Online Appendix for
"Populism and De Facto Central Bank Independence"

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A-1 Proofs

A-1.1 Complete Information Equilibrium

Under complete information, P and CB observe each other's conflict costs and the equilibrium is found via backward induction. Assuming P reaches its final node, P will escalate if the payoff from doing so is at least as great as the audience costs incurred by climbing down. In the scenario where markets have ignored its prior pressure, P will escalate if

$$w_p \leq \frac{\alpha_p}{1-z} \tag{1}$$

Analogously, in the scenario when markets have disciplined its prior pressure, P will escalate if

$$w_p \leq \frac{\alpha_p - \pi r}{1-z} \tag{2}$$

Complete information implies that the CB knows whether P will escalate or climb down at its final node, irrespective of whether markets discipline or ignore P's initial pressure. Thus, if markets ignore and equation (1) holds, the CB will always concede because $-w_{cb} \leq 0$. However, if P pressures but equation (1) does not hold, the CB will always resist because it knows that P will subsequently climb down. Likewise, when markets discipline, the CB will always concede if condition (2) holds and resist if it does not.

At P's initial node, complete information implies that P knows how the CB will respond to its pressure, but not whether markets will ignore or discipline. If $w_p > \frac{\alpha_p}{1-z}$, P will always choose the status quo since the CB will resist any pressure knowing that P will climb down at its final node. Conversely, if $w_p \leq \frac{\alpha_p - \pi r}{1-z}$, P will always pressure since the CB will always concede knowing that P will escalate at its final node. These strategies hold irrespective of whether markets ignore or discipline. However, when $\frac{\alpha_p - \pi r}{1-z} < w_p \leq \frac{\alpha_p}{1-z}$, P would like to escalate if markets ignore and climb down if markets discipline. Under these values of w_p, P will pressure if the expected utility from doing so is at least as great as the certain utility from the status quo. This condition implies that P will pressure if

$$\alpha_p \leq \frac{1-\gamma}{\gamma} \tag{3}$$

The equilibrium strategies for the complete information game are

1) If $\alpha_p \leq \frac{1-\gamma}{\gamma}$

P plays:

{PR, ES} when $w_p \leq \frac{\alpha_p - \pi r}{1-z}$

{PR, CD} if discipline and {PR, ES} if ignore when $\frac{\alpha_p - \pi r}{1-z} < w_p \leq \frac{\alpha_p}{1-z}$

{SQ, CD} when $w_p > \frac{\alpha_p}{1-z}$

The CB plays:

{CN} when $w_p \leq \frac{\alpha_p - \pi r}{1-z}$

{RS} if discipline and {CN} if ignore when $\frac{\alpha_p - \pi r}{1-z} < w_p \leq \frac{\alpha_p}{1-z}$

{RS} when $w_p > \frac{\alpha_p}{1-z}$

2) If $\alpha_p > \frac{1-\gamma}{\gamma}$
P plays:
{PR, ES} when $w_p \leq \frac{\alpha_p - \pi r}{1-z}$
{SQ, CD} if discipline and {SQ, ES} if ignore when $\frac{\alpha_p - \pi r}{1-z} < w_p \leq \frac{\alpha_p}{1-z}$
{SQ, CD} when $w_p > \frac{\alpha_p}{1-z}$

The CB plays:
{CN} when $w_p \leq \frac{\alpha_p - \pi r}{1-z}$
{RS} if discipline and {CN} if ignore when $\frac{\alpha_p - \pi r}{1-z} < w_p \leq \frac{\alpha_p}{1-z}$
{RS} when $w_p > \frac{\alpha_p}{1-z}$

Three outcomes are possible in the complete information setting: the status quo, the CB conceding to P's pressure, and P climbing down after facing resistance from the CB. Note that under complete information, we do not observe open hostilities between P and the CB because we never observe P escalating at its final node.

Given these outcomes, probabilities over two scenarios are of particular interest. First, we can derive the probability that P pressures the CB. If $\alpha_p \leq \frac{1-\gamma}{\gamma}$, this probability equals $F_p\left(\frac{\alpha_p}{1-z}\right)$ which is increasing in the level of populism and is unaffected by the interest rate penalty imposed by global capital markets. If $\alpha_p > \frac{1-\gamma}{\gamma}$, the probability of pressure equals $F_p\left(\frac{\alpha_p - \pi r}{1-z}\right)$, which is increasing in populism and decreasing in the interest penalty.

Our second scenario concerns the effect populism has on eroding *de facto* independence, conditional on pressure having occurred. When $\alpha_p \leq \frac{1-\gamma}{\gamma}$, this conditional probability is $\gamma F_{cb}\left(\frac{\pi r}{\alpha_p}\right)$. Conversely, when $\alpha_p > \frac{1-\gamma}{\gamma}$, the CB always concedes when pressured because P only pressures when it knows it will escalate at the final node. Therefore, under complete information populism has no discernible effect on the conditional probability of CB resistance. This is because when it comes time for the CB to resist or concede, the effect of populism has already been fully utilized by P in its decision to pressure or not.

A-1.2 Incomplete Information Equilibria

Under incomplete information, both P and the CB observe their own conflict cost, but not the conflict cost of their rival. However, the distributions from which these costs are drawn are common knowledge. As in the complete information game, the incomplete information game is solved by backward induction. The equilibrium concept is that of a perfect Bayesian equilibrium. After defining the game's beliefs and equilibrium thresholds, six propositions are derived that correspond to specific strategy sets derived from these beliefs and thresholds. Each proposition corresponds to a unique set of restrictions on the model's parameters.

At its final node, let k_p^i be the threshold at which P is indifferent between escalating and climbing down, given that markets have already ignored P's prior pressure. Here P will escalate if

$$w_p \leq \frac{\alpha_p}{1-z} \equiv k_p^i \quad (4)$$

Analogously, let k_p^d define the threshold at which P is indifferent between escalating and climbing down, given that markets have disciplined its prior pressure. Here P will escalate if

$$w_p \leq \frac{\alpha_p - \pi r}{1 - z} \equiv k_p^d \tag{5}$$

Moving up one level to the CB's decision rule, let k_{cb}^i be a threshold level of w_{cb} such that when markets ignore, the central bank will resist if $w_{cb} \leq k_{cb}^i$. To find k_{cb}^i, let q_{cb}^i be the CB's posterior belief that P will escalate given that it resisted and markets ignored. Derived using Bayes' rule, q_{cb}^i is the CB's posterior belief that $w_p \leq k_p^i$, given that markets have ignored, and is defined as

$$q_{cb}^i = \frac{F_p(k_p^i)}{F_p(b_p)} \tag{6}$$

Following pressure from P and markets ignoring, the CB will resist if the expected payoff from resisting is greater than the certain payoff from conceding. That is, the CB will resist if

$$q_{cb}^i(-w_{cb}) + (1 - q_{cb}^i)(1) \geq 0 \tag{7}$$

which, after subbing in for q_{cb}^i, sees the CB resist if

$$w_{cb} \leq \frac{F_p(b_p) - F_p(k_p^i)}{F_p(k_p^i)} \equiv k_{cb}^i \tag{8}$$

If markets instead discipline P's pressure, we arrive at the analogous threshold k_{cb}^d using the same procedure. Here the CB will resist if

$$w_{cb} \leq \frac{F_p(b_p) - F_p(k_p^d)}{F_p(k_p^d)} \equiv k_{cb}^d \tag{9}$$

Moving up to P's initial choice between pressuring and the status quo, P first infers whether the CB is likely to resist its pressure under each type of market reaction. Define $s_p^d = F_{cb}(k_{cb}^d)$ as P's prior belief that the CB will resist if P pressures and markets discipline. And let $s_p^i = F_{cb}(k_{cb}^i)$ be the analogous probability when markets ignore.

