Confidence in Central Banks and Inflation Expectations*

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Abstract

In this paper we explore the consequences of losing confidence in the price-stability objective of central banks. We propose a new model that shows that losing confidence can lead to both, an inflation as well as a deflationary bias, depending on the perception of the objective function of the central bank. Both biases emerge as a steady state outcomes and increase the burden of the central bank to achieve its mandate. We validate the predictions of the model using a comprehensive new dataset on 50,000 individual observations across 9 countries and can identify and quantify inflation and the deflationary bias as a consequence of losing confidence in central banks objectives. We can confirm the predictions of our model as we can show that inflation bias exists for expectations above the target and a deflationary bias exist for expectations below. As one would expect both inflationary and deflationary bias are more pronounced for medium-run than short-run inflation expectations. Furthermore, we also test the prediction of the model that conservative or inflation-targeting central banks reduces the the magnitude of inflation and deflationary bias and find supporting evidence in our dataset. Among the Eurozone countries in our sample we can document, despite the same experience with the ECB, significant differences in levels of confidence and responses to it.

Keywords: confidence, trust, inflation expectations, inflation bias, deflationary bias, microdata.

JEL classification: .

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1. Introduction

There is a widespread agreement that trust and confidence have significant implications for economic outcomes. It has been shown that trust affects long-term economic growth by influencing the development of financial markets, facilitate financial transaction, increase spending, and improve the efficiency of public institutions.[1] Trust is of importance for central banks as well. In a setting with an independent central bank trust in the ability of a central bank to achieve price stability and to deliver their promise is of the essence. If economic agents lose confidence in monetary authority pursuing its objective their inflation expectations may start deviating from the announced medium-term goals as formalized by Barro and Gordon (1983a, 1983b) and Kydland and Prescott (1977) for the case of inflation bias and more recently for the case of deflation at the zero lower bound (ZLB) (Krugman, 1998; Eggertsson, 2006). Nakov (2008) and Nakata and Schmidt (2014) show that deflationary bias can occur also away from ZLB in the presence of occasionally binding ZLB constraint.

In this paper we analyze the consequences of losing trust/confidence in central banks. We develop a model that shows that losing trust may lead to both inflation as well as deflationary bias. In our model trust plays an important role and the monetary authority is subject to the zero lower bound constraint. In this sense, we extend the model of Nakata and Schmidt (2014) adding the possibility of an inflation bias. In this simple environment we formally proof that the lack of trust can either result in an inflation bias—where inflation expectations are above the target level— or a deflationary bias— where inflation expectations are below the target level— conditional on agents perception of the relative preferences of the central bank between inflation and output stabilization. Furthermore, we also test the prediction of the model that conservative (Rogoff, 1985) or inflation-targeting central banks reduce the magnitude of inflation and deflationary bias.

We then test predictions of the model using a comprehensive database comprising 9 different countries across the world based on individual level data for short- to medium-run inflation expectations. Based on roughly 50,000 individuals observations, we can show that loosing trust has significant an sizable consequences for inflation expectations. Specifically, loosing trust increases inflation expectations in the short-run by 1% and medium-run expectations by 1.5%. Furthermore, we can document the existence of a deflationary bias which is linked to losing trust. Below the inflation target loosing trust leads to a deflationary bias of -0.8% for short run and -1.7% for medium-run expectations In addition, we show that both inflation and deflationary bias are mitigated when the central bank adopts inflation targeting framework, where there is a hierarchy among different objectives and price stability is a primary objective.

The possibility of inflation bias has triggered a lot of attention in economics literature in the past three decades. It has been formalized with the time inconsistency and rules vs. discretion debates initiated by Barro and Gordon (1983a,1983b) and Kydland and Prescott (1977). Backus and Driffill

[1] See, e.g., Knack and Keefer (1997), Guiso et al. (2004), Georgarakos and Pasini (2011) and Putnam et al. (1993). For an overview see also Algan and Cahuc (2014). Above that, trust in public institutions is a well-established research field in the political-science body of literature.

(1985) extend the analysis of Barro and Gordon (1983a,1983b) to the case where the public does not know the relative preferences of the central bank between inflation and output stabilization.

While there have been several papers exploring the determinants of trust in central banks there is no direct evidence on whether lack of trust has implications for inflation expectations of the public. Ehrmann et al. (2013) note that "If low public trust in central banks is associated with higher household inflation expectations, then swings in public trust in the ECB also directly affect its ability to deliver on its mandate, although the empirical relevance of this proposition has yet to be tested." Especially in a situation in which non-standard monetary policy tools are in place, a substantial loss in confidence in the central banks strategy might have substantive and potentially long lasting consequences. On top of that such a development may make the central bank central banks vulnerable for political pressure (Ehrmann and Fratzscher, 2011).

The only exception is the very recent paper by Christelis et al. (2016). The authors use micro data from the Dutch CentERpanel to examine the effect of trust on inflation expectations. They can show that trust reduces inflation expectations on average. If expectations are below the target, more trust increases inflation expectations. In our paper we introduce a model that can motivate the observed behavior and show that this effect is present at micro data level for several countries including non EMU countries and non- inflation targeting countries and for short- as well as medium-term expectations. On top of that we can distinguish between trust and reputation effects.

A very related paper is Bursian and Faia (2015) where the authors model the interaction between trust and economics outcomes endogenizing the level of trust. They test the validity of their model in a VAR setting using aggregate data and conclude that trust affects inflation expectations. Our papers allows for a much better identification using a individual level dataset. In addition we allow for the existence of a deflationary bias.

Several studies study trust in central banks in terms of anchored expectations. If people trust the central banks the inflation expectations should be anchored and should not deviate from the announced target or to a transitory inflation shocks. See for instance Easaw et al. (2013) or Lamla and Dräger (2013). Furthermore, there exist a literature that investigates the evolution of trust in public institutions in general and central banks in particular. Based on the Eurobarometer survey, Ehrmann et al. (2013) analyzes the effects of the crisis on trust in the ECB. Bachmann et al. (2015) shows that trust in public institutions affects spending behavior in the US.

2. Terminology

Before we continue, it is important to clarify some terms particularly the difference between credibility, reputation, confidence, and trust. While all these concept are inherently related, the game theoretic literature distinguish between them. To clarify the objective of the question asked in the survey; it relates to the public confidence that the central bank is currently pursuing appropriate policies to achieve price stability over the medium term. As the literature most of the time discusses either credibility (reputation) or trust, instead of confidence, we first define these terms before proceeding with the outline of the relationship with confidence.

The main difference among these terms is that reputation and credibility are the characteristics of the institution/individual (one sided), while trust and confidence are inherently two-sided relationship, as they are characterized by the preferences of both agents involved in this *game* (relationship). Credibility and reputation depend solely on the actions and characteristics of the institution/individual. Reputation involves learning based on past experience; in other words, repeated credible actions and achieved targets lead to a certain reputation and uncertainty regarding the *type* of agents slowly dissipates.[2]

In economic terms, trust can be defined as "the belief or perception by one party (e.g., a principal) that the other party (e.g., an agent) to a particular transaction will not cheat" (Knack, 2001). It is more difficult to disentangle the difference between trust and confidence as they are strongly related. Potentially, trust could be a broader concept than confidence as one has confidence in something, and also one could argue that confidence is based on trust, or that it is a perception of trust. In a game theoretic setup, a trust game embeds moral hazard due to uncertainty which action will be implemented, while a reputation game is characterized by asymmetric information on the type of agent.[3]

3. Stylized model

This section presents the stylized model and the policy problem of the central bank. After defining the equilibrium we present the hypotheses that are later on tested.

3.1. Private Sector

The private sector of the economy has the standard New Keynesian structure formulated as presented in detail in Woodford (2003) and Galí (2008). A representative, infinitely-living household supplies labor in a perfectly competitive labor market and consumes a basket of differentiated goods that are produced by firms. Firms maximize profits subject to nominal friction that are modeled as in Calvo (1983). The only major departure from the otherwise standard model is the introduction of trust between households and central bank. Here we follow Bursian and Faia (2015) who present a model where trust emerges endogenously as an equilibrium of a strategic interaction game featuring moral hazard and uncertainty on policy actions. In this game households are betrayal averse and policy makers have incentives to deviate. We implement a simplified version of this mechanism via an exogenous shock, but preserving the main channels though which trust affect macroeconomic dynamics. We refer to the appendix where we derive the full version of the model, with endogenous trust.

To derive closed-form results, we put all model equations except for zero lower bound (ZLB) constraint in semi-loglinear form. Our specification is in the case no incentives for the central bank

[2]Generally, trust in institutions and policy making is a wider concept than reputation, as it is the nexus of both preferences of the trustee and the trustor (see, Bursian and Faia, 2015).

[3]Furthermore, it is possible to argue that both trust and confidence are influenced by credibility and reputation. However, they represent only one side of the relationship, as credibility and reputation do not directly depend on the preferences of the other agent. Trying to study reputation may be difficult, as one would need to disentangle the change in preferences to learning about the *type* of the agent. Thus, we focus on credibility and trust in this paper.

to deviate similar to the one from Nakata and Schmidt (2014), though the interpretation of shock is different. The equilibrium conditions of the private sector are represented by the New Keynesian Phillips curve (eq. 1) and the consumption Euler equation (eq. 2):

$$\pi_t = \kappa y_t + \beta E_t \pi_{t+1} \tag{1}$$

and

$$y_t = E_t y_{t+1} - \sigma(i_t - E_t \pi_{t+1} - r^*) + \tau_t. \tag{2}$$

where π_t is the inflation rate in t, y_t denotes the output gap, and i_t is the level of the nominal interest rate. τ_t is an exogenous trust shock capturing that can be endogenized in line with (Bursian and Faia, 2015). The natural real rate of interest, r_t, equals $r^* + \frac{1}{\sigma}\tau_t$. $\sigma > 0$ is the intertemporal elasticity of substitution in consumption, $\beta \in (0,1)$ is subjective discount factor, and the deterministic steady state of the natural real rate, r^*, is $\frac{1}{\beta} - 1$. The slope of the New Keynesian Phillips curve, κ, equals:

$$\kappa = \frac{(1-\alpha)(1-\alpha\beta)}{\alpha(1+\eta\theta)}(\sigma^{-1} + \eta), \tag{3}$$

where $\alpha \in (0,1)$ is the share of firms that in a given period cannot re-optimize their price, $\theta > 1$ denotes the price elasticity of demand for differentiated goods, and $\eta > 0$ is the inverse Frisch elasticity of labor supply.

