t \tag{1}$$

where π_t is inflation π_t^e is expected inflation, and ε_t is an independently and identi-

†*Discussants:* Michael Bruno, World Bank; David Mullins, Long-Term Capital Management, New York; Donald Kohn, Federal Reserve Board.

*Alesina: Department of Economics, Harvard University, Cambridge, MA 02138, NBER, and CEPR; Gatti: Department of Economics, Harvard University.

[1]For empirical evidence on this point concerning OECD countries see Alesina and Lawrence Summers (1993). For evidence on OECD and LDC's, see Alex Cukierman (1992).

[2]This short paper describes the model and provides the intuition for the results. For a more complete treatment, see Alesina and Gatti (1995).

cally distributed shock with mean zero and variance σ_ε^2. Thus, the "natural" level of expected output, with $\pi_t = \pi_t^e$, is normalized at zero. With no loss of generality, parameters are set equal to 1. Expectations (i.e., wage contracts) are set *before* the shock is realized and before the policymaker chooses π_t. Thus, the timing is: first, π_t^e, then ε_t, and finally π_t, which is the policy instrument. The policymaker's loss function is

$$(2) \qquad L = \frac{1}{2}\pi_t^2 + \frac{b}{2}(y_t - k)^2$$

where $b > 0$ and $k > 0$. The arguments underlying this loss function and, in particular, the reason why the target output, k, is above the "natural" level, zero, are well known since the paper by Robert Barro and David Gordon (1983).

Substituting (1) in (2), taking first-order conditions with respect to π_t, solving for rational expectations, and dropping time subscripts one obtains

$$(3) \qquad \pi = bk - \frac{b}{1+b}\varepsilon$$

$$(4) \qquad \pi^e = bk$$

$$(5) \qquad y = \frac{1}{1+b}\varepsilon.$$

The policy rule (3) embodies the well-known inflation bias (bk) and a stabilization term ($[b/1+b]\varepsilon$). From (3)–(5) it follows that

$$E(\pi) = bk \qquad E(y) = 0$$

$$\mathrm{Var}(\pi) = \left(\frac{b}{1+b}\right)^2 \sigma_\varepsilon^2$$

$$\mathrm{Var}(y) = \frac{1}{(1+b)^2}\sigma_\varepsilon^2$$

where $E(\cdot)$ indicates expected values.

Thus, the policy rule reduces output variance but induces positive average inflation, without increasing average output. The inflation bias can be eliminated if the policymaker could commit *ex ante* to follow the optimal policy rule, which, in this model, is contingent on the realization of ε. Throughout the paper we assume, realistically, that commitment is not an available option to the policymakers.

Rogoff (1985) notes that social welfare can be increased if the policymaker delegates *ex ante* the choice of monetary policy to an independent agent, chosen before everything else. Independence implies that the agent cannot be dismissed *ex post*, when he has to choose policy. The policymaker can select an agent with a preference parameter $\hat{b}$ different from his own, if he so wishes. The timing in each period is as follows: First the policymaker chooses an agent from a population with different parameters *bs*. Then expectations are formed; next the shock ε occurs; and finally the agent chooses policy. In the following period, the policymaker can change the agent, but since all periods are identical to each other, the optimal choice for the policymaker is as follows:

$$(6) \qquad \min_{\hat{b}} E(L(b,\hat{b}))$$

$$= E\left\{\frac{1}{2}\left(\hat{b}k - \frac{\hat{b}}{1+\hat{b}}\varepsilon\right)^2 + \frac{b}{2}\left(\frac{1}{1+\hat{b}}\varepsilon - k\right)^2\right\}$$

where $\hat{b}$ is the parameter of the loss function of the agent. Equation (6) embodies the knowledge that, once appointed, the agent will follow rule (3) with $\hat{b}$ instead of b. Since the policymaker is acting first, before π^e and ε are realized, he has to take expectations over the shock.

The solution of problem (6) delivers Rogoff's (1985) result that $0 < \hat{b} < b$. The policymaker improves his own utility (and social welfare if they coincide) by *delegating monetary policy to an agent who is more inflation-averse* (i.e., more "conservative") than the policymaker himself. The key is that the agent is independent (i.e., he cannot be removed *ex post*).[3]

[3]In fact, after expectations are set, the policymaker has an incentive to remove the agent, choose monetary policy directly, and be time-inconsistent, causing unexpected inflation. Thus, central-bank independence alleviates a problem of time-inconsistency.

Comparing the solutions with and without the independent central bank, it is straightforward to show that, with the independent agent, inflation is lower and more stable, but output is more variable, while expected output is the same.