Define b_p as the threshold level of w_p at which P will be indifferent between pressuring and the status quo. For P's strategy to be sequentially rational, b_p must be consistent with P's beliefs about s_p^d and s_p^i and the CB's beliefs about q_{cb}^d and q_{cb}^i. Rearranging equation (9), we obtain an expression for b_p.[1]

$$b_p = F_p^{-1}\left[F_p(k_p^d)\,(1 + k_{cb}^d)\right] \tag{10}$$

At the b_p consistent with the beliefs described above, P's expected utility from pressuring equals its expected utility from the status quo. That is,

$$\begin{aligned} EU_p\big(PR\big) = \gamma\Big[F_{cb}(k_{cb}^d)\max\left(-\alpha_p\,, -b_p(1-z) - \pi r\right) + [1 - F_{cb}(k_{cb}^d)](1 - \pi r)\Big] \\ + (1-\gamma)\left[F_{cb}(k_{cb}^i)\max\left(-\alpha_p\,, -b_p(1-z)\right) + [1 - F_{cb}(k_{cb}^i)](1)\right] = 0 \end{aligned} \tag{11}$$

[1] Note that (8) could also be used to derive b_p.

Rearranging for $F_{cb}(k^d_{cb})$, we obtain

$$F_{cb}(k^d_{cb}) = \frac{1 - \pi r \gamma - F_{cb}(k^i_{cb})(1-\gamma)\left[1 - \max\left(-\alpha_p\,,\,-b_p(1-z)\right)\right]}{\gamma\left[1 + \pi r - \max\left(-\alpha_p\,,\,-b_p(1-z)\right)\right]} \tag{12}$$

and the final expression for b_p is

$$b_p = F_p^{-1}\left(F_p(k^d_p)\left[1 + F_{cb}^{-1}(k^d_{cb})\right]\right) \tag{13}$$

with k^d_{cb} equal to that defined in equation (12).

Propositions

The following is a list of decisions in the game and their abbreviations.

PR: Pressure **SQ**: Status quo **RS**: Resist
CN: Concede **ES**: Escalate **CD**: Climb down

The Bayesian game described above consists of a set of agents, actions, type space, common priors over this type space, and utility functions. These are summarized as follows:

Agents: $i = \{P, CB\}$
Actions: $A = \{A_p,\, A_{cb}\}$ where A_i is the set of actions available to player i.
Type space: $\Omega = \{w_p,\, w_{cb}\}$, where w_i is the type space of player i.
Common priors: $p = \Omega \rightarrow [0,1]$ is the common prior over types.
Utility functions: $U = \{u_p,\, u_{cb}\}$, where u_i: $A \times \Omega \rightarrow R$ for each player i.

Proposition 1

The following strategies characterize a perfect Bayesian equilibrium when:
(i) $\frac{1}{1+w_{cb}} \leq F_p(k^d_p)$
(ii) $\frac{1-\pi r\gamma}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k^d_{cb}) \leq 1 - \pi r \gamma$

P plays {PR, ES} if discipline and {PR, ES} if ignore, when $w_p \leq k^d_p$
P plays {PR, CD} if discipline and {PR, ES} if ignore, when $k^d_p < w_p < k^i_p$
P plays {PR, CD} if discipline and {PR, CD} if ignore, when $w_p \geq k^i_p$
CB plays {CN} always

Proof

At its final node, P escalates if markets ignore and $w_p \leq k^i_p$ or if markets discipline and $w_p \leq k^d_p$. Here P's optimal strategy is the same as that in the complete information game. Moving up in the game tree, at its final node, the CB always concedes. This strategy set implies that the expected utility from resisting is always less than the certain utility the CB receives from conceding, irrespective of whether markets ignore or discipline. That is, if markets discipline, the CB's objective satisfies the following expected utility condition

$$EU_{cb}\left(RS \middle| \text{discipline}\right) \;=\; q^d_{cb}(-w_{cb}) + (1-q^d_{cb})(1) < 0 \tag{14}$$

Solving for q_{cb}^d and substituting in for q_{cb}^d in, we see that the CB will always concede if markets discipline if $\frac{F_p(b_p)}{1+w_{cb}} \leq F_p(k_p^d)$. Furthermore, given that $F_p(k_p^i) \geq F_p(k_p^d)$, it follows that if the CB always concedes when markets discipline, then it will also do so when markets ignore. Parameter condition (i) is completed by noting that because P always pressures, $F_p(b_p) = 1$.
Knowing that the CB will always concede (i.e., $F_{cb}(k_{cb}^i) = F_{cb}(k_{cb}^d) = 0$), P always pressures at its initial node. Two conditions must be met for P to always pressure in this case. The first is an *expected utility condition* which holds that the expected utility from pressuring is at least as high as the expected utility from choosing the status quo, even for values of w_p where P always concedes at its final node. That is, P's expected utility condition must satisfy

$$EU_p\left(PR \middle| w_p > \frac{\alpha_p}{1-z}\right) \;=\; \gamma(1-\pi r) + (1-\gamma)(1) \;\geq\; 0 \tag{15}$$

After simplifying we see that P's expected utility condition is met if $1 - \pi r\gamma \geq 0$. The second condition is a *no-deviation condition* and states that P will not deviate from its proposition 1 strategy until there is a positive probability that the CB will resist if markets discipline. That is, P will play its strategy so long as

$$\gamma\left[F_{cb}(k_{cb}^d)\,(-\alpha_p) + [1 - F_{cb}(k_{cb}^d)](1-\pi r)\right] + (1-\gamma)(1) < 0$$

After simplifying, we find that proposition 1 strategy sets are played when $\frac{1-\pi r\gamma}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k_{cb}^d)$, which completes parameter condition (ii).