We implement the trust shock, τ_t, as a two-state Markov process. These processes are commonly used in the effective lower bound literature, for example, Eggertsson and Woodford (2003) and Nakata and Schmidt (2014), to intuitively describe the underlying mechanisms and transmission processes of the shocks. We assume that τ_t takes the value of either τ_H or τ_L where, for simplicity, we refer to $\tau_H > -\sigma r^*$ as the high trust state and $\tau_L < -\sigma r^*$ as the low trust state. The transition probabilities are given by

$$Prob(\tau_{t+1} = \tau_L | \tau_t = \tau_H) = p_H \tag{4}$$

and

$$Prob(\tau_{t+1} = \tau_L | \tau_t = \tau_L) = p_L \tag{5}$$

p_H represents the likelihood of switching to the low trust state in the next period when the economy is in the high trust state today and will be referred to as the *frequency* of the low trust state. p_L denotes the likelihood of staying in the low state when the economy is in a low trust state today and will be referred to as the *persistence* of the low trust state.

3.2. Society's Objective and the Central Bank's Problem

Society's welfare at time t is represented by the expected discounted sum of future utility flows,

$$V_t = u(\pi_t, y_t) + \beta E_t V_{t+1}, \tag{6}$$

where society's contemporaneous utility function, $u(\pi_t, y_t)$, is given by the standard quadratic function of inflation and the output gap augmented for the possibility that the central bank may be inclined to push the output gap below the natural level,

$$u(\pi, y) = -\frac{1}{2}(\pi^2 + \bar{\lambda}(y)^2) \tag{7}$$

As shown by Woodford (2003) this objective function can be derived using a second-order approximation to the household's preferences. In this case $\bar{\lambda}$ we can further set the $\bar{\lambda}$ to be equal to $\frac{\kappa}{\theta}$.

The form of the central bank's objective function is similar to the society's but potentially—as advocated by the time inconsistency and rules vs. discretion debates initiated by Barro and Gordon (1983a,1983b) and Kydland and Prescott (1977)—has important differences. In this paper we focus on two potential departures.

$$V_t^{CB} = u^{CB}(\pi_t, y_t) + \beta E_t V_{t+1}^{CB}, \tag{8}$$

where the central bank's contemporaneous utility, $u^{CB}(\pi_t, y_t)$, is of the following form:

$$u^{CB}(\pi, y) = -\frac{1}{2}(\pi^2 + \lambda(y - y^*)^2) \tag{9}$$

Although the central bank's objective function resembles the private sector's one there are potentially two differences. First, $y^* \geq 0$ represents the central bank's desired level of the output gap, which if positive can lead to inflation bias as will be proven below. Second, the relative weight that central bank assigns to the stabilization of the output gap, $\lambda > 0$, may potentially differ from $\bar{\lambda}$. Central bank is subject to the zero lower bound constraint,[4]

$$i_t \geq 0. \tag{10}$$

In this paper we assume that the central bank behaves discretionally and commitment option is not available. The central bank chooses the output gap, inflation rate, and the nominal interest rate in each period t to maximize its objective function subject to the behavioral constrains of the private sector, while considering the policy functions at time $t+1$ taken as given. Therefore, the central bank is maximizing the following objective:

$$V_t^{CB}(d_t) = \max_{\pi_t, y_t, i_t} u^{CB}(\pi_t, y_t) + \beta E_t V_{t+1}^{CB}(d_{t+1}). \tag{11}$$

subject to the zero lower bound constrained in eq. (10) and the private-sector equilibrium conditions detailed in eqs. (1) and (2).

We define Markov-Perfect equilibrium as a set of time-invariant value and policy functions $\{V_t^{CB}(\cdot), y(\cdot), \pi(\cdot), i(\cdot)\}$ that solves the central bank's problem described above, together with society's value function $V(\cdot)$ that is consistent with $y(\cdot)$ and $\pi(\cdot)$. Armenter (2017), Nakata (2014), and

[4] For simplicity we consider a zero lower bound instead of effective lower bound that is lower than zero. Results in the next section remain unchanged if we would consider a lower bound $i_t < 0$

Nakata and Schmidt (2014) point out that there are two Markov-Perfect equilibria in this economy. The *standard* Markov-Perfect equilibrium fluctuates around a positive nominal interest rate and zero inflation and output, and the *deflationary* Markov-Perfect equilibrium fluctuates around a zero nominal interest rate and negative inflation/output.

The *standard* Markov-Perfect equilibrium is given by a vector $y_H, \pi_H, i_H, y_L, \pi_L, i_L$ that solves the following system of linear equations:

$$y_H = [(1-p_H)y_H + p_H y_L] + \sigma\left[(1-p_H)\pi_H + p_H\pi_L - i_H + r^*\right] + \tau_H, \tag{12}$$

$$\pi_H = \kappa y_H + \beta\left[(1-p_H)\pi_H + p_H\pi_L\right], \tag{13}$$

$$0 = \lambda(y_H - y^*) + \kappa\pi_H, \tag{14}$$

$$y_L = [(1-p_L)y_H + p_L y_L] + \sigma\left[(1-p_L)\pi_H + p_L\pi_L - i_L + r^*\right] + \tau_L, \tag{15}$$

$$\pi_L = \kappa y_L + \beta\left[(1-p_L)\pi_H + p_L\pi_L\right], \tag{16}$$

and

$$i_L = 0, \tag{17}$$

and satisfies the non-negativity of the nominal interest rate in the high state and non-positivity of the Lagrangian multiplier on the ZLB constraint in the low state:

$$i_H > 0, \tag{18}$$

and

$$\lambda y_L + \kappa\pi_L < 0, \tag{19}$$

x_k denotes the value of variable x in the k state where $k \in \{H, L\}$.

Proposition 1. *The standard Markov-Perfect equilibrium exists if and only if*

$$p_L \leq p_L^*(\Theta_{(-p_L)})$$

and

$$p_H \leq p_H^*(\Theta_{(-p_H)})$$

where i) for any parameter x, $\Theta_{(-x)}$ denotes the set of parameter values excluding x, and ii) the cutoff values $p_L^*(\Theta_{(-p_L)})$ and $p_H^*(\Theta_{(-p_H)})$ are given in Appendix B.

Proof. See Appendix B. □

The two conditions guarantee the non-positivity of the Lagrange multiplier in the low trust state and the non-negativity of the nominal interest rate in the high trust state. When the frequency of the low trust state, p_H, is high, the central bank reduces the nominal interest rate aggressively to mitigate the deflation bias, which will be described shortly. Thus, for the policy rate to be positive in the high trust state, p_H must be sufficiently low. With $p_L > p_L^*(\Theta_{(-p_L)})$, inflation and output in the low state are positive when they satisfy the consumption Euler equation and the Phillips curve: When the persistence of the low trust state, p_L, is high, inflation and output in today's low trust state are largely dependent on private sector expectations of output and inflation in the next period's low state. Thus, positive inflation and output in the low state can be self-fulfilling. However, such positive inflation and output cannot be an equilibrium because the central bank would have incentives to raise the nominal interest rate from zero in the low state. This incentive manifests itself in the positive Lagrangian multiplier in the low state when inflation and output are positive.

The *deflationary* Markov-Perfect equilibrium is given by a vector $y_H, \pi_H, i_H, y_L, \pi_L, i_L$ that solves the following system of linear equations:

$$y_H = [(1-p_H)y_H + p_H y_L] + \sigma\left[(1-p_H)\pi_H + p_H\pi_L - i_H + r^*\right] + \tau_H, \tag{20}$$

$$\pi_H = \kappa y_H + \beta\left[(1-p_H)\pi_H + p_H\pi_L\right], \tag{21}$$

$$i_H = 0, \tag{22}$$

$$y_L = [(1-p_L)y_H + p_L y_L] + \sigma\left[(1-p_L)\pi_H + p_L\pi_L - i_L + r^*\right] + \tau_L, \tag{23}$$

$$\pi_L = \kappa y_L + \beta\left[(1-p_L)\pi_H + p_L\pi_L\right], \tag{24}$$

and

$$i_L = 0, \tag{25}$$

and satisfies the constraints that Lagrangian multipliers on the ZLB constraint are negative in both states:

$$\theta_H = \lambda y_H + \kappa\pi_H < 0, \tag{26}$$

and

$$\theta_L = \lambda y_L + \kappa\pi_L < 0, \tag{27}$$

As shown in Nakata and Schmidt (2014) there are potentially two other Markov-Perfect equilibria in this framework.[5] These two equilibria are less likely to occur and for the purpose of this paper we do not consider them. We focus on the standard Markov-Perfect equilibrium in this paper, as this one seems more empirically relevant for the set of countries that we consider in our empirical part of the paper. All these economies have positive long-run inflation expectations and most surveys indicate that economic agents expect the central bank to eventually raise interest rates.

[5]The *ZLB-free* Markov Perfect equilibrium where the ZLB constraint does not bind in neither states and the *topsy-turvy* Markov perfect equilibrium where the ZLB binds in the high state but not in the low state

Furthermore, all countries have lowered the interest rate after the end of the 2015, which marks the end of our time sample for our empirical analysis.

