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A structuralist theory of central bank independence

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Abstract

Can a heterodox economist find arguments in favor of Central Bank independence? Economists currently favor arguments in favor of Central Bank independence based on Barro-Gordon (1983 a,b), a very 'orthodox' model. Consequently, those who view the economic orthodoxy with suspicion tend to question Central Bank independence. I argue that Central Bank independence can be beneficial even in a very 'structuralist' economy: one in which workers are unionized, firms are cartelized and inflation arises as the result of distributive struggles among capitalists and workers. This is so because it is the time-inconsistency issue, and not the structure of the economy, that which generates the inflation bias that Central Bank independence is set to eliminate.

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1. Introduction

The seminal work by Barro and Gordon (1983 a,b) is routinely used to defend the importance of Central Bank independence in modern economies. This well-known model has an 'orthodox' economic structure, with its assumptions of perfect competition and an expectations-augmented Phillips curve, which in turn embed the standard neoclassical assumptions of the neutrality of money, the existence of a natural rate of unemployment and the undesirability of stabilization policies. For this, and other reasons, the argument of Central Bank independence is not bought by those who question the validity of the orthodox economics assumptions. Those assumptions include, but are not limited to: (i) purpose-oriented behavior at the individual level; (ii) aggregate real variables (mainly prices and output) determined through individual interaction via (possibly imperfect and) decentralized markets; and (iii) markets settle in (a possibly dynamic) equilibrium over time.[1]

What if it could be possible to be a heterodox economist and still appreciate the importance of Central Bank independence? This is of obvious relevance as many members of society, both inside and outside of the economics profession, view the modern economic orthodoxy with suspicion. For example, consider a branch of heterodox economics known as the *structuralist school*. This school is characterized by the recognition that, among other things: (i) many agents possess significant market power; (ii) aggregate demand is crucial in the determination of real output; (iii) money is often endogenous; and (iv) details about how nominal variables are determined can affect macroeconomic outcomes in important ways.[2]

Members of the structuralist school propose a theory of inflation that places little weight on monetary factors as them being the driving force in explaining inflation:

> *Proponents of this approach viewed price increases as being determined largely on the real side of the economy--for example, by (...) the efforts of labor and other groups to increase their shares of aggregate income. From the structuralist perspective, monetary policy makers have little option other than to accommodate wage and price increases, as these increases are determined outside the monetary sphere--a conclusion that rationalized central banks' abdication of responsibility for inflation.*[3]

From this angle it seems to follow that since price pressures arise outside the monetary sphere there is little the Central Bank can do to fight inflation and therefore Central Bank independence is of no use in the fight against inflation.

In this short note I show that this need not be so: Central Bank independence can be beneficial for society even in a very extreme version of a structuralist economy: one in which workers are all unionized, firms are completely cartelized and inflation arises as the result of distributive struggles among capitalists and workers. The economy I study is not even "New Keynesian" in that its distinguishing feature is not the presence of nominal rigidities in an otherwise neoclassical world (as in, for example, Clarida, Gali and Gertler 1999 and references therein) but instead in that wages and prices are direct choices made independently by the union of workers and the cartel of firms to increase their income share.

[1] McCloskey (1995).
[2] Agenor and Montiel (2008, p.13).
[3] Bernanke (2005).

[4] See, e.g., the discussion in Eijffinger and De Haan (1996, ch. 2).

I show that the issues of dynamic inconsistency studied by Barro and Gordon are *just as important* in this structuralist model as in the orthodox models and show that the inflation bias generated by dynamic inconsistency *disappears* in the structuralist economy once Central Bank independence is in place.

Central Bank independence is often criticized as being potentially inconsistent with transparency and democratic accountability.[4] That inconsistency is a potential cost of independence.[5] The point of this paper is that those costs should be weighted against the potential benefits. To illustrate the simple logic behind those benefits in the context of a simple structuralist economy, something that to my knowledge has never been done before, is the main goal of this work.

2. The model

The purpose of this section is not to develop a full-fledged model of a monetary economy but instead to build the simplest possible model of a structuralist economy where the importance of Central Bank independence can be demonstrated. The model is extraordinarily simple and atypical and abstracts from many important elements of how a modern economy operates. This is deliberate. The fact that this economy is very non-standard makes it all the more interesting that the Barro-Gordon (1983 a,b) results can be formulated and proved in it.