Proposition 2

The following strategies characterize a perfect Bayesian equilibrium when:
(i) $F_p(k_p^d) < \frac{F_p(b_p)}{1+w_{cb}} \leq F_p(k_p^i)$
(ii) $\frac{1-\pi r\gamma - F_{cb}(k_{cb}^i)(1-\gamma)(1+\alpha_p)}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k_{cb}^d) \leq \frac{1-\pi r\gamma}{\gamma(1-\pi r+\alpha_p)}$
P plays {PR, ES} if discipline and {PR, ES} if ignore, when $w_p \leq k_p^d$
P plays {PR, CD} if discipline and {PR, ES} if ignore, when $k_p^d < w_p < k_p^i$
P plays {PR, CD} if discipline and {PR, CD} if ignore, when $k_p^i \leq w_p \leq b_p$
P plays {SQ, CD} if discipline and {SQ, CD} if ignore, when $w_p \geq b_p$
CB plays {CN} if discipline and {CN} if ignore, when $w_{cb} > k_{cb}^d$
CB plays {RS} if discipline and {CN} if ignore, when $w_{cb} \leq k_{cb}^d$

Proof

At its final node, P plays the same strategy as in proposition 1 and escalates if markets ignore and $w_p \leq k_p^i$ or if markets discipline and $w_p \leq k_p^d$. At its final node, the CB continues to always concede when markets ignore but now resists with probability $F_{cb}(k_{cb}^d)$ if markets discipline. The CB therefore has two expected utility conditions, one for each market reaction. These are

$$EU_{cb}\left(RS \middle| \text{discipline}\right) \;=\; q_{cb}^d(-w_{cb}) + (1-q_{cb}^d)(1) \geq 0 \tag{16}$$

$$EU_{cb}\left(RS \middle| \text{ignore}\right) \;=\; q_{cb}^i(-w_{cb}) + (1-q_{cb}^i)(1) < 0 \tag{17}$$

Equations (16) and (17) imply $F_p(k_p^d) \leq \frac{F_p(b_p)}{1+w_{cb}}$ and $\frac{F_p(b_p)}{1+w_{cb}} \leq F_p(k_p^i)$. These conditions complete parameter condition (i).

Knowing that the CB concedes when markets ignore (i.e., $F_{cb}(k_{cb}^i) = 0$), but resists with probability $F_{cb}(k_{cb}^d)$ when markets discipline, P pressures at its initial node if its expected utility and no-deviation conditions are met. The expected utility condition holds when the expected utility from pressuring is at least as high as the expected utility from choosing the status quo. That is, P's expected utility condition must satisfy

$$EU_p\left(PR \middle| w_p > \frac{\alpha_p}{1-z}\right) = \gamma\left[F_{cb}(k_{cb}^d)(-\alpha_p) + [1-F_{cb}(k_{cb}^d)](1-\pi r)\right] + (1-\gamma)(1) \geq 0 \quad (18)$$

After simplifying we see that P's expected utility condition is met if $F_{cb}(k_{cb}^d) \leq \frac{1-\pi r\gamma}{\gamma(1-\pi r+\alpha_p)}$. P's no-deviation condition implies that P will not deviate from its proposition 2 strategy until there is a positive probability that the CB will resist if markets ignore. That is, P will play its strategy so long as

$$\gamma\left[F_{cb}(k_{cb}^d)(-\alpha_p) + [1-F_{cb}(k_{cb}^d)](1-\pi r)\right] + (1-\gamma)\left[F_{cb}(k_{cb}^i)(-\alpha_p) + [1-F_{cb}(k_{cb}^i)](1)\right] < 0$$

Rearranging, P's strategy set is played when $\frac{1-\pi r\gamma - F_{cb}(k_{cb}^i)(1-\gamma)(1+\alpha_p)}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k_{cb}^d)$, which completes parameter condition (ii).

Proposition 3

The following strategies characterize a perfect Bayesian equilibrium when:

(i) $F_p(k_p^i) < \dfrac{F_p(b_p)}{1+w_{cb}}$

(ii) $\frac{1-\pi r\gamma - F_{cb}(k_{cb}^i)(1-\gamma)(1+b_p(1-z))}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k_{cb}^d) \leq \frac{1-\pi r\gamma - F_{cb}(k_{cb}^i)(1-\gamma)(1+\alpha_p)}{\gamma(1-\pi r+\alpha_p)}$

P plays {PR, ES} if discipline and {PR, ES} if ignore, when $w_p \leq k_p^d$
P plays {PR, CD} if discipline and {PR, ES} if ignore, when $k_p^d < w_p < k_p^i$
P plays {PR, CD} if discipline and {PR, CD} if ignore, when $k_p^i \leq w_p \leq b_p$
P plays {SQ, CD} if discipline and {SQ, CD} if ignore, when $w_p \geq b_p$
CB plays {CN} if discipline and {CN} if ignore, when $w_{cb} \geq k_{cb}^d$
CB plays {RS} if discipline and {CN} if ignore, when $k_{cb}^d > w_{cb} > k_{cb}^i$
CB plays {RS} if discipline and {RS} if ignore, when $w_{cb} \leq k_{cb}^i$

Proof

At its final node, P plays the same strategy as in proposition 1 and escalates if markets ignore and $w_p \leq k_p^i$ or if markets discipline and $w_p \leq k_p^d$. At its final node, the CB resists with probability $F_{cb}(k_{cb}^i)$ when markets ignore and continues to resists with probability $F_{cb}(k_{cb}^d)$ when markets discipline. The CB expected utility conditions are

$$EU_{cb}\left(RS\middle|\text{discipline}\right) = q^d_{cb}(-w_{cb}) + (1-q^d_{cb})(1) \geq 0 \quad (19)$$

$$EU_{cb}\left(RS\middle|\text{ignore}\right) = q^i_{cb}(-w_{cb}) + (1-q^i_{cb})(1) \geq 0 \quad (20)$$

Equations (19) and (20) imply $F_p(k^d_p) \leq \frac{F_p(b_p)}{1+w_{cb}}$ and $F_p(k^i_p) \leq \frac{F_p(b_p)}{1+w_{cb}}$. However, given that $F_p(k^i_p) \leq F_p(k^d_p)$, it follows that if equation (20) is satisfied, then so too will be equation (19). This is reflected in parameter condition (i).

As in previous cases, at its initial node, P's strategy set implies that it pressures if doing so yields an expected utility at least as high as that from choosing the status quo, even for values of w_p where P always concedes at its final node. In this case, given the CB's probabilities of resistance, P's expected utility condition must satisfy

$$\begin{aligned} EU_p\left(PR\middle|w_p > \frac{\alpha_p}{1-z}\right) &= \gamma\left[F_{cb}(k^d_{cb})(-\alpha_p) + [1-F_{cb}(k^d_{cb})](1-\pi r)\right] \\ &\quad + (1-\gamma)\left[F_{cb}(k^i_{cb})(-\alpha_p) + [1-F_{cb}(k^i_{cb})](1)\right] \geq 0 \quad (21) \end{aligned}$$

After simplifying, P's expected utility condition is met if $F_{cb}(k^d_{cb}) \leq \frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1+\alpha_p)}{\gamma(1-\pi r+\alpha_p)}$. Given that the CB's strategy set is unchanged from proposition 2, P's no-deviation condition implies that P will continue to play its proposition 3 strategy until there is a positive probability that P will chose to status quo at its initial node. That is, P will play its strategy so long as

$$\gamma\left[F_{cb}(k^d_{cb})(-\alpha_p) + [1-F_{cb}(k^d_{cb})](1-\pi r)\right] + (1-\gamma)\left[F_{cb}(k^i_{cb})(-b_p(1-z)) + [1-F_{cb}(k^i_{cb})](1)\right] < 0$$

Rearranging, P's strategy set is played when $\frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1+b_p(1-z))}{\gamma(1-\pi r+\alpha_p)} < F_{cb}(k^d_{cb})$, where b_p is defined in equation (13). Note that since $b_p > \frac{\alpha_p}{1-z}$ in this case, parameter condition (ii) is satisfied.