Proposition 2. *The conditions under which deflationary Markov-Perfect equilibrium exist are identical to those of standard Markov-Perfect equilibrium detailed in Proposition 1.*

The model can be solved in closed form. The main exercise of the paper will be to examine the effects of λ on welfare. We quantify the welfare of an economy by the perpetual consumption transfer (as a share of its steady state) that would make a household in the economy indifferent to living in the economy without any fluctuations. This is given by

$$W = (1-\beta)\frac{\theta}{\kappa}(\sigma^{-1}+\eta)E[V]. \tag{28}$$

where the mathematical expectation is taken with respect to the unconditional distribution of τ_t.

3.3. Analytical results

When the conditions for the existence of the equilibrium hold, it is possible to show that depending on the values of y^* we can observe either inflationary or deflationary bias. Depending on y^* the signs of the endogenous variables can be determined.

Proposition 3. *When the conditions for the existence of the equilibrium hold, we can observe either inflationary or deflationary bias depending on the values of y^*.*

(a) For any $\lambda \geq 0$ and $y^* \geq 0$:

- $\pi_H \leq 0$ *iff* $y^* \leq \widetilde{y^*}$ *and* $\pi_H > 0$ *otherwise, where* $\widetilde{y^*} \equiv -\beta p_H \tau_L (\kappa C)^{-1}$
- $\pi_L \leq 0$ *iff* $y^* \leq \widehat{y^*}$ *and* $\pi_L > 0$ *otherwise, where* $\widehat{y^*} \equiv B(\lambda)\tau_L(D\kappa\lambda)^{-1}$
- $y_H > 0$
- $y_L \leq 0$ *iff* $y^* \leq \overline{y^*}$ *and* $y_L > 0$ *otherwise, where* $\overline{y^*} \equiv (1-\beta p_L)\kappa^2 + (1-\beta)(1+\beta p_H - \beta p_L)\lambda(-\lambda\left[(1-\beta)C + (1-\beta p_L)\right]\kappa)^{-1}\tau_L$

(b) For any $\lambda \geq 0$ and $y^* = 0$: $\pi_H \leq 0$, $y_H > 0$, $i_H < r_H$, $\pi_L < 0$, and $y_L < 0$.

(c) With $\lambda = 0$: $\pi_H = 0$.

Proof. See Appendix B. □

In this proposition we can observe the interaction between the trust shock and the perceived target for the output gap, y^*. As long as $y^* \leq \widehat{y^*}$ and $y^* \leq \overline{y^*}$, we observe that output and inflation are below target values in the low state, as the ZLB constraint is binding and monetary policy cannot offset the trust shock. However, higher y^* reduces these effects and if $y^* \geq \widehat{y^*}$, inflation becomes positive. In the high state, firms lower prices due a positive probability of τ_L (low state) that leads to a reduction in the expected marginal costs of production. This raises the expected real interest rate that incentivizes households to postpone their consumption plans. These anticipation effects are mitigated by a central banks' lowering of nominal rates. This effect is usually in the literature referred as deflationary bias and alone causes inflation in the high state to be negative. With $y^* > 0$ we have an additional effect that in equilibrium raises inflation and leads to inflation bias if $y^* \leq \widetilde{y^*}$. As the central bank would like to stabilize the output around y^* this raises inflation due to a tradeoff between inflation and output gap stabilization. Output in the high state is positive irrespective of the value of y^*. To be precise both effect of y^* and τ_L lead to higher output (see propositions below). These mechanisms are consistent with those described in the inflation and deflationary bias literature.

We now establish several results on how the degree of conservatism affects endogenous variables in both states.

Proposition 4. *How the degree of conservatism affects endogenous variables depends on the values of y^*. Higher conservatism (lower λ) reduces the absolute distance of inflation from 0 irrespective of y^*.*

(a) For any $\lambda \geq 0$ and $y^* \leq \widetilde{y^*}$: $\frac{\partial \pi_H}{\partial \lambda} \leq 0$, $\frac{\partial \pi_L}{\partial \lambda} \leq 0$, and $\frac{\partial y_L}{\partial \lambda} \leq 0$. For any $\lambda \geq 0$, $\frac{\partial y_H}{\partial \lambda} < 0$ iff $\beta p_H - (1-\beta)C < 0$.

(b) For any $\lambda \geq 0$ and $y^* > \widetilde{y^*}$: $\frac{\partial \pi_H}{\partial \lambda} > 0$, $\frac{\partial \pi_L}{\partial \lambda} > 0$, and $\frac{\partial y_L}{\partial \lambda} > 0$. For any $\lambda \geq 0$, $\frac{\partial y_H}{\partial \lambda} < 0$ iff $\beta p_H - (1-\beta)C < 0$.

Proof. See Appendix B. □

This proposition states that, as the central bank cares relatively more about inflation, both biases—inflationary and deflationary—that can occur in the high trust state will be lower. When deflationary bias prevails ($y^* \leq \widetilde{y^*}$), and inflation in the high state is negative (see proposition 3) then lower λ increases inflation. However, when inflation bias prevails ($y^* \geq \widetilde{y^*}$), and inflation in the high state is positive (see proposition 3) then lower λ decreases inflation in this state.

Proposition 5. *For any $y^* \geq 0$: $\frac{\partial \pi_H}{\partial y^*} > 0$, $\frac{\partial \pi_L}{\partial y^*} > 0$, $\frac{\partial y_H}{\partial y^*} > 0$, and $\frac{\partial y_L}{\partial y^*} > 0$.*

Proof. See Appendix B. □

Proposition 6. *For any τ_L: $\frac{\partial \pi_H}{\partial \tau_L} < 0$, $\frac{\partial \pi_L}{\partial \tau_L} < 0$, $\frac{\partial y_H}{\partial \tau_L} > 0$, and $\frac{\partial y_L}{\partial \tau_L} < 0$.*

Proof. See Appendix B. □

Proposition 7. *For any p_H that satisfy conditions for existence of equilibria:*

(a) For any $p_H \geq 0$ and $y^* \leq \widetilde{\widetilde{y^*}}$: $\frac{\partial \pi_H}{\partial p_H} \leq 0$, where $\widetilde{\widetilde{y^*}} \equiv -\frac{\kappa^2+\lambda(1-\beta)}{\kappa\lambda}\tau_L$.

(b) For any $p_H \geq 0$ and $y^* > \widetilde{\widetilde{y^*}}$: $\frac{\partial \pi_H}{\partial p_H} > 0$.

Proof. See Appendix B. □

Corollary 1. *We can observe the following effects on π_H depending on the level of y^*:*

(a) *For any $y^* \leq \widetilde{y^*}$: $\pi_H \leq 0$ and $\frac{\partial \pi_H}{\partial p_H} < 0$*

(b) *For any $\widetilde{y^*} < y^* \leq \widetilde{\widetilde{y^*}}$: $\pi_H > 0$ and $\frac{\partial \pi_H}{\partial p_H} \leq 0$.*

(c) *For any $y^* > \widetilde{\widetilde{y^*}}$: $\pi_H > 0$ and $\frac{\partial \pi_H}{\partial p_H} > 0$.*

Proof. See Appendix B. □

Proposition 8. *For any p_L: $\frac{\partial \pi_H}{\partial p_L} < 0$, $\frac{\partial \pi_L}{\partial p_L} < 0$.*

Proof. See Appendix B. □

4. Hypotheses and Empirical Strategy

This section details the hypotheses that will be later on tested using survey data and explains the empirical strategy. The first hypothesis states that both inflation and deflationary bias can occur when economic agents assign a positive probability of hitting the ZLB constraint. As monetary authorities in all countries in the sample decreased the interest rates after the end of the sample, we consider that our sample is best described by a *standard* Markov perfect equilibrium in a high state, as in the low state the equilibrium features interest rates at the effective lower bound.

The survey asks for "How confident, if at all, are you that the central bank is currently pursuing the correct policies in order to meet its target of price stability (i.e., inflation around [target]) over the medium term (i.e., the next 3 - 5 years)?" In the model there are four non-structural parameters that influence inflation expectations can could lead to lower confidence of achieving the inflation target. The (perception of) probability of entering the low trust steady state (p_H) and the probability of staying in the low steady state (p_L), the degree of conservatism (λ) and the output gap target level (y^*). Implicitly, we are assuming that p_L, y^*, and λ are invariant within the country, but potentially y^* and λ can vary within a monetary union. We link the answers to the confidence question to the probability of entering the low trust steady state (p_H). Note that in a more realistic model p_H would depend on the distance of interest rate from the ZLB (see **?**), so it is reasonable to expect that this probability is state(time)-dependent, although our model assumes that it is a constant. Indeed, our measure of confidence has 5 potential answers. Contrary, there is less clear whether economic agents should expect a time-varying λ and y^*, at least within the framework that we outlined in the previous section, and the questions actually states "...the central bank is currently pursuing the correct policies to meet..." which also signals that the policy objectives are invariant across time.

Hypothesis 1. *Depending on y^*, for $\lambda > 0$ there exits either deflationary or inflationary bias when there is a positive probability of the low trust state, as described in Proposition 7.*

Testing this hypothesis entails examining whether households with low confidence have inflation expectations both lower or higher than their inflation objective, depending on their perceptions of y^*. *(summary stats; regressions; distribution of those who trust vs those who do not trust)*

As the four structural parameters have differential effects on π_H, we can furthermore test the effects of y^* and λ. Next two hypothesis deals with differences in inflation expectations between inflation targeting and non-inflation targeting central banks. Hypothesis 2 deals with conditional (on the level of confidence) reduction of inflation and deflationary bias (inflation disagreement), while Hypothesis 3 with unconditional reduction in inflation disagreement.