Consider an economy with one good and three agents: a group of workers, a group of capitalists, and the monetary policy authority.

This model is composed of one period that is divided in three stages. In the first stage workers define their inflation expectations and collectively impose their nominal wage demands onto the group of capitalists. In the second stage the monetary policy authority defines its expectations about the capitalists' future pricing decisions and takes actions that determine the level of nominal aggregate demand in the economy. In the third stage the capitalists collectively choose prices in the economy, therefore setting the price level. I present the details below.

2.1 The workers

Workers are all unionized and they collectively bargain their wage contracts with the capitalists in the first stage. Workers are set to defend a real wage equal to w_0 and have inflation expectations equal to π_o^e. (I assume that the initial price level P_0 is equal to one). I assume that the union imposes to the group of capitalists, at stage 1, wage contracts that guarantee a nominal wage for workers equal to

$$W = w_0 (1+\pi_o^e). \qquad (1)$$

Equation (1) adopts an extreme point of view according to which the labor union has all the bargaining power in the wage discussions with the capitalists, as in Cukierman (1992, Ch. 3).

2.2 The monetary policy authority

In this model the monetary policy authority takes steps that successfully determine the level of nominal aggregate demand, Y, in the economy to strike a balance between inflation and the level of real GDP.[6] In particular, I model the monetary policy authority as choosing at stage 2 the level

[4] See, e.g., the discussion in Eijffinger and De Haan (1996, ch. 2).

[5] That cost, however, is not borne in the data. Dincer and Eichengreen (2014) present substantive evidence to the effect that independence and transparency go hand in hand in practice.

[6] This formulation is general enough that it leaves room for nominal demand to be affected through direct control of the money supply, by the setting of interest rate rules, or through the conduction of non-Ricardian fiscal policy, as in *the fiscal theory of the price level*. In other words: in this paper I am agnostic as to how it is that the government can affect nominal aggregate demand. All that is required is that it actually can.

of Y to maximize $Y/(1+\pi_1) - (\gamma/2)\,\pi_1^2$, $\gamma > 0$, where π_1 is the inflation rate and $Y/(1+\pi_1)$ is the level of real GDP. The interpretation is that the higher γ the more averse to inflation the monetary policy authority is. At the moment of making the decision about the level of nominal aggregate demand the authority takes nominal wages as given and forms expectations about the pricing decisions that the capitalists will make after they see the course of action taken by the monetary policy authority.

2.3 The capitalists

Capitalists in the model are completely cartelized, and so they operate as a single monopolist. They take nominal wages as previously bargained and the level of nominal aggregate demand as given and choose at stage 3 a price level P_1 for the economy to maximize $Y/P_1 - (W/P_1)\,L(Y/P_1)$, where Y/P_1 represents the level of output they produce (real GDP in this model), W/P_1 represents real wages and $L(Y/P_1)$ represents the conditional labor demand function evaluated at the production level Y/P_1. I specialize the model further[7] and assume that the aggregate production function in the economy is $y=(3L)^{1/2}$, from where it follows that the conditional labor demand function is given by $L(y) =(1/3)\,y^2$. It is interesting to notice that, given Y and W, when the capitalists choose P_1 they are automatically determining the level of real GDP, and the level of inflation π_1. A noteworthy feature in this formulation is the ability the capitalists have to also control the real wages in the economy.[8] Based on the above it is easy to see that, when the capitalists choose P_1 they also determine the distribution of income in this economy.

3. The 'structuralist' inflation bias

As usual, we begin studying the model backwards. The first order condition for the maximization problem for the group of capitalists is $-Y/P_1^2 + (1/3)\,WY^2\,3/P_1^4 = 0$, from which it follows that $P_1=(WY)^{1/2}$, namely, prices would rise with an increase in nominal wages or an increase in the nominal aggregate demand. The inflation induced by the behavior of capitalists is then equal to

$$\pi_1=(WY)^{1/2}-1. \qquad (2)$$

It is interesting to notice that in this model an increase in Y raises the price level, the level of real GDP and the total profits for the capitalists. At the same time, an increase in Y depresses real wages and worsens the distribution of income,[9] even though it increases labor demand and the real wage bill.