Proposition 4

The following strategies characterize a perfect Bayesian equilibrium when:

(i) $F_p(k^i_p) < \dfrac{F_p(b_p)}{1+w_{cb}}$

(ii) $\frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1+b_p(1-z))}{\gamma(1+b_p(1-z))} < F_{cb}(k^d_{cb}) \leq \frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1+b_p(1-z))}{\gamma(1-\pi r+\alpha_p)}$

P plays {PR, ES} if discipline and {PR, ES} if ignore, when $w_p \leq k^d_p$

P plays {PR, CD} if discipline and {PR, ES} if ignore, when $k^d_p < w_p < b_p$

P plays {SQ, CD} if discipline and {SQ, CD} if ignore, when $w_p \geq b_p$

CB plays {CN} if discipline and {CN} if ignore, when $w_{cb} \geq k^d_{cb}$

CB plays {RS} if discipline and {CN} if ignore, when $k^d_{cb} > w_{cb} > k^i_{cb}$

CB plays {RS} if discipline and {RS} if ignore, when $w_{cb} \leq k^i_{cb}$

Proof
At its final node, P plays the same strategy as in proposition 1 and escalates if markets ignore and $w_p \leq k_p^i$ or if markets discipline and $w_p \leq k_p^d$. At its final node, the CB resists with probability $F_{cb}(k_{cb}^i)$ when markets ignore and continues to resists with probability $F_{cb}(k_{cb}^d)$ when markets discipline. The CB expected utility conditions are as in proposition 3 and lead to the equivalent parameter restriction (i).
As in previous cases, at its initial node, P's strategy must satisfy the expected utility condition and the no-deviation condition. Here P's expected utility condition must satisfy

$$EU_p\left(PR\Big|\frac{\alpha_p-\pi r}{1-z}<w_p<\frac{\alpha_p}{1-z}\right) = \gamma\left[F_{cb}(k_{cb}^d)\,(-\alpha_p)+[1-F_{cb}(k_{cb}^d)](1-\pi r)\right] + (1-\gamma)\left[F_{cb}(k_{cb}^i)\,(-b_p(1-z))+[1-F_{cb}(k_{cb}^i)](1)\right] \geq 0 \qquad (22)$$

where b_p is defined as in equation (13). Furthermore, note that equation (22) will hold with equality at b_p, the point at which P is indifferent between pressuring and the status quo.
After simplifying, P's expected utility condition is met if $F_{cb}(k_{cb}^d) \leq \frac{1-\pi r\gamma-F_{cb}(k_{cb}^i)(1-\gamma)(1+b_p(1-z))}{\gamma(1-\pi r+\alpha_p)}$.
Given that the CB's strategy set remains unchanged from proposition 2, P's no-deviation condition implies that P will continue to play its proposition 4 strategy so long as $b_p > \frac{\alpha_p-\pi r}{1-z}$. That is, P will not deviate from its strategy so long as

$$\gamma\left[F_{cb}(k_{cb}^d)\,(-b_p(1-z)-\pi r)+[1-F_{cb}(k_{cb}^d)](1-\pi r)\right] + (1-\gamma)\left[F_{cb}(k_{cb}^i)\,(-b_p(1-z))+[1-F_{cb}(k_{cb}^i)](1)\right] < 0$$

Rearranging, P's strategy set is played when $\frac{1-\pi r\gamma-F_{cb}(k_{cb}^i)(1-\gamma)(1+b_p(1-z))}{\gamma(1+b_p(1-z))} < F_{cb}(k_{cb}^d)$, where b_p is defined in equation (13). Note that since $b_p > \frac{\alpha_p-\pi r}{1-z}$ in this case, parameter condition (ii) is satisfied.

Proposition 5
The following strategies characterize a perfect Bayesian equilibrium when:
(i) $F_p(k_p^i) < \dfrac{F_p(b_p)}{1+w_{cb}}$
(ii) $\frac{1-\pi r\gamma-F_{cb}(k_{cb}^i)(1-\gamma)(1-b_p(1-z))}{\gamma(1-b_p(1-z))} < F_{cb}(k_{cb}^d) \leq \frac{1-\pi r\gamma-F_{cb}(k_{cb}^i)(1-\gamma)(1+b_p(1-z))}{\gamma(1+b_p(1-z))}$
P plays {PR, ES} if discipline and {PR, ES} if ignore, when $w_p \leq b_p$
P plays {SQ, CD} if discipline and {SQ, CD} if ignore, when $w_p \geq b_p$
CB plays {CN} if discipline and {CN} if ignore, when $w_{cb} \geq k_{cb}^d$
CB plays {RS} if discipline and {CN} if ignore, when $k_{cb}^d > w_{cb} > k_{cb}^i$
CB plays {RS} if discipline and {RS} if ignore, when $w_{cb} \leq k_{cb}^i$

Proof
At their respective final nodes, P plays the same strategy as in proposition 1 and the CB plays the same strategy as in proposition 4. At its initial node, P's strategy must satisfy the expected utility condition and the no-deviation condition. Here P's expected utility condition must satisfy

$$EU_p\left(PR\middle|w_p < \frac{\alpha_p - \pi r z}{1-z}\right) = \gamma\Big[F_{cb}(k^d_{cb})\,(-b_p(1-z)-\pi r)+[1-F_{cb}(k^d_{cb})](1-\pi r)\Big] + (1-\gamma)\left[F_{cb}(k^i_{cb})\,(-b_p(1-z))+[1-F_{cb}(k^i_{cb})](1)\right] \geq 0 \qquad (23)$$

where b_p is defined as in equation (13). As in proposition 4, equation (A-1.2) holds with equality at b_p. Here P's expected utility condition is met if $F_{cb}(k^d_{cb}) \leq \frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1+b_p(1-z))}{\gamma[1+b_p(1-z)]}$. Given that the CB's strategy set remains unchanged from proposition 4, P's no-deviation condition implies that P will continue to play its proposition 5 strategy so long as $b_p > 0$ (i.e., when $b_p \leq 0$, P chooses SQ always). That is, P will not deviate from its strategy so long as

$$\gamma\Big[F_{cb}(k^d_{cb})\,(-(-b_p(1-z))-\pi r)+[1-F_{cb}(k^d_{cb})](1-\pi r)\Big] + (1-\gamma)\left[F_{cb}(k^i_{cb})\,(-(-b_p(1-z)))+[1-F_{cb}(k^i_{cb})](1)\right] < 0$$

Rearranging, P's strategy set is played when $\frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1-b_p(1-z))}{\gamma(1-b_p(1-z))} < F_{cb}(k^d_{cb})$. Note that since $b_p > 0$ in this case, parameter condition (ii) is satisfied.