Hypothesis 2. *Inflation targeting (higher conservatism; lower λ) reduces both inflation and deflationary bias given the level of confidence (p_H), as described in Proposition 4.*

This hypothesis test the implications of central bank design on inflation expectations. One reason for the introduction of inflation targeting was to control inflation also via the inflation expectations and this hypothesis test this design assumption. Our sample consist of both inflation and non-inflation targeting countries, although only 2 out of 9 countries are not an inflation targeting countries. Testing this hypothesis entails comparing inflation expectations in inflation targeting and non-inflation targeting central banks given the level of confidence. *do entropy matching to account for only two countries*

An additional hypothesis could be that inflation targeting central banks, with the hierarchical mandate—like the European Central Bank—should have a higher level of confidence than dual mandate central banks. Behind this question there is essentially a credibility problem that leads to inflation bias. This is a testable hypothesis in our framework, as we have data from both inflation targeting and non-inflation targeting central banks. Of course, institutional mandate is not the only determinant of the credibility, but also (other) communication practices matter.

Hypothesis 3. *Inflation targeting countries have higher confidence (lower π_H), and thus additionally reduce both inflationary and deflationary bias.*

This hypothesis also allows that the perception of π_H is different among inflation targeting and non-inflation targeting central banks in addition to conditional reduction in inflation disagreement that is studied in Hypothesis 3. This link between inflation targeting (λ) and confidence (π_H) is not explicit in our stylized model, but in a case when π_H is state(time)-varying is it plausible to assume that the probability of the low trust state is dependent on the institutional design. In testing this hypothesis, we unconditionally compare the levels of confidence in inflation targeting and non-inflation targeting central banks.

The next hypotheses test the difference of inflation expectations within the monetary union, and study the differential effects of p_H, λ, and y^*. Households within the European Monetary Union have been experiencing common monetary policy since the establishment of the ECB in 1999.

Hypothesis 4. *Within a monetary union λ is not different.*

This is actually a testable hypothesis in our framework, as cross-country comparison of inflation expectations given the level of confidence (p_H) implies that an increase in λ reduces both inflation and deflation bias, while an increase in y^* reduces deflationary bias and increases the inflation bias.[6] Therefore, this constitute as a test that those countries given the level of confidence (p_H) that have lower inflation bias do not also have lower deflation bias.

Hypothesis 5. *Within a monetary union differences in inflation expectations, given the level of confidence (p_H), could be explained by perception of y^*.*

As mentioned before, an increase in y^* reduces deflationary bias and increases the inflation bias, given the level of confidence (p_H). We test this using our database.

In an environment of inflation targeting where the 'type' of agent is at least to some degree predetermined (λ is given and equal for everyone), the game between central bank and economic agents is about the trust (confidence). The uncertainty regarding the type of the central bank is that same for all countries. As it is mentioned above, trust (confidence) is about preferences of both the trustee and trustor. In this case, due to potentially different preferences of the public (see formulation in Bursian and Faia, 2015), level of trust (confidence) can be different among member countries of the Eurozone. Potentially, different preferences can originate due to cultural and historical differences among Eurozone countries.

Hypothesis 6. *Level of confidence varies across EMU countries: Countries with higher confidence (lower p_H) have (unconditionally) lower inflationary and deflationary bias.*

Testing this hypothesis involves testing whether unconditional variance of inflation expectations (disagreement of inflation expectations around the target level) is lower in countries, where the level of confidence is higher (lower p_H).

5. Data

For our analysis we combine different datasets. Our main dataset consists of individual level data across 9 countries from 11 survey waves from end of 2013 to end of 2015 with a total of 51,082 observations. More specifically our country sample includes individuals living in Austria, France, Germany, Hong Kong, Italy, Singapore, Spain, Switzerland, and the United Kingdom. For Austria, Hong Kong, Singapore, and Switzerland there are approximately 500 participants per wave. For France, Germany, Italy, and Spain there are 1000 participants per wave. To analyze the data, we combine countries and waves to form a panel of the data across individuals, countries, and time.

[6] A similar effect would hold as well for a reduction in p_L, but it is less empirically likely that this is the case, as one would expect that empirically p_H and p_L would be correlated, at least among households.

The microdata we use in this paper is collected by YouGov, an online research center focusing on the perceptions and opinions of individuals across the world.[7]

The survey has information on inflation expectations, confidence in central bank, trust in the government, and general characteristics of the individual. To measure inflation expectations, the survey asks the participants to provide their short-run inflation expectations, what they expect inflation to be 12 months from the date of the survey; and their medium-run inflation expectations, what they expect inflation to be five years from the date of the survey. To measure central bank confidence, the survey asks the following question: "How confident, if at all, are you that the central bank is currently pursuing the correct policies in order to meet its target of price stability (i.e., inflation around [target]) over the medium term (i.e., the next 3 - 5 years)?" The individual then chooses between "Not at All," "Not Very," "Fairly Confident," or "Very Confident." To measure trust in the government, they ask the individual the following question: "To what extent do you agree or disagree with the following statement? 'I think that the government is currently following the right economic policies for [Country]'." The participants then choose between the following answers: "Strongly Disagree," "Tend to Disagree," "Neither Agree nor Disagree," "Tend to Agree," and "Strongly Agree." General characteristics that YouGov surveys include the participants gender, age, and region in which they are currently living.

The macroeconomic variables we use are inflation rate, interest rate, GDP growth, and seasonally adjusted unemployment rate. The inflation rate is calculated as the change in CPI from one quarter to the next. GDP growth is calculated as the change in GDP from quarter to quarter. We collect these variables from the ECB for all European Union countries and from the central bank websites for all countries outside of the European Union except Singapore whose data comes from the Singapore Government Department of Statistics. We classify a country as inflation targeting based on the central bank mission as stated on the country's central bank website. Those countries who state a specific number as their inflation target are labeled as inflation targeting in our sample.

The political data we use to classify the political leanings of our countries comes from political yearbook data.[8] We classify a country as "Right" or "Left" based on the leaning of the party in majority control of the legislative branch[9] at the time of our analysis. During the time the survey was conducted, there was only one election period; thus, the country is labeled as "Right" or "Left" based on this result for the entire sample period.

[7]It conducts surveys using Active Sampling: YouGov predetermines who is allowed to participate in the survey in order to maximize the representativeness of the sample. Each survey is anonymous and takes under ten minutes to complete and YouGov provides a monetary incentive for completing the survey. After surveys are conducted, the data is statistically weighted to correspond to the national population profile of all adults over the age of 18. These weights are calculated based on Census data, large scale random probability surveys, election results, and national statistic agencies. YouGov, specifically, weights based on age, gender, social class, region, party identity, and the readership of individual newspapers. YouGov's results have been shown to be comparable in accuracy to other major polling and have a high predictive accuracy for actual outcomes in national and regional elections. YouGov operates in France, Germany, and the United Kingdom. They use a partner to conduct surveys in Austria, Hong Kong, Italy, Singapore, Spain, and Switzerland. YouGov public opinion research is conducted according to the Market Research Society guidelines.

[8]This data is collected from and published in various issues of the European Journal of Political Research (Caramani et al., 2011).

[9]Examples of the legislative branches include the House of Commons in the United Kingdom and the National Assembly in France.

5.1. Summary Statistics

In the following we introduce our confidence measure and provide first evidence on the link between confidence and inflation expectation.

Table 2 contains the shares of consumers that are confident for a overall and conditional specific characteristics (age, gender, etc.), countries and over time. Stars denote whether the proportions are different from each other. From this table we can infer that roughly 60% of the survey population in not confident with respect to the central bank meeting the inflation close to 2%. This is not unexpected as this period is dominated by very low inflation rates in Europe which dominates the sample, furthermore the values are comparable to the EU Eurobarometer survey. The Eurobarometer survey asks "For each of the following institutions, please tell me if you tend to trust it or tend not to trust it or don't know?". During that period roughly 30% of the respondents trusted the ECB which is very close to the average of 28% we report. Interestingly we can observe that we have some country heterogeneity. While in most of the EMU countries the majority is not confident, in countries like UK and Switzerland the majority is confident that the central bank will meet their promise. In terms of time we see an slight upward movement in the confidence share for the panel as a whole. This time dynamic is depicted in Figure 1.

In Table 1, we compare the means for short run inflation expectations and medium-run inflation expectations by the range of confidence in the central bank and compare these means across political orientation, inflation targeting countries, trust in government, countries, gender, age, and survey. For both short run and medium-run inflation expectations, the means differ across the range of confidence in the central bank.

Using t-test to compare the mean inflation rate and a Kruskal-Wallis equality of populations rank test to compare the median inflation rate across confidence level, we find for each confidence level the mean and median inflation expectation in both short- and medium-run are statistically significant at the 99% confidence level when compared to the remaining levels of confidence.

In Table 1, when we compare the binary measures, "Not Confident" has a 1% higher short run inflation expectation and almost 1.5% higher medium run inflation expectation. The mean and median inflation expectations in both short- and medium-run for the binary measures of confidence are statistically significantly different from each other at the 99% confidence level.

For inflation targeting countries compared to non targeting countries, we can see that for all confidence ranges, for short and medium-run inflation expectations, targeting countries have lower expectations of inflation, significant at the 99% confidence level. The binary measure of "Confident" has a higher short and medium-run inflation expectation when the government is trusted, both median and mean are statistically significantly different at the 99% confidence level. However, when individuals are "Not Confident", the inflation expectation is higher when they do not trust the government; the median is significant for short run at the 95% confidence level and the mean is significant in the medium-run at the 95% confidence level. When testing the means across countries, the United Kingdom had the lowest short run and medium-run inflation expectations across all confidence ranges, at the 99% significance level. Hong Kong had the highest short run and medium-run inflation expectations across all ranges of confidence, at the 99% significance level.