Given this conduct, the monetary policy authority faces the following dilemma: raising Y leads to a higher real GDP, which is good for everyone (although mostly for the capitalists) but it also leads to a higher π_1 (which depresses real wages). The monetary authority then chooses at stage 2 a level of Y to maximize $Y/(1+\pi_1) - \gamma/2\,\pi_1^2$ subject to $\pi_1=(WY)^{1/2}-1$.

The first order condition for this problem is $(WY)^{-1/2}-\gamma W+\gamma W^{1/2}Y^{-1/2}=0$, which leads the monetary policy authority to choose a level of nominal aggregate demand given by

$$Y= (1+\gamma W)^2/(W^3\gamma^2). \qquad (3)$$

Combining (2) with (3) we get a level of inflation in equilibrium given by

[7] This is without loss of generality in the sense that what I set myself to do in this paper is to produce a counterexample to the notion that there is no role for central bank independence in a structuralist economy.

[8] This distinguishes this model from one in which firms maximize individually and the aggregate arises from considering a symmetric equilibrium, as an individual firm in this case would not be able to affect real wages through their pricing or output choices.

[9] In the sense that income differences across the two groups are increasing in Y.

$$\pi_1=1/(\gamma W) \quad (4)$$

All this has the following implications: At the moment of wage bargaining, labor unions will not take seriously any promise made by the capitalists not to raise prices because it is clear to the unions that the capitalists know that the monetary policy authority, through an increase in Y, will allow them to pass some of the cost increases onto prices "to avoid a recession." In light of this, the labor unions will not accept low nominal wages in stage 1 and hence the model serves as a novel formalization of what is known in the literature as a structuralist, "cost-push," inflation.[10] I will call this the *structuralist inflation bias* that takes place in this model.

All this is easy to see in the model by combining (1) and (4), which leads to a level of inflation in the economy equal to $\pi_1=1/[\gamma\ w_0\ (1+\pi_o^e)]$. Hence, if inflation expectations for workers were too low (say, equal to zero), the pricing response of the capitalists given the incentives of the monetary policy authority, would be to produce a positive inflation level, equal to $\pi_1=1/(\gamma\ w_0)$, which could not occur in equilibrium. The resulting equilibrium inflation is determined when, in stage 1, workers set their inflation expectations π_o^e equal to π_1,

$$\pi_o^e=\pi_1 \quad (5)$$

which means that the equilibrium inflation level π^*_1 is such that $\pi^*_1(1+\pi^*_1)= 1/(\gamma\ w_0)$, an inflation level that is far from the "optimal" desired inflation level, as I show below.

4. Central bank independence

The question, then becomes: can an independent monetary policy authority eliminate the structuralist inflation bias identified above? Following Barro and Gordon (1983 a,b) I now model the monetary policy authority as one that is able to commit to a particular policy, in particular a policy that will not be revised upon knowledge of the inflation expectations of the economic agents. In the context of the model this independence translates into a change in the order in which the events that determine inflation take place.

I assume in this section that the monetary policy authority now commits in stage 1 to a given level of nominal aggregate demand Y. In stage 2 unions take Y as given and set their nominal wage demands. Finally, in stage 3, the capitalists set prices in the economy, taking Y and W as given.

In this economy the capitalists continue to use the rule $P_1=(WY)^{1/2}$ for setting prices and unions continue to set nominal wage demands equal to $W= w_0\ (1+\pi_o^e)$. What is different is the behavior of the monetary policy authority. Such authority now knows that it does not take inflation expectation as given. In fact, it gets to affect inflation expectations by committing to a given level of Y. As a consequence, the monetary policy authority gets to affect the resulting inflation *directly*, through nominal demand management, and *indirectly*, through expectations management.

Therefore, the monetary policy authority views the resulting inflation as the one that comes from combining equations (1), (2) and (5), which produces an inflation level equal to $\pi_1=w_0Y-1$. This expression summarizes the effect of aggregate nominal demand on the resulting inflation. Now the monetary policy authority chooses in stage 1 the level of Y to maximize $Y/(1+\pi_1) - \gamma/2\ \pi_1^2$ subject to

[10] See, e.g., Bernanke (2005) for a brief discussion of the so-called structuralist theories of inflation and Agenor and Montiel (2008) for a much more detailed account.