Proposition 6

The following strategies characterize a perfect Bayesian equilibrium when:
(i) $F_p(k^i_p) = F_p(k^d_p) = 0$
(ii) $F_{cb}(k^d_{cb}) \leq \frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1-b_p(1-z))}{\gamma(1-b_p(1-z))}$
P plays {SQ, CD} always
CB plays {RS} always

Proof

In this case, were P to reach its final node, parameter condition (i) implies that P would always climb down. Knowing that P will always climb down, the CB will always resist irrespective of whether markets discipline or ignore.
At its initial node, P's strategy must satisfy the expected utility condition

$$EU_p\left(SQ\middle|b_p < 0\right) = \gamma\Big[F_{cb}(k^d_{cb})\,(-(-b_p(1-z))-\pi r)+[1-F_{cb}(k^d_{cb})](1-\pi r)\Big] + (1-\gamma)\left[F_{cb}(k^i_{cb})\,(-(-b_p(1-z)))+[1-F_{cb}(k^i_{cb})](1)\right] \geq 0$$

Here we see that P's expected utility condition is met if $F_{cb}(k^d_{cb}) \leq \frac{1-\pi r\gamma - F_{cb}(k^i_{cb})(1-\gamma)(1-b_p(1-z))}{\gamma(1-b_p(1-z))}$, which satisfies parameter condition (ii).

A-1.3 Derivation of Hypotheses

Here we outline the procedure for deriving the expressions that are used to construct Figure 4. Below is the procedure applied to case 3. Note that Figure 4 requires applying the following procedure to each of the six cases above.

Recall that we assume that w_p and w_{cb} are drawn from the standard uniform distribution. Under this assumption, we have the following expressions for the thresholds k_p^d, k_p^i, k_{cb}^i, and k_{cb}^d

$$k_p^i = \frac{\alpha_p}{1-z} \tag{24}$$

$$k_p^d = \frac{\alpha_p - \pi r}{1-z} \tag{25}$$

$$k_{cb}^i = \frac{b_p - k_p^i}{k_p^i} \tag{26}$$

$$k_{cb}^d = \frac{b_p - k_p^d}{k_p^d} \tag{27}$$

Also recall that the *ex-ante* probability that P will pressure is

$$b_p = k_p^d (1 + k_{cb}^d) \tag{28}$$

To be consistent with proposition 3, we assume the following parameter restriction[2]

$$k_{cb}^d = \frac{1 - \pi r \gamma - k_{cb}^i (1-\gamma)(1+\alpha_p)}{\gamma(1 - \pi r + \alpha_p)} \tag{29}$$

To derive an expression for b_p, we substitute (24) into (26), which is then substituted into (29). This, plus (25), and the parameter assumptions of $\alpha = 0.15$, $r = 0.1$, $\gamma = 0.25$, and $\pi = 0.3$ are then substituted into (28), which yields the following equation for b_p

$$b_p = \frac{0.26}{1-z}$$

Here the probability of pressure is increasing in z, as shown in Figure 4 in the main paper.
The probability that the CB will achieve *de facto* independence, conditional on being pressured, is

$$\gamma k_{cb}^d [1 - k_p^d] + (1-\gamma) k_{cb}^i [1 - k_p^i] \tag{30}$$

After all equation and parameter substitutions, we arrive at the conditional probability that the CB will attain *de facto* independence after coming under pressure

$$b_p = \frac{2.46 - 2.87z}{1-z}$$

This equation shows that the probability of achieving *de facto* independence, conditional on pressure, is decreasing in z, as shown in Figure 4 in the main paper.

[2]Note that the point $z3$ in Figure 4 in the main paper equals the z at which this parameter restriction holds.

A-1.4 Modelling markets as strategic actors

Recall that a Perfect Bayesian Equilibrium is comprised of strategy sets and beliefs over those strategies. For the market to behave strategically in a game theoretic sense, markets too need to form beliefs over the likely moves by the central bank and politician at later points in the game. These beliefs would, in turn, guide the market in its decision to discipline or ignore.

Let us consider a version of this model that is solvable, though only at high computational cost. It turns out that this changes nothing of substance. Consider Figure A1, which depicts the game tree for a variant of our original game where markets (M) are modelled as a fully strategic actor. To do so, we introduce market payoffs as follows: markets receive 1 if the central bank sets monetary policy, 0 if the politician sets monetary policy, and receive $-\omega_m$ when the politician escalates at the end of the game. Note that ω_m follows the same set of assumptions as ω_p and ω_{cb}.

In this version of the game the politician now forms a rational belief that M will discipline after observing pressure. This belief is denoted by the probability γ^p. The market holds rational beliefs regarding the likely moves by the central bank and politician at later stages of the game. These beliefs are the same set of beliefs denoted by s and q in the original model. The only simplifying assumption we need for the game to be solvable is that while the central bank's beliefs (i.e., q^d_{cb} and q^i_{cb}) are conditional on the politician having pressured (as in the original game), they are independent of the market's reaction. This is a reasonable assumption in that the market does not change in its basic characteristics as long as we assume it is a rational actor.

The game is solved as in the main manuscript with the following added on. After observing pressure, M either disciplines by bidding up the interest rate on government bonds or ignores the pressure and imposes no such penalty. Given this, there exists a threshold level of ω_m at which M is indifferent between disciplining and ignoring. To derive this threshold, consider that M disciplines if

$$F(k^d_{cb})[q^d_{cb}(-\omega_m)+(1-q^d_{cb})(1)]+[1-F(k^d_{cb})](0) \geq F(k^i_{cb})[q^i_{cb}(-\omega_m)+(1-q^i_{cb})(1)]+[1-F(k^i_{cb})](0)$$