A comparison across gender shows that females have around a one percent higher short run and medium-run inflation expectation at all ranges of confidence, with a 99% confidence level. The medians are also statistically significantly different at a 99% confidence level. Across the age range, young people, aged 18 to 34, have the highest mean for short and medium-run inflation expectations for all ranges of confidence, at the 99% confidence level. The median is also statistically significant at the 99% confidence level for all confidence ranges compared to old, 45 and above, and middle aged, 35-44. Old people, aged 45 and above, have the lowest mean for short run and medium-run inflation expectations for all ranges of confidence, at the 99% confidence level. The medians for old people is also statistically significantly different at the 99% confidence level. In all cases, younger people have more than 1% higher expectations, both short and medium-run, than old people.

Comparing the means across surveys, it appears that the mean decreases over the survey period for all confidence ranges. The lowest means for short run and medium-run inflation appear in the last four surveys.

In Figure 2 we depict the time dynamic of short- and long-run inflation expectations. The solid line represents the average while the dashed lines represents the averages for consumers that have confidence and those that are not confident. As one can see we observe slightly falling inflation expectations. Notably the gap between both groups remains stable.

Table 1: Summary Statistics for Expected Inflation For Combined Confidence Measure

			Political Orientation		Inflation Targeting		Gov. Trust		Country								
	No. Obs.	Total	Right	Left	No	Yes	Trust	Distrust	Austria	France	Germany	Hong Kong	Italy	Singapore	Spain	Switzerland	UK
Short Run Inflation																	
Not Confident	29,233	3.84***	3.74***	3.84***	5.08***	3.56***	3.83***	3.85***	3.39***	3.09***	3.53***	5.37**◇	4.68***	4.59***	3.65◇◇◇	3.52***	2.75***
Confident	21,246	2.81	2.75	3.04	4.39	2.51	2.91	2.45	2.84	2.62	2.44	5.06	3.30	4.00	3.69	1.99	1.98
Medium Run Inflation																	
Not Confident	27,204	5.34***	5.13***	5.08***	7.29***	4.88***	5.24***	5.39***	5.09***	4.66***	5.21***	7.82***	5.41***	6.40***	4.48◇◇◇	5.39***	4.29***
Confident	19,928	3.84	4.06	3.65	5.71	3.45	3.92	3.53	3.59	3.62	3.47	6.56	3.69	5.22	4.36	3.33	3.07
		Gender		Age			Survey										
	No. Obs.	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
Short Run Inflation																	
Not Confident	29,233	3.33***	4.47***	4.59***	3.99***	3.37***	4.37***	4.07***	3.99***	4.10***	3.80***	3.84***	3.78***	3.45***	3.57***	3.66***	3.64***
Confident	21,246	2.53	3.31	3.82	3.11	2.26	3.58	3.22	3.28	2.92	3.18	2.80	2.79	2.53	2.39	2.56	2.41
Medium Run Inflation																	
Not Confident	27,204	4.95***	5.82***	6.11***	5.48***	4.84***	5.68***	5.52***	5.64***	5.59***	5.44***	5.18***	5.20***	5.14***	5.11***	5.08***	5.12***
Confident	19,928	3.55	4.35	4.81	4.03	3.32	4.40	4.14	4.19	4.19	3.94	3.79	3.85	3.58	3.61	3.64	3.49

Notes: The mean (median) of each group variable is compares between confident and not confident. For example, when testing Austria we are comparing the mean (median) of Not Confident to the mean (median) of Confident within Austria. *, **, *** denote significance at the 10, 5 and 1%, respectively, for both the two sample t test and the Kruskal-Wallis equality of populations rank test. ⋆,⋆⋆, ⋆⋆⋆ denote significance at the 10, 5 and 1%, respectively, for the two sample t test. ◇,◇◇, ◇◇◇ denote significance at the 10, 5 and 1%, respectively, for the Kruskal-Wallis equality of populations rank test.

Table 2: Share of Confidence Combined Confidence Measure

		Political Orientation		Inflation Targeting		Gov. Trust		Country									
	Total	Right	Left	No	Yes	Trust	Distrust	Austria	France	Germany	Italy	Spain	EU	Hong Kong	Singapore	Switzerland	UK
Not Confident	61.98***	57.35***	71.58***	60.78***	62.19***	43.65***	83.26***	73.55***	77.54***	66.54***	65.88***	77.37***	71.77***	72.54***	48.55**	37.02***	40.29***
Confident	38.02	42.65	28.42	39.22	37.81	56.35	16.74	26.45	22.46	33.46	34.12	22.63	28.23	27.46	51.45	62.98	59.71
		Gender		Age			Survey										
	Total	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
Not Confident	61.98***	56.86***	67.24***	62.55***	63.11***	61.32***	69.67***	65.28***	69.24***	65.40***	61.62***	61.04***	61.54***	57.71***	58.16***	59.23***	57.17***
Confident	38.02	43.14	32.76	37.45	36.89	38.68	30.33	34.72	30.76	34.60	38.38	38.96	38.46	42.29	41.84	40.77	42.83

Notes: The median of each group variable is compares between confident and not confident. For example, when testing Austria we are comparing the median of Not Confident to the median of Confident within Austria. *,**,*** denote significance at the 10, 5 and 1%, respectively, for a one-sample test of proportion.

From this observations so far we can only infer that the majority tends to have higher inflation expectations when confidence is lost. However, our model predicts that loosing confidence, under certain assumptions, might as well lead to even lower inflation expectations. To check whether this is the case in our sample we need to change our perspective. To gain some insight into this potential pattern we calculate the share of people that are confident for intervals of inflation expectations (e.g how high is the share of people being not confident that have expectation of 1-1.5%). If we plot the share of confidence across different bins of inflation expectations and there is no deflation bias we should expect a rising share of people being not confident with rising inflation expectations. However, if a deflation bias exist we should expect an u-shape relationship. Close to the target inflation rate the confident shares should be very high. If we move away from this area there should be less people being confident. Most people having no confidence could expect either very high inflation or very low inflation.

Figure 3 shows the resulting distribution for the share of people being not confident across different levels of inflation expectations for short and medium-run inflation expectations. We can clearly observe the u-shaped pattern. Most people that are confident have inflation expectations around 1.0% to 2.0%. Hence loosing confidence leads to having high expectations >2.5% or very low expectations <0% which clearly indicates the potential of generating both inflation as well as deflation bias.

Figure 1. Evolution of Confidence over the Sample Period

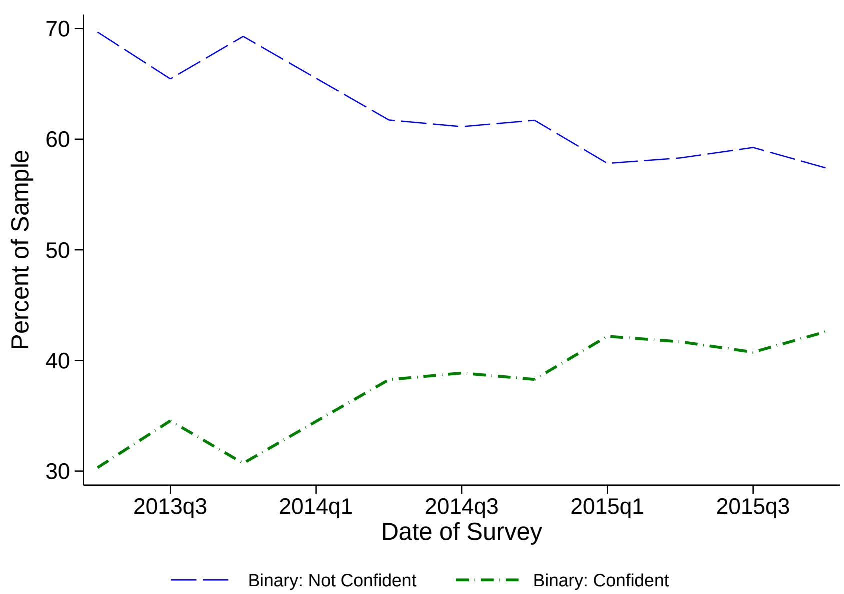
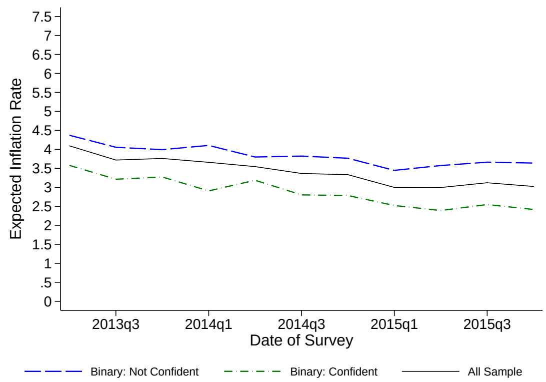
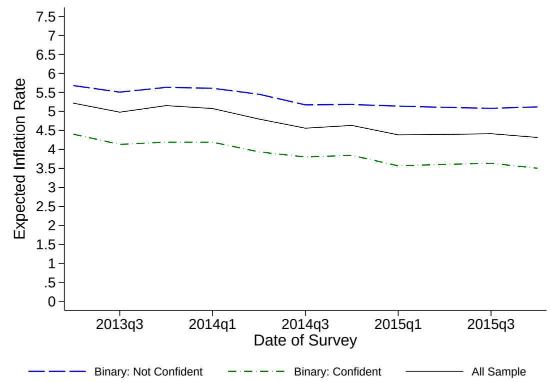