$\pi_1 = w_0 Y - 1.$ (6)

The first order condition for this problem is $-2\gamma\, w_0 2Y + 2\gamma\, w_0 = 0$ which means that the monetary policy authority chooses a level of Y given by

$Y = 1/w_0,$ (7)

Combining (6) with (7) allows us to compute the new equilibrium inflation level in the model,

$\pi^*_1 = w_0 Y - 1 = w_0 (1/w_0) - 1 = 0$, *an inflation level which is exactly zero.*

The independence of the monetary policy authority eliminates the structuralist inflation bias by virtue of committing not to revise its policies upon knowledge of the inflation expectations of the economic agents and the role they play in creating "cost-push" pressures to the price level. This commitment keeps aggregate demand to a level that eliminates all incentive for both the unions and the group of capitalists to push wages or prices upwards. Hence, the structuralist inflation bias completely disappears.

5. Inflation bias and the distributive struggle

A possible criticism of the model presented here is that the inflation bias developed above arises simply from the fact that workers have rational expectations and not from any distributive struggle inherent in the model. In this Section I show that this view is incorrect: without the distributive struggle, the inflation bias disappears, even in the presence of rational expectations on the part of the workers and a monetary authority that cannot commit to a particular policy choice.

To see this consider a model with a timing structure identical to that in Section 2, but where the capitalists do not attempt (or are not able) to depress the real wages that the workers are implicitly requesting. In other words, the capitalists choose at stage 3 a price level P_1 to maximize $Y/P_1 - w_0\, L(Y/P_1)$.

The first order condition for this problem is $-Y/P_1^2 + (1/3)\, w_0 Y^2\, 2/P_1^3 = 0$, which leads to an inflation level of

$\pi_1 = (2/3)\, w_0 Y - 1.$ (8)

It turns out that an economy in which the monetary authority cannot indirectly depress real wages through the capitalist's pricing rules *is an economy that the monetary authority has no incentives to inflate*.

To see that this happens notice that the monetary authority now chooses at stage 2 a level of Y to maximize $Y/(1+\pi_1) - \gamma/2\, \pi_1^2$ subject to $\pi_1 = (2/3)\, w_0 Y - 1$. The first order condition for this problem is $(8/9)\, w_0^2 Y - (4/3)\, w_0 \gamma = 0$, which leads the monetary policy authority to choose a level of nominal aggregate demand given by

$Y = 3/(2w_0)$ (9)

Combining (8) with (9) we get a level of inflation in equilibrium given by $\pi_1 = (2/3)\, w_0\, (3/2w_0) - 1 = 0$, that is, *an inflation level of zero*. Since workers in stage 1 can anticipate that zero inflation is the inflation that will take place they will request nominal wages equal to w_0. In equilibrium, this is also the level of real wages that they will obtain.

Remark. That dynamic inconsistency problems reveal the presence of an underlying conflict of interest is not new: it has been noted previously by Chari, Kehoe and Prescott (1989) and Fischer

(1980), among others. [11] Conceptually, the contribution of this paper is different from theirs *in that it goes in the opposite direction*: it shows that the distributive struggle that generates inflation in a simple structuralist model of the economy can be described as a time inconsistency problem and, in particular, as *one that disappears* once the monetary authority is endowed with the ability to commit to its desired policy choices.[12]

6. Comparison of the three models

The model without distributive struggle clarifies further the nature of the inflation bias that occurs in the structuralist economy discussed in Section 2. Table 1 shows the equilibrium outcomes for the three models: the model without monetary authority commitment and distributive struggle (model 1), the model with monetary authority commitment and distributive struggle (model 2), and the model without monetary authority commitment and no distributive struggle (model 3).

Table 1: A comparison of the three models

	No commitment + distributive struggle	*Commitment + distributive struggle*	*No commitment + no distributive struggle*
Inflation	$\pi^*_1>0$	0	0
Real GDP	$1/(\gamma w_0)$	$1/w_0$	$3/(2w_0)$
Real wages	w_0	w_0	w_0
Capitalist's income share	2/3	2/3	½
Labor's Income share	1/3	1/3	½

Note: π^* solves $\pi^*_1(1+\pi^*_1)= 1/(\gamma w_0)$

Three facts stand out from the examination of Table 1. First, that the output level in model 3 is higher than that of model 2. Second, that income is equally distributed in model 3, as opposed to models 1 and 2. Third, that inflation, and also real output, are decreasing in γ in model 1.