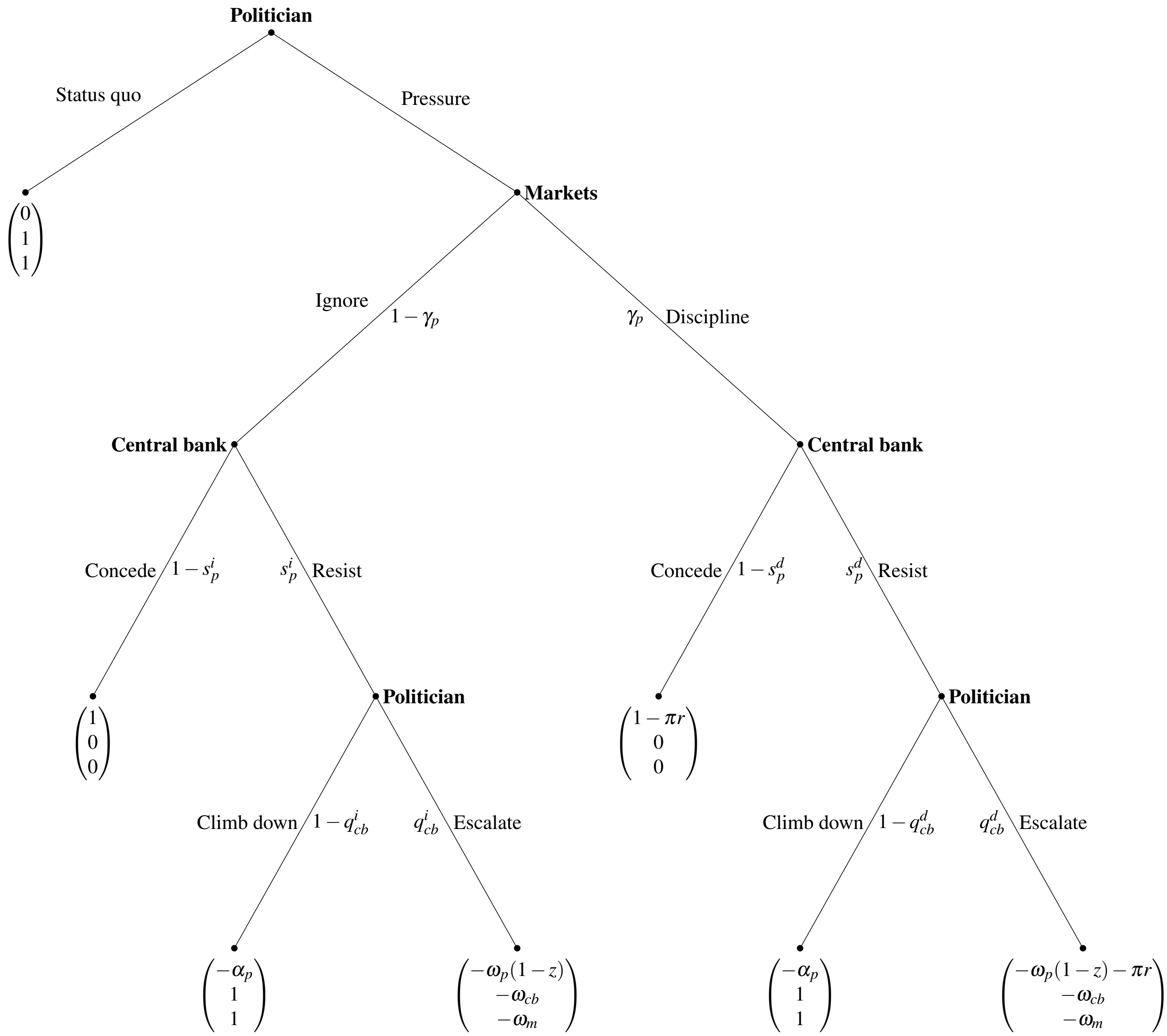
which implies the following equilibrium threshold

$$\omega_m \leq \frac{F(k^d_{cb})(1-q^d_{cb})-F(k^i_{cb})(1-q^i_{cb})}{F(k^d_{cb})q^d_{cb}-F(k^i_{cb})q^i_{cb}} \equiv k_m \tag{31}$$

Equation (31) states that M will discipline if $\omega_m \leq k_m$ and ignore otherwise. Following the setup in the original game, let $\gamma^p = F_m(k_m)$. This implies that the politician's belief that markets will discipline, γ^p, is a function of the threshold k_m.

The final step is to substitute γ^p for γ (recall this was treated as exogenous in the original manuscript) in the equations used to derive our two hypotheses. As in the main paper, we use Case 3 and the parameter assumptions $\alpha = 0.15$, $r = 0.1$, and $\pi = 0.3$ to derive our hypotheses. According to our Mathematica code (which we would gladly provide upon request), we can confirm that both H1 and H2 continue to hold in the strategic markets setting. That is, even when markets are strategic, the model predicts that as populism increases so too does the probability of pressure (H1) and the probability that the CB will ease monetary policy, conditional on pressure (H2).

Figure A1: Game tree: Strategic markets variant



A-2 Data Overview

A-2.1 Summary Statistics

Table A1: Summary Statistics

	N	Mean	SD	Min	Max
Political pressure	2000	0.037	0.189	0	1
Pressure incidents per quarter	2000	0.048	0.265	0	3
Degree of populism	2000	0.403	0.237	0.051	0.993
Economic left-right scale	2000	0.384	1.184	-2.507	2.802
Democracy	2000	7.696	1.819	1.000	10.000
Less than 12 months to election	2000	0.314	0.464	0	1
IMF CB conditions	2000	0.067	0.249	0	1
Debt to GDP ratio	2000	7.646	8.701	-0.463	78.575
Lagged inflation	2000	1.714	0.899	-3.416	4.690
Lagged Δ exchange rate	2000	0.003	0.016	-0.089	0.162
Lagged Δ GDP	2000	0.007	0.018	-0.108	0.341

A-2.2 Text Classification Procedures

Our raw text data, the Economist Intelligence Reports, are available since 1996 in a consistent electronic format. In principle, with enough effort, it would be possible to manually classify all texts, but machine-coding has specific advantages. The first is that it is less likely that the researcher's preferences for a specific outcome or implicit bias to see certain patterns color the data. The second is that for replication purposes, it is easier to evaluate the coding of a smaller set of manually classified documents than to check second-hand coding efforts for thousand of observations.

A-2.2.1 Reported Pressure on the Central Bank in EIU Reports

To train a machine-learning classifier, we first draw a random sample from the data–in our case, 2100 texts–and directly code this sample by reading the texts. Our classification is binary, and our coding rule is to set this to equal one if the EIU report for the month or quarter cites public pressure by a member of the government or the governing party to ease monetary policy. As an example, the episode described in the paper itself is described as follows in the EIU reports. Note that this in this case, the pressure is cited in the May EIU report as having occurred in April, so that we manually correct the timing in our data:

> On May 29th the BOT voted unanimously to lower its main policy interest rate, the one-day repurchase rate, by 25 basis points to 2.5%, the lowest level in around two years. The central bank's monetary policy committee said that its decision was motivated by slower than expected economic growth in the first quarter, but it followed intense pressure from the finance minister for lower interest rates to counter a rapid appreciation of the local currency, the baht. On April 19th Kittiratt said that he thought about removing the BOT's governor, Prasarn Trairatvorakul, "every da", underscoring the tension between the two men.

An example in a non-populist context comes from Chile in June 1999, when senators from the governing coalition criticized Central Bank Governor Massad's tightening decision:

> Mr Massad responded to criticism from most senators over the monetary squeeze in the second half of 1998, denying that policy was too harsh or that it was responsible for the overadjustment that the Chilean economy has been going through.

A similar example comes from Poland in November 2001, again from a non-populist government under President Kwasniewski following pressure from Finance Minister Belka. In this case, the EIU report interprets the cut as motivated by government pressure. We merely code that there was public pressure.

> The November cut in interest rates (by 150 basis points) was the sixth reduction of the year, bringing the total cut in 2001 so far to 750 bp. Mr Belka, who had been fiercely critical of the MPC's restrictive monetary policy stance throughout the year, welcomed the recent monetary loosening. As to be expected, despite apparent political pressure, the MPC justified the moves purely on economic grounds, and in particular on the belief that its end-2001 inflation target of 6-8% would be comfortably achieved.

A-2.2.2 Training Classifiers and Model Selection

We split this sample randomly into a subset used to train the model, the "training data" to which we allocate 75% of the 2100 observations, and 25% that are kept as "test data" to validate the model. Validation means using the model that has been trained on the training data to predict the values of the test data, and then to verify what percentage of the observations have been correctly coded when comparing it with the manual classification. In other words, the human classification is assumed to be correct.