Figure 2. Evolution of Inflation Expectation by Confidence Level

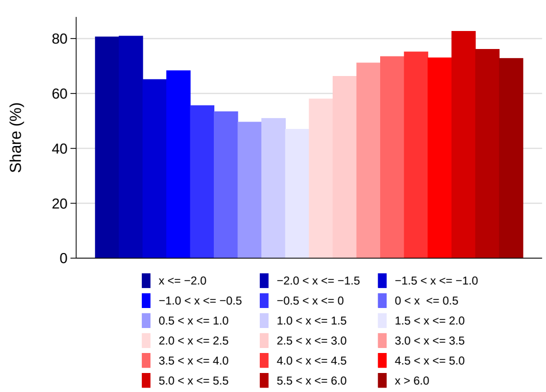


(a) Short Run

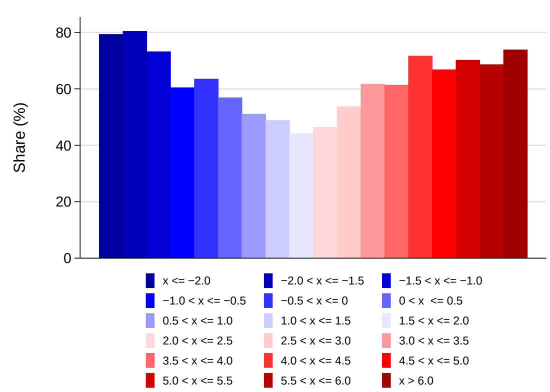


(b) Medium Run

Figure 3. Confidence Level Shares By Inflation Expectations



(a) Short Run



(b) Medium Run

6. Results

To test our hypothesis we estimate the following equation:

$$\pi^e_{i,j,t} = \alpha + \beta NC_{i,j,t} + \Gamma Z_{i,j,t} + \mu_j + \nu_t + \varepsilon_{i,j,t}$$

where the subscripts i, j, t denote individual i, country j, and time t. π^e represents either short term expectations (one year ahead) or medium term expectations (3-5 years ahead). NC captures whether the individual is confident in the central bank achieve inflation close to 2%. The vector Z contains several control variables including individual characteristics as well as macroeconomic control variables. μ and ν are country and year fixed effects and ε is the i.i.d error term. Note furthermore we assume that the following holds: $(\pi \rightarrow) NC \rightarrow \pi^e$ but $NC \nleftarrow \pi^e$. While inflation (past actions) might effect the probability of being confident, inflation expectations should be expected to result from that on confidence and not the cause.

In table 3 we test Hypothesis 1 and 2. Hypothesis 1 is tested by looking at short- and medium-run inflation expectations including our confidence indicator and a set of control variables. Hypothesis 1 is confirmed (not-rejected) if our confidence indicator is statistically significant.

We control for socioeconomic characteristics like gender and age, the macroeconomic situation proxied by the short-term interest rate, economic growth and the inflation rate as well as the presence of a right-wing government and the attitude towards the government. Furthermore, we include country and time fixed effects.

Hypothesis 2 is tested when we control for inflation targeting central banks. For this purpose we add a dummy variable which is 1 if a central banks is an inflation targeter. As laid out before we expect that inflation expectations are lower if a central bank is targeting inflation. Furthermore, we include an interaction term with our confidence variable as we hypothesize that loosing confidence in an inflation targeting central bank should have a stronger impact on inflation expectations.

First and foremost we observe that our variable of interest, the confidence in the central bank achieving low inflation rates, is highly significant in all specifications. Furthermore, it is also economically very relevant. Loosing confidence in the central bank increases inflation expectations by roughly 0.5% (ranging from 0.42 in column (4) up to 0.67 in column (1)). Consequently there is strong support for our Hypothesis 1.

With respect to Hypothesis 2 we provide evidence that inflation targeting matters. Countries with an inflation target have 1.2% (in column (1)) lower inflation expectations than not inflation targeting countries.[10]

Confidence and trust should matter a lot more in inflation targeting regimes as they carry a promise to deliver inflation rates close to a pre-announced target. Hence loosing confidence should have a stronger effect in these countries than in countries that have no official or implicit target. Indeed we can confirm this conjecture in column (2). Loosing confidence in a inflation targeting country increases inflation expectations instead of 0.4% by 0.71% (0.26+0.454).

[10] In our case non-inflation targeting countries are Hong Kong and Singapore.

The results for the control variables are as follows. First, we do not observe any significant impact of trust in the government on short-run inflation expectation. Controlling for the attitude towards the government is particularly important as we want to clearly identify the effect of trust in the ECB. Ignoring the attitude toward the government might influence the results as we might only capture an attitude towards governmental structures and their perceived efficiency in the past. Our dataset allows us to include a variable that captures whether people believe that the government the right economic policy.

Regarding socioeconomic characteristic it seems that women have slightly higher inflation expectations than man and that young people tend to have larger inflation expectation than middle aged people, with older people having the lowest.

With respect to the economic environment we find that, as expected, current inflation feeds into short-run inflation expectations positively and higher interest rates reduce expected inflation expectations. GDP growth has a negative effect on short-run inflation expectations. This result might be driven by our sample period. We observe growth rates below long-run growth implying that higher economic growth should have virtually no effect.[11]

Furthermore we observe that having a right-wing government lead people to expect slightly lower inflation rates.

Looking at the mistrust in government we observe that it increases inflation expectations when interacted with right-wing government.

In columns 4 and 5 we include time-fixed effects. This implies that time-invariant variables drop out (inflation targeting and right-wing). With respect to main results this change in the specification has qualitatively no implication.

So far we only considered the short-term effect of loosing confidence in the central bank. More importantly from a central bank perspective is of course the effect on longer term expectations. For this purpose we estimate the same specification using medium-term inflation expectations (3-5 years) which is the horizon most central banks are looking at. Results are presented in Table 4.

In the first column we regress the same set of explanatory variables as for the short-run expectations except that we include short-run expectations as an additional explanatory variable. The inclusion of the short-run inflation expectations changes the interpretation of the control variables slightly as they now explain the additional effect that cannot be explained by short-run expectations. Short-run inflation expectations are highly significant and have economically an important effect. This is not surprising as following the term structure theory, short-run expectation by definition must explain a large part of medium-run expectations.

Again, we find a very significant and economically meaningful effect of confidence or the lack thereof on inflation expectations. Notably the effect is slightly smaller than the effect on short-run inflation expectations. This indicates that the effect of trust builds up over the term structure of inflation expectations and is more relevant for 3-5 years expectations (see also column (3) where we drop short-run inflation expectations from our specification).

[11] This interpretation is underlined as economic growth has a positive effect on medium-run inflation expectations.

The effect of inflation targeting remains significant but is slightly smaller. Right wing indicator changes sign is now positive. We now find an effect of mistrust in the government. Apparently this only matters for longer term expectations.

Regarding or demographic controls the gender dummy and the variable controlling for old people looses significance. The variables measuring current economic conditions continue to matter. Interestingly, the impact of economic growth changes sign. With respect to medium-run expectation higher current growth increases inflation.

In columns (2) and (3) we include again the interaction terms. While the interaction between government trust and right-wing looses significance we now observe a negative effect of inflation targeting and confidence in the central bank. This indicates that the increase of expectations is decaying over the term structure of inflation expectations. This is in line with Svensson who showed that an inflation shock is decaying over time and that there no difference between the response of inflation targeters and non-inflation targeters.

In column (4) we drop short-run inflation expectations to observe the cumulative response. Doing this we provide evidence that the loosing confidence increases medium-term expectation by 1.2%. Similarly the inflation targeting effect increases to 1.7%. Hence we see that loosing trust has a bigger effect on longer expectation that on short-term expectations. In sum we find strong support for Hypothesis 1 and 2 for short- as well as medium-run inflation expectations.

In the last two columns we again include country and time fixed effect with no implications for the results.

So far we have explored consequences of loosing confidence following standard models. However, our model allows for deflationary effects when loosing confidence. As indicates in the previous sections there is a certain amount of population that has little confidence and not high inflation expectations but very low expectations. In order to analysis this we run several different specification summarized in Table 5. Columns (1) and (6) replicate the standard specification for short and medium run expectations to ease the comparison. In column (2) we add a dummy variable for inflation expectations below target and an interaction term with being non confident. As can bee seen the both variables are highly significant and indicate given the negative sign of the interaction term that loosing confidence can work in the other direction causing deflationary bias. Another interesting observation is the rise in the quality of the model specification as indicate by the R^2. When we control for low inflation expectations the increase from 0.05 in the initial specification to 0.5 in column (5). In columns (3-5) we vary the specification by controlling for very high expectations and very low expectations and basically confirm the initial observation that loosing confidence can cause both, inflationary as well as deflationary bias. This is true and in economic terms even more relevant if we consider the estimation results for medium term expectations presented in columns (6) onwards. For inflation expectations below one we observe a deflationary bias of -0.3 and for high inflation expectations we observe an inflation bias of 0.45 which is slightly higher.

With Hypothesis 3 we try to disentangle the trust effect from reputation which might feed into trust. For this purpose we focus only on countries that are part of the European Monetary Union (EMU). As all EMU countries have the same central bank they have the same experience with the ECB and hence should agree on the reputation the of ECB.[12] Any heterogeneity in confidence estimate must be driven by differences by trust differences and not reputation (assuming similar preferences). Hence this regression will allow us to extract the reputation effect and focus only on trust. The empirical results are presented in Table 6. First, confidence, our main variable of interest, remains highly significant. If we look at the heterogeneity within the European Monetary Union across individual member countries we observe significant country fixed effects. Note that the reference country is Germany. Our results reveal, for instance, that Austria has similar inflation expectation as Germany and that Spain has inflation expectations which are roughly 1.5% higher. With respect to loosing confidence the response is markedly differential as well. This is shown in the differences across the interaction effects estimates of confidence and the country specific fixed effect. For instance, relative to Germany Spain responds much less to losing confidence. Hence while Germany has among the lowest inflation expectation it has the highest response to losing confidence in the central bank. Austria has similar inflation expectations as Germany but respond less strong to losing trust. Apparently Germany and Italy have similar aversion of losing confidence

[12] All countries in our sample joint the Monetary Union at the same time and consequently have the same experience with the ECB.