All these facts, in this structuralist setup, hinge on whether the capitalists, through choice of prices, can affect the level of real wages. If they can't (as in model 2, where the workers are able to adjust their inflation expectations) or won't (as in model 3, where the capitalists accommodate the nominal wages to their own pricing behavior), inflation is zero, as there is no channel through which the monetary authority can affect output.

Such channel, in model 1, is the decline in real wages that is produced by the capitalist's choice of pricing rule. This pricing rule is more aggressive when there is a distributive struggle because, at the margin, part of the real revenue that is lost from raising prices is offset by lower marginal costs of production due to the corresponding decline in real wages that follows from raising prices.

This effect is a distinctive feature of the model presented above, and is entirely absent from the traditional neoclassical or new Keynesian macroeconomic models. In the end all this translates into the capitalists having an incentive to curb production to allow prices to be high, real wages to be low, and to tilt the distribution of income in their favor. In the model without distributive

[11] See Drazen (2000, ch. 4) for a more elaborate discussion on this.

[12] Faust (1996) made a very similar point, in a general equilibrium overlapping generations model. He shows that when the policy is chosen by majority rule an inflation bias arises that reflects the fact that inflation shifts real resources away from the holders of nominal wealth. He also shows that an independent, properly balanced Central Bank eliminates the inflation bias.

struggle this effect is not present, and a higher real GDP, zero inflation and a more equitable distribution of income arise in consequence.

Finally, as expected, the lower the inflation aversion parameter in model 1, the higher the inflation bias will be, and the higher the observed real output.

7. Related literature

In this Section we briefly discuss the empirical relevance of the model and compare it to other models.

7.1 Empirical evidence

While this model is not intended to be a realistic depiction of any actual economy,[13] situations in which the monetary policy authority accommodates private sector conflict pressures as described in the model have been documented for many countries and time periods. Burdekin and Burkett (1996), for example, show that the Reichsbank accommodated not only budget deficits during the German hyperinflation but also higher profit markups and, until 1922, higher wage demands as well. These authors also studied the inflationary episodes of Argentina, Chile, México and Uruguay in the 1970s-1990s and the experience of several European economies as the European Monetary System adopted the Exchange Rate Mechanism in 1979 and reached a similar conclusion. Devine (1999), in turn, makes the case that distributional conflicts also underlay the price explosions of the 1970s in the UK, US and Japan.[14]

7.2 The Lange-Lerner model and the corporatists

In 1920 Ludwig von Mises published his now famous criticism of central planning as a substitute for market-based allocation of the factors of production. As a response to this criticism, Oskar Lange, and later Abba Lerner, argued that a form of 'market socialism' would be feasible as follows: (i) the distribution of consumption would be altered from a typical capitalist distribution by redistributing dividends of firms in a quite egalitarian manner among citizens; (ii) a central planning bureau would tentatively announce prices and wages; (iii) firms would announce production plans at those prices were they to equate those prices to marginal cost, (iv) the central planning bureau would readjust those prices and wages as needed in case there was an excess supply or demand for goods or labor at the candidate prices and wages, and (v) the process would repeat until markets cleared.[15]

Despite their similarities, there are two main differences between the Lange-Lerner model and the model developed in the present paper: (i) While there are distributive implications to the policies enacted by the monetary policy authority in the present model, these are accidental rather than deliberate. This is so because here the monetary policy authority does not have as objective making the distribution of consumption more egalitarian across workers and capitalists. (ii) In the present model all nominal prices and wages are choice variables of the representatives of the capitalists and the workers. The monetary policy authority has no direct control of those prices and wages as in the Lange-Lerner model. Consequently, it could be said that this monetary policy authority is (i) less ambitious in its goals and (ii) less powerful in its range of policy instruments than the central planning bureau in the Lange-Lerner model.

[13] For example, real wages are countercyclical in the model in Section 2, a feature that is inconsistent with the behavior of most modern economies.
[14] See also Rosenberg and Weisskopf (1981).
[15] Roemer (1995, pp. 115-116).