This procedure is then used to compare different classifiers. In our case, we compared the performance of a naïve Bayes classifier, a support vector machine, and a Random Forest model. The linear support vector machine resulted in the best predictive accuracy.

A-2.2.3 Text Preprocessing Steps

We undertake a number of standard text pre-processing steps on all our documents. The EIU reports are divided into several sections, and reports on interactions between the government and the central bank only appear in the sections "economic policy" and sometimes "monetary policy." We use a keywords-in-context approach and only select text with a window of 25 words around the terms "central bank," "monetary" and "interest rates," tokenize these, remove punctuation and numbers, andcreate document-term matrices. In a document-term matrix, the rows represent the documents and the columns the terms (words) that appear in each document. A made-up example constructed from the first few lines of dialogue of a popular PBS Kids television program is shown in Table A2 below.

Table A2: Hypothetical Document-Term Matrix

	wolf	fox	caracal	we	are	here	in	North	America	...
Episode 1	1	1	0	1	2	4	5	1	1	...
Episode 2	0	1	1	2	3	2	8	0	0	...
Episode 3	1	1	0	1	2	5	2	1	1	...
...										

In our case, each row in this matrix is a single monthly EIU report for a specific country, and each column is again a term. Our subsequent analysis is therefore only based on the vectorized relative word frequencies in each document. These are the features the model uses to classify texts. Subsequently we apply synthetic minority oversampling of the relatively rare instances of pressure and under-sampling (Menardi and Torelli, 2014) of the vastly more common non-events to the 75 percent training data to create a more balanced set.

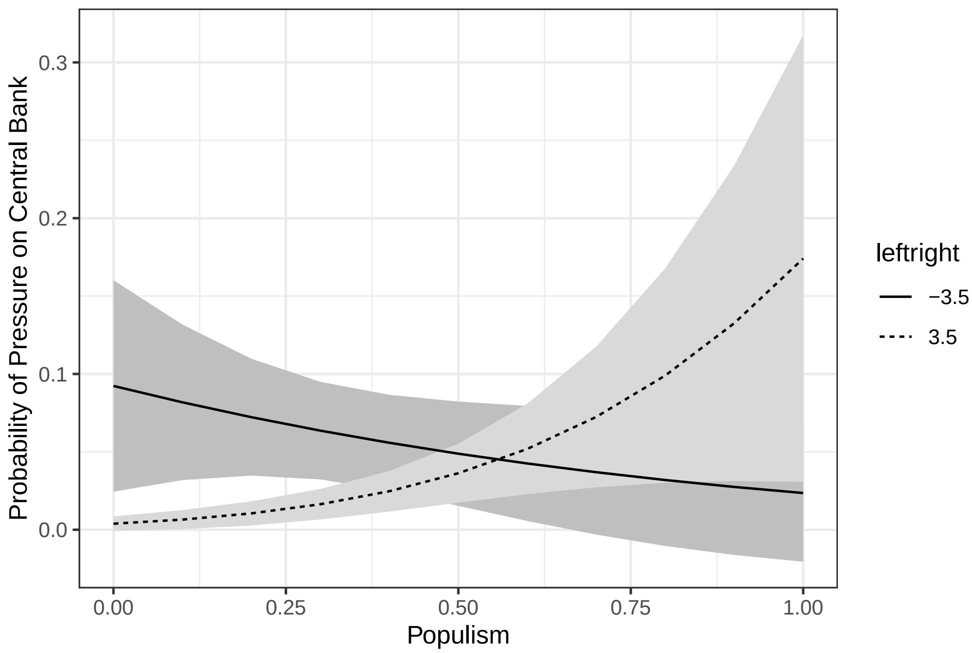
A-3 Further Empirical Tests and Robustness Checks

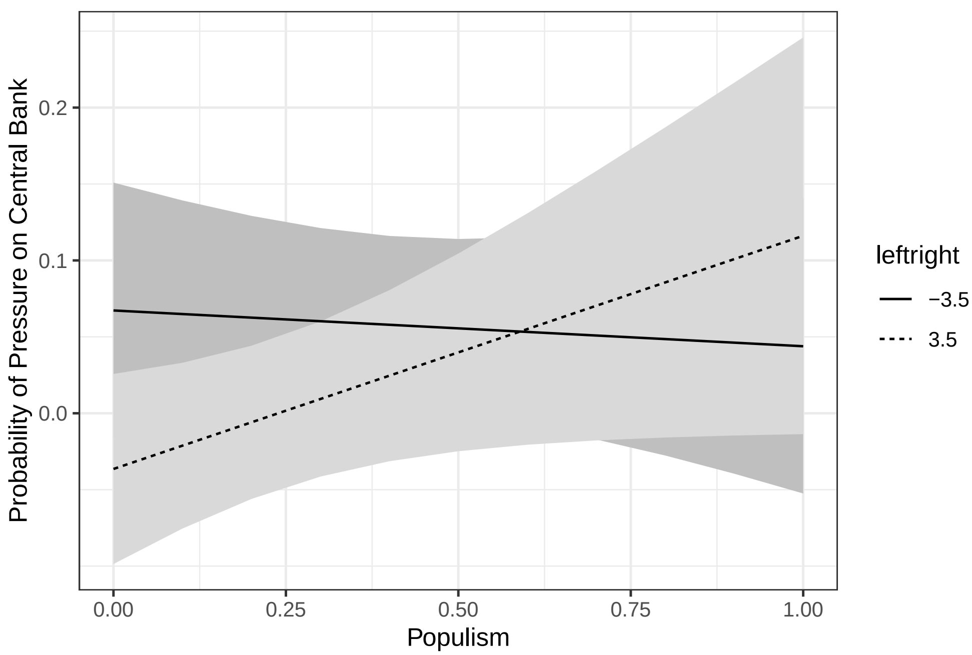
This section presents various econometric tests and robustness checks of our results. In our replication code, we provide the commands to successively drop one country from the sample to check if our results are driven by an individual outlier. This is not the case.

A-3.1 Marginal Effects Plots for Probit Models

The marginal effects for models (5) and (7) in the paper are shown in Figure A2 below for the highest and lowest values on the left-right scale in our sample. As noted in the paper, these marginal effects are not statistically different from each other.

Figure A2: Effect of populism on predicted probabilities: Probit and LPM-IV models





Notes: Ribbons denote 95 percent confidence intervals.

A-3.2 Tests for Weak Instruments and Underidentification

We conduct several tests for weak instruments and underidentification. As the commonly used Kleinbergen-Paap (2006) rank test for underidentification is not valid with clustered standard errors, we perform the tests proposed by Finlay and Magnusson (2009) that draw on Anderson and Rubin (1949). We can reject the null hypothesis that the instrument coefficient is equal to zero but only with $p < 0.1$, in other words, there is little statistical difference between the probit model and the instrumented LPM. We also verify that the instrument is stationary and does not contain problematic trends (Christian and Barrett, 2019).