Table 3: Determinants of Short Run Inflation Expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e
Not Confident	0.660***	0.650***	0.537***	0.670***	0.454***	0.440***	0.421***
	(0.04)	(0.04)	(0.09)	(0.04)	(0.09)	(0.09)	(0.12)
Gov. Mistrust	-0.029	-0.031	-0.032	-0.005	-0.006	-0.145***	-0.007
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
Female	0.915***	0.916***	0.917***	0.921***	0.919***	0.918***	0.920***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age: Young	0.558***	0.556***	0.603***	0.573***	0.573***	0.571***	0.610***
	(0.06)	(0.06)	(0.09)	(0.07)	(0.07)	(0.07)	(0.10)
Age: Old	-0.414***	-0.410***	-0.554***	-0.433***	-0.433***	-0.433***	-0.537***
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)	(0.05)	(0.07)
Interest Rate$_{t-1}$		-0.355*	-0.358*	-0.315***	-0.300**	-0.367***	-0.294**
		(0.21)	(0.21)	(0.12)	(0.12)	(0.12)	(0.12)
GDP Growth$_{t-1}$		-0.025***	-0.024***	-0.082***	-0.082***	-0.080***	-0.082***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$		0.194***	0.197***	0.146***	0.152***	0.143***	0.151***
		(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Young*Not Confident			-0.076				-0.061
			(0.13)				(0.13)
Old*Not Confident			0.249**				0.179*
			(0.10)				(0.10)
Right Wing				-0.199***	-0.202***	-0.378***	-0.203***
				(0.06)	(0.06)	(0.07)	(0.06)
Inflation Target				-1.178***	-1.322***	-1.380***	-1.286***
				(0.07)	(0.09)	(0.09)	(0.09)
Not Conf*Infl Target					0.263***	0.271***	0.205**
					(0.10)	(0.10)	(0.10)
Mistrust*Right Wing						0.350***	
						(0.08)	
Constant	2.923***	2.538***	2.587***	4.086***	4.194***	4.347***	4.210***
	(0.10)	(0.14)	(0.14)	(0.14)	(0.15)	(0.15)	(0.16)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	No	No	No	No
N	50074	50074	50074	50074	50074	50074	50074
R-squared	0.070	0.071	0.072	0.065	0.066	0.066	0.066

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as individuals who answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" The variable "Gov. Mistrust" is defined as those who "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]". Not Conf*Infl Target is the interaction between "Not Confident" and Inflation Target. Mistrust*Right Wing is the interaction between Right Wing and Gov. Mistrust. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the Central Bank and do not "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]."

Table 4: Determinants of Medium Run Inflation Expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	0.553***	0.562***	0.604***	0.583***	0.864***	0.866***	1.225***	0.858***
	(0.04)	(0.04)	(0.07)	(0.04)	(0.10)	(0.10)	(0.12)	(0.11)
SR_INFL_e	0.927***	0.928***	0.928***	0.923***	0.923***	0.923***		0.923***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)		(0.01)
Gov. Mistrust	0.356***	0.358***	0.358***	0.298***	0.299***	0.318***	0.156**	0.300***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.06)	(0.04)
Female	0.003	0.001	-0.000	-0.004	-0.001	-0.001	0.727***	-0.002
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.03)
Age: Young	0.171***	0.174***	0.145**	0.156***	0.157***	0.157***	0.599***	0.136**
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)	(0.05)	(0.08)	(0.07)
Age: Old	0.027	0.025	0.084	0.033	0.034	0.034	-0.325***	0.048
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)
Interest Rate$_{t-1}$		0.324*	0.325*	-0.381***	-0.400***	-0.391***	-0.508***	-0.401***
		(0.17)	(0.17)	(0.11)	(0.11)	(0.11)	(0.16)	(0.11)
GDP Growth$_{t-1}$		0.050***	0.050***	0.051***	0.051***	0.050***	-0.025***	0.051***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$		-0.009	-0.010	0.168***	0.161***	0.162***	0.257***	0.161***
		(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Young*Not Confident			0.047					0.034
			(0.10)					(0.10)
Old*Not Confident			-0.103					-0.024
			(0.08)					(0.08)
Right Wing				0.111**	0.114**	0.138***	-0.147*	0.114**
				(0.04)	(0.04)	(0.05)	(0.08)	(0.04)
Inflation Target				-0.642***	-0.455***	-0.447***	-1.712***	-0.462***
				(0.07)	(0.08)	(0.08)	(0.11)	(0.08)
Not Conf*Infl Target					-0.345***	-0.347***	-0.126	-0.333***
					(0.10)	(0.10)	(0.13)	(0.10)
Mistrust*Right Wing						-0.047	0.195*	
						(0.07)	(0.10)	
Constant	1.261***	1.213***	1.196***	1.127***	0.987***	0.967***	4.930***	0.992***
	(0.09)	(0.13)	(0.13)	(0.13)	(0.14)	(0.14)	(0.19)	(0.14)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	No	No	No	No	No
N	44762	44762	44762	46785	44762	44762	44762	44762
R-squared	0.519	0.520	0.520	0.516	0.516	0.516	0.068	0.516

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as individuals who answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" The variable "Gov. Mistrust" is defined as those who "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]". Not Conf*Infl Target is the interaction between "Not Confident" and Inflation Target. Mistrust*Right Wing is the interaction between Right Wing and Gov. Mistrust. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals.The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the Central Bank and do not "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]."

Table 5: Determinants of Inflation Expectations Conditional of Level of Inflation Expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	0.718***	1.122***	2.252***	1.041***	0.097***	0.565***	0.767***	1.129***	0.757***	0.153***
	(0.05)	(0.07)	(0.06)	(0.07)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)	(0.02)
SR_INFL_e						0.909***	0.843***	0.859***	0.838***	0.548***
						(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Gov. Mistrust	-0.038	0.015	-0.039	0.020	-0.131***	0.215***	0.245***	0.239***	0.246***	0.062**
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Female	0.982***	0.799***	0.835***	0.805***	0.414***	-0.050	0.020	-0.001	0.032	-0.037
	(0.05)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Age: Young	0.768***	0.747***	0.779***	0.760***	0.370***	0.080	0.134**	0.129**	0.140***	-0.005
	(0.08)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.04)
Age: Old	-0.411***	-0.443***	-0.442***	-0.486***	-0.269***	0.064	0.023	0.023	0.009	-0.013
	(0.06)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Right Wing	-0.181***	-0.270***	-0.207***	-0.235***	-0.237***	0.085*	-0.044	0.009	-0.037	-0.027
	(0.06)	(0.05)	(0.06)	(0.05)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.03)
Interest Rate_{t-1}	-0.521***	-0.113	-0.048	0.174	-0.602***	-1.256***	-1.036***	-0.990***	-1.003***	-0.409***
	(0.16)	(0.15)	(0.15)	(0.15)	(0.12)	(0.13)	(0.13)	(0.13)	(0.13)	(0.10)
GDP Growth_{t-1}	-0.069***	-0.076***	-0.091***	-0.090***	-0.006	0.104***	0.068***	0.077***	0.065***	0.050***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation_{t-1}	0.152***	-0.011	-0.046	-0.184***	-0.197***	0.089***	-0.004	-0.014	-0.039	-0.007
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Below Target		-2.666***		-2.229***			-1.683***		-1.488***	
		(0.05)		(0.04)			(0.04)		(0.03)	
Below Target * Not Conf		-1.530***	-4.150***	-1.394***			-0.979***	-2.608***	-0.922***	
		(0.07)	(0.05)	(0.06)			(0.05)	(0.05)	(0.05)	
Below One				-1.865***	-1.619***				-0.887***	-1.547***
				(0.04)	(0.02)				(0.05)	(0.03)
Below One * Not Conf				0.113**	-0.362***				0.100	-0.315***
				(0.04)	(0.02)				(0.07)	(0.04)
Above 75% of Sample					7.048***					5.959***
					(0.15)					(0.12)
Above * Not Conf					-0.359**					0.452***
					(0.17)					(0.14)
Constant	2.786***	3.921***	2.916***	4.283***	2.353***	0.853***	1.568***	1.145***	1.650***	1.398***
	(0.13)	(0.13)	(0.13)	(0.13)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.08)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	41340	41340	41340	41340	41340	36542	36542	36542	36542	36542
R-squared	0.050	0.196	0.160	0.213	0.472	0.539	0.575	0.566	0.577	0.738

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. “Not Confident” is defined as those individuals who have answered “Not at All” or “Not Very” to the question: “How confident, if at all, are you that the [country’s] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?” Not Conf*Infl Target is the interaction between “Not Confident” and Inflation Target. Young*Not Confident is the interaction between “Not Confident” and the dummy for young-aged individuals. Old*Not Confident is the interaction between “Not Confident” and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are “Fairly Confident” or “Very Confident” in the central bank.