II. Political Uncertainty

Following Alesina (1987), consider the case of two competing parties, D and R, with the following loss functions

$$L^{D} = \frac{1}{2}\pi^2 + \frac{b^{D}}{2}(y-k)^2$$

$$L^{R} = \frac{1}{2}\pi^2 + \frac{b^{R}}{2}(y-k)^2$$

where $0 < b^{R} < b^{D}$. Thus, party D cares more about output stabilization relative to inflation than party R. The timing of events is as follows: first, expectations (wages) are set; then elections take place. Party D wins with probability P, which is exogenous; party R wins with probability $1-P$. After the election, the shock ε occurs; finally, the party in office chooses policy.[4] The same sequence of events is repeated in every period. Thus, a "period" coincides with the length of a wage contract and with a term of office. Nothing hinges on the latter assumption: we could have multiperiod terms of office. The crucial point instead is that the inflation expectation embodies electoral uncertainty: $\pi^{e} = PE(\pi^{D}) + (1-P)E(\pi^{R})$.

Taking this into account, the policies chosen by the two parties if in office are

$$(7)\quad \pi^{D} = \frac{b^{D}(1+b^{R})}{(1+b^{D}) - P(b^{D}-b^{R})}k - \frac{b^{D}}{1+b^{D}}\varepsilon$$

$$(8)\quad \pi^{R} = \frac{b^{R}(1+b^{D})}{(1+b^{D}) - P(b^{D}-b^{R})}k - \frac{b^{R}}{1+b^{R}}\varepsilon.$$

Thus, it follows that, if D is elected,

$$(9)\quad y^{D} = \frac{(1-P)(b^{D}-b^{R})}{(1+b^{D}) - P(b^{D}-b^{R})}k + \frac{1}{1+b^{D}}\varepsilon.$$

If, instead, R is elected, we have

$$(10)\quad y^{R} = -\frac{P(b^{D}-b^{R})}{(1+b^{D}) - P(b^{D}-b^{R})}k + \frac{1}{1+b^{R}}\varepsilon.$$

From (9) and (10) we then obtain our key equation:

$$(11)\quad \mathrm{Var}(y) = \frac{P(1-P)(b^{D}-b^{R})^2 k^2}{[(1+b^{D}) - P(b^{D}-b^{R})]^2} + \left[\frac{P}{(1+b^{D})^2} + \frac{(1-P)}{(1+b^{R})^2}\right]\sigma_{\varepsilon}^2.$$

The variance of output can be decomposed into two parts. The first term in (11) is the politically induced variance. This term reflects the fluctuations of output induced by the electoral uncertainty. It can be shown to be increasing in $(b^{D}-b^{R})$, namely, with the difference in parties' preferences; it also

[4] The probability of electoral results could be made exogenous as a function of individual preferences, following work by Alesina and Howard Rosenthal (1995). Since this is not our focus, we keep things simple here.

vanishes if $P=0$ or $P=1$, namely, with no electoral uncertainty. The second term in (11) derives from the exogenous shock ε, the effects of which are dampened by the stabilization terms in (7) and (8).

Suppose now that the two parties consider the appointment of an independent central banker. Specifically, we ask the following question: can the two parties improve upon the outcome described above by agreeing before the election to appoint an independent central banker who then, after the election, chooses policy and cannot be removed from office? More precisely, consider the following timing: first the two parties appoint a central banker, namely, they agree on an agent characterized by a certain $\hat{b}$ in his loss function; then expectations are formed, followed by elections; then ε is realized; and finally, the independent agent chooses policy.

For the parties to achieve an agreement, it must be that for each of them the expected loss when acting "noncooperatively" (i.e., choosing policy directly after the election) is larger than the expected loss when the appointed agent chooses policy independently.

In this setting we would expect the independent agent to have two benefits: first, to reduce the inflation bias problem, as in Rogoff (1985); second, to eliminate politically induced output variance.

We are now ready to illustrate the punchline of this paper, which is a comparison of the outcomes with an independent central bank and without. With the independent central bank we have

$$E(\pi)=\hat{b}k \qquad E(y)=0$$

$$\mathrm{Var}(\pi)=\left(\frac{\hat{b}}{1+\hat{b}}\right)^2\sigma_\varepsilon^2$$

$$\mathrm{Var}(y)=\frac{1}{(1+\hat{b})^2}\sigma_\varepsilon^2 \tag{12}$$

where $\hat{b}$ is the parameter characterizing the appointed agent.