The assumptions of the present model also bear a resemblance to those from the corporatist literature. The basic idea of corporatism is that the economy is organized into major interest groups and representatives of those groups settle any conflicting claims through negotiation and bargaining among themselves and with representatives of the State, with there it being many possibilities as to how the process of bargaining takes place, and the ideological characteristics of the economic system that arises as a result.[16] A number of economic regimes in Europe (Germany, Italy, Spain, Portugal) and many in Latin America (Brazil, Argentina, México, Chile, the Dominican Republic, Paraguay, Panama, Perú and Chile) throughout the first half of the XXth century[17] have been deemed corporatist as defined above. The prevalence of these kinds of regimes in Latin America may helps explain why the early proponents of the structuralist theory of inflation[18] came from that region of the world as well.

7.3 The Barro-Gordon model and the New Keynesians

The purpose of the model developed in this paper is to serve as a simple albeit extreme benchmark in which to make the point that Central Bank independence can be of importance even when the economy does not satisfy traditional assumptions such as perfect competition and market clearing prices.

It was already known (c.f. Clarida, Gali and Gertler 1999) that New Keynesian economies also exhibit an inflation bias similar to that of Barro and Gordon (1983 a,b). The contribution of this paper has been to show that this inflation bias is also present in structuralist economies as well.

This point of view is so compelling that that it springs forth, unwittingly, in Figure 1 in Christiano and Fitzgerald (2003).

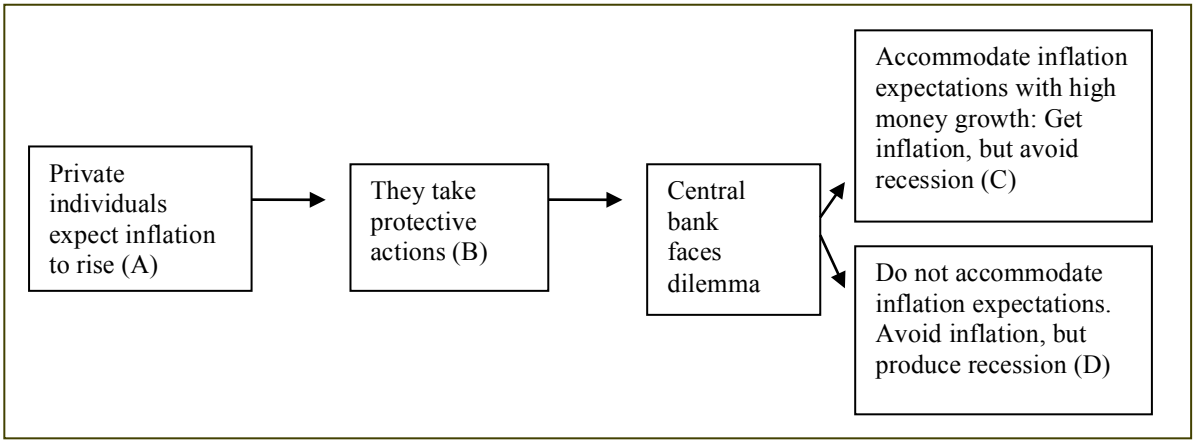

Figure 1: Central Banker in a democratic society (Christiano and Fitzgerald, 2003, p.24)

Christiano and Fitzgerald (2003) use Figure 1 to describe the economic intuition behind the original Barro and Gordon (1983 a,b) model. But Figure 1 is so stylized that, if one replaces the term "money" with the term "aggregate nominal demand," Figure 1 *also* describes the economic intuition behind the model developed in Section 2 of this paper, *even though there are the tremendous differences between the economic fundamentals of both models*.

[16] Baccaro (2003, pp. 684-686).
[17] See, e.g., Watkins (2014) and Wiarda (1997).
[18] Most notably, Juan Noyola in 1957 and Oswaldo Sunkel in 1958. See Di Filippo (2009).

8. Conclusions

In this short note I have shown that the ability of the monetary policy authority to commit to a particular set of policies that cannot be affected by the inflation expectations of the economic agents completely eliminates inflation in an economy where all agents are unionized and all owners of firms act as a single monopolist.

That this is so reveals that it is the time-inconsistency issue, and not any particular economic structure (orthodox or otherwise), that which generates the inflation bias that Central Bank independence is set to eliminate. All this, of course, has very important implications for the design of economic policy institutions, as Central Bank independence is often viewed as a conservatively motivated policy prescription that can only be defended with orthodox economic arguments. This point of view no longer seems necessary.

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