A-3.3 Robustness Checks

In Table A3, we show the results for the first stage of the instrumental variable linear probability model. Column two includes all countries for which we have data, i.e. developed and developing countries regardless of their exchange rate regime or political system. In column three, we replace the V-Party populism score with the populist speech measure from Hawkins et al. (2019). The results are very similar to our results in the paper, including for the interaction effect. We prefer the V-Party score because it is likely more reliable with five coders per country. We also worry that the Hawkins et al. score is measuring populist discourse, which very likely includes public attacks on the central bank already, and therefore might be plagued by post-treatment bias or, more simply, might be circular: It could be correlated with our dependent variable because it measures the same thing. In the fourth column, we use the same sample as in the paper but include country cases of hyperinflation and freely-falling exchange rates. The fifth and final column includes all developing countries and all exchange rate regimes (except those countries that do not have their own currency and no monetary authority, like fully-dollarized El Salvador). The conclusions are substantively the same.

Table A3: Robustness Checks

	(1)	(2)	(3)	(4)	(5)
Degree of populism	0.065	0.718**		0.756**	0.663**
	(0.034)	(0.226)		(0.245)	(0.252)
Hawkins et al. populism			0.325***		
			(0.092)		
Economic left-right scale	-0.015	-0.150**	-0.090*	-0.267***	-0.283***
	(0.010)	(0.052)	(0.035)	(0.070)	(0.068)
Populism × Economic left-right scale	0.025	0.213*		0.461**	0.545***
	(0.019)	(0.084)		(0.167)	(0.163)
Hawkins et al. populism × Economic left-right scale			0.085**		
			(0.030)		
Lagged capital outflows to GDP	-0.000	-0.000*	-0.000**	-0.001*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Democracy	0.002	-0.002	0.006	-0.066	-0.046
	(0.005)	(0.015)	(0.017)	(0.042)	(0.041)
Less than 12 months to election	-0.019	-0.133	-0.155	-0.165	-0.227
	(0.013)	(0.144)	(0.147)	(0.153)	(0.162)
IMF CB conditions	-0.028	-0.166	-0.078	-0.430	-0.269
	(0.025)	(0.232)	(0.227)	(0.317)	(0.336)
Debt to GDP ratio	0.001	-0.012*	-0.013**	-0.004	-0.008
	(0.001)	(0.005)	(0.005)	(0.009)	(0.006)
Lagged inflation	-0.011	0.099	0.085	-0.009	0.030
	(0.007)	(0.051)	(0.053)	(0.061)	(0.056)
Lagged Δ exchange rate	-0.333	-1.674	-1.824	-0.568	-0.760
	(0.493)	(1.482)	(1.392)	(3.175)	(3.072)
Lagged Δ GDP	0.355	-2.492	-2.141	-0.900	1.335
	(0.288)	(3.362)	(3.335)	(5.581)	(3.851)
t	-0.020***	-0.169***	-0.168***	-0.178***	-0.174***
	(0.004)	(0.018)	(0.019)	(0.022)	(0.021)
t^2	0.000***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
t^3	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Prob > F$	0.00	0.00	0.00	0.00	0.00
pseudo-R^2		0.370	0.362	0.333	0.334
Chi-square	77	1073	1044	529	494
Log-likelihood		-326	-330	-216	-218
N	2000	5011	5011	2110	2205
Number of clusters	35	62	62	36	37

Standard errors clustered on countries in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A-3.4 Tables of Estimates for the Local Projections

Finally, in Table A-3.5, we show the coefficients for the first difference of the monetary policy rate and inflation rate corresponding to the impulse response graphs in Figure 7 in the main paper. Pressure on the central bank from a high-populism government has a statistically significant negative effect on the (change) in the monetary policy rate in quarters one, three, and five after a shock, but there is no evidence of this for low-populism governments. For the change in the inflation rate, a positive and statistically significant effect is evident in quarters three and six, while only a minimally negative effect is statistically significant in quarter 8 after a pressure event. This confirms that only pressure by highly populist governments leads to reductions (or slower increases) in the monetary policy rate and to faster increases (or slower decreases) in inflation.

A-3.5 Tables of Local Projection Estimates

Table A4: Monetary Rate and Inflation Rate Local Projection Coefficient Estimates

Response: Monetary rate	Quarter 0	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Populist pressure	0.24	-0.52*	-0.57	-0.96**	-0.83	-1.42*	-0.12	-1.95	-0.39
	(0.28)	(0.23)	(0.37)	(0.33)	(0.46)	(0.58)	(0.46)	(1.11)	(0.54)
Non-populist pressure	-0.31	-0.09	-0.15	-0.29	0.08	-0.28	-0.28	0.05	-0.24
	(0.34)	(0.25)	(0.22)	(0.16)	(0.09)	(0.20)	(0.15)	(0.17)	(0.15)
Test of difference p-value	0.189	0.235	0.350	0.117	0.080	0.091	0.746	0.110	0.782
R^2	0.285	0.486	0.579	0.521	0.494	0.460	0.489	0.489	0.461
Observations	2541	2500	2458	2416	2378	2340	2305	2270	2235
Response: Inflation rate	Quarter 0	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Populist pressure	-0.41	0.25	-0.01	0.34***	0.18	-0.35	0.86***	0.17	0.45
	(0.35)	(0.20)	(0.15)	(0.07)	(0.45)	(0.28)	(0.20)	(0.29)	(0.29)
Non-populist pressure	-0.49**	-0.24	-0.33	-0.12	0.68	0.27	0.02	-0.56	-0.66*
	(0.17)	(0.28)	(0.20)	(0.21)	(0.54)	(0.33)	(0.18)	(0.45)	(0.31)
Test of difference p-value	0.833	0.172	0.156	0.037	0.465	0.169	0.004	0.164	0.005
R^2	0.449	0.547	0.647	0.749	0.601	0.578	0.584	0.586	0.564
Observations	2541	2498	2455	2412	2374	2337	2302	2267	2233

Huber-White Standard errors clustered by country in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

References

Anderson, T. W. and H. Rubin (1949). Estimation of the Parameters of a Single Equation in a Complete System of Stochastic Equations. *The Annals of Mathematical Statistics 20*(1), 46–63. Publisher: Institute of Mathematical Statistics.

Christian, P. and C. B. Barrett (2019). Spurious Regressions and Panel IV Estimation: Revisiting the Causes of Conflict. World Bank Working Paper, Washington, DC: The World Bank.

Finlay, K. and L. M. Magnusson (2009). Implementing Weak-Instrument Robust Tests for a General Class of Instrumental-Variables Models. *The Stata Journal 9*(3), 398–421.

Hawkins, K. A., R. Aguilar, B. Castanho Silva, E. K. Jenne, B. Kocijan, and C. Rovira Kaltwasser (2019). Measuring Populist Discourse: The Global Populism Database. Paper presented at the Annual Conference of the European Political Science Association, June 20-22, Belfast, UK.

Menardi, G. and N. Torelli (2014). Training and assessing classification rules with imbalanced data. *Data Mining and Knowledge Discovery 28*(1), 92–122.