Without an independent central bank we have instead

$$E(\pi)=\frac{b^{\mathrm{R}}(1+b^{\mathrm{D}})+P(b^{\mathrm{D}}-b^{\mathrm{R}})}{(1+b^{\mathrm{D}})-P(b^{\mathrm{D}}-b^{\mathrm{R}})}k$$

$$E(y)=0$$

$$\mathrm{Var}(\pi)=\frac{Pk^2\left[(b^{\mathrm{D}})^2(1+b^{\mathrm{R}})^2-(b^{\mathrm{R}})^2(1+b^{\mathrm{D}})^2\right]}{\left[(1+b^{\mathrm{D}})-P(b^{\mathrm{D}}-b^{\mathrm{R}})\right]^2}$$

$$+\frac{Pk^2\left[-2b^{\mathrm{R}}(b^{\mathrm{D}}-b^{\mathrm{R}})(1+b^{\mathrm{D}})-P(b^{\mathrm{D}}-b^{\mathrm{R}})^2\right]}{\left[(1+b^{\mathrm{D}})-P(b^{\mathrm{D}}-b^{\mathrm{R}})\right]^2}$$

$$+\sigma_\varepsilon^2\left[P\left(\frac{b^{\mathrm{D}}}{1+b^{\mathrm{D}}}\right)^2+(1-P)\left(\frac{b^{\mathrm{R}}}{1+b^{\mathrm{R}}}\right)^2\right]$$

$$\mathrm{Var}(y)=\frac{P(1-P)(b^{\mathrm{D}}-b^{\mathrm{R}})^2k^2}{\left[(1+b^{\mathrm{D}})-P(b^{\mathrm{D}}-b^{\mathrm{R}})\right]^2}$$

$$+\left[\frac{P}{(1+b^{\mathrm{D}})^2}+\frac{(1-P)}{(1+b^{\mathrm{R}})^2}\right]\sigma_\varepsilon^2. \tag{13}$$

It can be shown that an appropriate choice of $\hat{b}$, in the range of the parameters that make both parties better off, allows them to achieve a *lower* expected inflation. The variance of inflation can also be lower.

More importantly, the variance of output in (13), without an independent central bank, can easily be *larger* than the variance of output with an independent and inflation-averse central bank, (12). To see this, consider the extreme case in which $b^{\mathrm{R}}=b^{\mathrm{D}}=b$, and $\hat{b}<b$. A comparison of (12) and (13) in this case reproduces the standard Rogoff (1985) model. If $b^{\mathrm{D}}\cong b^{\mathrm{R}}$, the parties have similar preferences for inflation, and only a little political uncertainty is introduced in the system. As $(b^{\mathrm{D}}-b^{\mathrm{R}})$ increases, the role of the "political" variance also increases. For $(b^{\mathrm{D}}-b^{\mathrm{R}})$ sufficiently large (relative to σ_ε^2), the first term in (13) becomes predominant, and the vari-

ance of output is significantly *lower* with an independent central bank.[5]

III. Discussion and Conclusion

The institution of an independent and inflation-averse central bank has two benefits: first it reduces average inflation; second, it eliminates "politically induced" output variability, since monetary policy is not under the direct control of governments with changing preferences. The elimination of this type of real variability may or may not more than compensate for the increased variability caused by the fact that the inflation-averse central bank does not make a big effort at stabilizing output shocks.

The basic thrust of these results should be quite general. We have modeled a rather specific form of "political" uncertainty: uncertain election results in a two-party system. However, other forms of "political" or policy-induced uncertainty may bring about similar considerations. For instance, the case of uncertainty about political outcomes in coalition governments with shifting weights within the coalition; unpredictable outcomes of interparty struggles between factions; and so on. From an empirical standpoint, these results suggest that one should *not* expect that an increase in the measured degree of independence of central banks is necessarily associated with an increase in real economic variability. In other words, an independent central bank can achieve both lower average inflation and *lower* output variability. The empirical results in Alesina and Summers (1993) which show a strong positive correlation between independence and inflation, but no correlation between independence and output (or unemployment) variability, are consistent with this model.

[5]An interesting question is how the two parties would choose a particular $\hat{b}$ within the range that makes both of them better off relative to the noncooperative solution. It is easily verifiable that for $b^D = 3$, $b^R = 0$, $P = 1/2$, $k^2 = 1$, and $\sigma_\varepsilon^2 = 1$ a choice of $\hat{b} = 0.5$ would benefit both parties by lowering average inflation and output variability. For a detailed discussion see Alesina and Gatti (1995).

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