Table 6: European Union Countries Unconditioned

	(1)	(2)	(3)	(4)	(5)
	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	1.039***	1.055***	0.844***	1.615***	0.836***
	(0.10)	(0.10)	(0.08)	(0.12)	(0.08)
SR_INFL_e			0.911***		0.910***
			(0.01)		(0.01)
Gov. Mistrust	-0.080	-0.174***	0.290***	0.151***	0.344***
	(0.05)	(0.07)	(0.04)	(0.06)	(0.05)
Female	1.000***	1.269***	-0.046	0.729***	-0.139***
	(0.05)	(0.06)	(0.04)	(0.06)	(0.05)
Age: Young	0.716***	0.815***	0.096*	0.660***	0.086
	(0.08)	(0.10)	(0.06)	(0.09)	(0.07)
Age: Old	-0.377***	-0.555***	0.043	-0.262***	0.045
	(0.06)	(0.08)	(0.05)	(0.07)	(0.06)
GDP Growth$_{t-1}$	-0.007	0.015	0.045***	0.043***	0.053*
	(0.01)	(0.04)	(0.01)	(0.01)	(0.03)
Inflation$_{t-1}$	0.483***	0.431***	-0.112*	0.333***	-0.099
	(0.08)	(0.11)	(0.06)	(0.09)	(0.08)
Not Conf * Austria	-0.482**	-0.473**	0.010	-0.177	0.009
	(0.19)	(0.19)	(0.16)	(0.21)	(0.16)
Not Conf * France	-0.633***	-0.635***	-0.334**	-0.689***	-0.334**
	(0.18)	(0.18)	(0.14)	(0.21)	(0.14)
Not Conf * Italy	0.198	0.179	-0.289**	-0.095	-0.295***
	(0.16)	(0.16)	(0.11)	(0.18)	(0.11)
Not Conf * Spain	-1.294***	-1.288***	-0.735***	-1.721***	-0.741***
	(0.18)	(0.18)	(0.13)	(0.19)	(0.13)
Not Conf * UK	-0.459***		-0.287***	-0.570***	
	(0.11)		(0.09)	(0.14)	
Country: Austria	-0.050	-0.015	0.075	-0.227	0.071
	(0.16)	(0.17)	(0.12)	(0.17)	(0.13)
Country: France	0.303**	0.340**	0.032	0.224	0.033
	(0.15)	(0.17)	(0.11)	(0.17)	(0.12)
Country: Italy	0.937***	0.979***	-0.576***	0.339**	-0.550***
	(0.13)	(0.18)	(0.08)	(0.14)	(0.12)
Country: Spain	1.473***	1.464***	-0.299**	1.049***	-0.275**
	(0.17)	(0.20)	(0.12)	(0.17)	(0.14)
Country: UK	-0.533***		-0.392***	-0.809***	
	(0.12)		(0.10)	(0.14)	
Constant	1.626***	1.739***	1.415***	2.783***	1.400***
	(0.22)	(0.29)	(0.17)	(0.25)	(0.23)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	38102	28112	33637	35176	24814
R-squared	0.058	0.048	0.540	0.040	0.550
Coefficient Test					
Austria=France	0.081	0.107	0.776	0.038	0.823
Austria=Italy	0.000	0.000	0.000	0.004	0.000
Austria=Spain	0.000	0.000	0.023	0.000	0.067
France=Italy	0.000	0.000	0.000	0.511	0.000
France=Spain	0.000	0.000	0.014	0.000	0.024

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as those individuals who have answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" Not Conf*[Country] is the interaction between "Not Confident" and the country. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the central bank.

7. Robustness

We conduct several robustness checks. We consider the relevance of the attitude towards the governments (Table 12), include higher order fixed effect (Table 13), account for outliers by truncating the upper and lower 5% of the sample (Table 14) and use the full scale categorical measures of our measure of confidence (Tables 8 and 9). Overall these additional exercises confirm our initial results.

We have seen that the attitude towards the government matters in some specifications. Furthermore, we might argue that individuals might voice a negative attitude towards government bodies in one country which might have little to do with the current monetary policy. To account for this potential caveat in mixing the assessment of government and monetary authority performance we remove all individuals that have a negative attitude towards government policy, i.e. disagree that the government is following the right economic policies for the country. Results are presented in Table5. Although this approach leads to a substantial loss of observations our main results remain valid.

In Table 13 we include higher order fixed effects. First we replace country and time fixed effects with country per time fixed effects. These effects should control for any unobserved effect that is specific to a country in every time period. Given that we have information regarding the region within the country the survey participant is living in we even include region per time fixed effects which control for quarterly effects happening within the region. Remarkably, our coefficient estimates only vary marginally and our overall results remain valid.

In Table 5 we control for extreme observations by removing the top 5% and bottom 5% of the sample. This is done by other studies using survey data as well in order to exclude observations that might indicate reporting errors or misconceptions of percentages rather than the true expectation of an individual. For instance, Dräger et al (2016) among others suggest for the University of Michigan Survey of Consumers to exclude observations with inflation rates above 30% and below -5%. Regarding the results, all our qualitative statements regarding our Hypothesis remain valid. There are, however, some interesting observations to note. First of all we observe that the explanatory power as measured by the R^2 goes up from 0.06 to 0.18. This is as expected if we exclude noisy observations. With respect to our variable of interest confidence remains highly significant with a value of roughly 0.5 as compared to 0.7 in Table 3 column (1). Regarding inflation targeting the coefficient again remains significant and increases slightly from 1.2 to 1.4. The interaction term between inflation targeting and confidence stays significant as well with a slightly decreasing magnitude. If we compare the results of medium-run expectations, for instance by considering column (7) and Table 4 column (4) we again find confirmation for our previous results with very similar value in both significance as well as magnitude.

Finally, we replicate our results using the complete categorical measure of confidence. Results are presented in Tables 8 and 9. While again our previous results are re-confirmed we should highlight that we observe some non-linearity as moving from 'not very confident' to 'not at all' confident almost doubles the impact on inflation expectations. This is not unexpected as we are moving to an extreme opinion. All other results remain qualitatively the same. Interestingly, we observe that being very confident has higher inflation expectations than being ‘fairly confident’.

In Table 7 replicates the statistics of Table 1 but with additional categories of confidence (“Not At All”,“Not Very”, “Fairly Confident”,“Very Confident”). Overall the results are in line with the previous statements. When looking at the “Total” column, we can see that the highest mean for short and medium-run inflation expectations occurs in the “Not At All” confident group. The means continue to decrease for “Not Very” and “Fairly Confident”. However, “Very Confident” has a higher mean than “Fairly Confident” but still lower than both of the not confident groups.

In Table 7, we first compare the inflation rates across political orientation. In the short run it is not clear whether right or left wing regimes have higher inflation expectations. The right wing regimes have higher short run inflation expectations when individuals are not confident in the central bank (“Not At All,” “Not Very,” and “Not Confident”). However, right wing regimes have lower inflation expectations for those who are confident in the central bank (“Fairly Confident,” “Very Confident,” and “Confident”). For medium-run inflation expectations under differing political orientations the results are more conclusive. Medium-run inflation expectations are higher under right wing regimes; both median and mean are statistically significant at the 99% for all confidence ranges, except for “Very Confident” where only the median is statistically significant.

In some cases countries who do not target inflation have more than 2% higher inflation expectations than targeting countries. Examining how the inflation expectations differ based on trust in government is less conclusive. The means for trust in government are higher for “Not Very,” “Fairly Confident,” and “Very Confident” for both short and medium run inflation. The means are statistically significantly different for “Not Very” and “Fairly Confident”, at the 95% and 99% confidence levels, respectively. In contrasts, for those who are “Not At All” confident in the central bank the inflation expectations in the short and medium-run are higher if they distrust the government; the mean is statistically significantly different for medium-run inflation expectation at the 90% confidence level.

When comparing the mean for “Very Confident,” young people have higher expectations, both short and medium-run, than old people by more than 2%.

Table 7: Summary Statistics for Expected Inflation for Disaggregate Confidence Measure

			Political Orientation		Inflation Targeting		Gov. Trust		Country								
	No. Obs.	Total	Right	Left	No	Yes	Trust	Distrust	Austria	France	Germany	Hong Kong	Italy	Singapore	Spain	Switzerland	UK
<u>Short Run Inflation</u>																	
Not At All	7,944	4.17***	4.17***	4.02***	5.57***	3.95***	4.07***	4.19***	3.74***	3.28***	4.08***	5.68***	5.13***	5.34***	3.71◇◇◇	3.56***	3.36***
Not Very	21,289	3.71***	3.64***	3.68**◇	4.95***	3.41***	3.80***	3.64**◇	3.25◇	2.99	3.34***	5.28	4.46***	4.42*◇◇	3.61	3.52***	2.59***
Fairly Confident	18,738	2.76***	2.89***	2.97***	4.31***	2.46***	2.86***	2.41***	2.74***	2.54***	2.35***	4.95***	3.25***	3.93***	3.50◇◇◇	1.99***	1.99***
Very Confident	2,508	3.19***	3.49***	3.61***	5.13◇◇◇	2.88**◇	3.26◇◇◇	2.84***	3.79◇◇	3.48	3.26◇◇◇	6.19⋆⋆	3.60*◇◇	4.62	4.88⋆⋆⋆	1.97**◇	1.97***
<u>Medium Run Inflation</u>																	
Not At All	7,396	5.96***	5.79***	5.63***	8.49***	5.54***	5.65***	6.01***	5.71***	5.09***	6.44***	8.89***	6.04***	7.68***	4.83***	6.15***	5.10***
Not Very	19,808	5.10***	4.90***	4.82***	6.97***	4.61***	5.20***	5.01◇◇	4.85**◇	4.43	4.78***	7.52	5.10***	6.11***	4.31⋆⋆	5.23***	4.08***
Fairly Confident	17,529	3.82***	4.03***	3.60***	5.68***	3.42***	3.91***	3.50***	3.55***	3.51***	3.40***	6.48***	3.67***	5.21***	4.17**◇	3.40***	3.10***
Very Confident	2,399	3.99***	4.31**◇	4.03**◇	5.99**◇	3.66***	4.02***	3.81***	3.95◇◇◇	4.69	4.12◇◇◇	7.43	3.84***	5.31◇◇◇	5.50⋆⋆⋆	2.97***	2.91***

		Gender		Age			Survey										
	No. Obs.	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
<u>Short Run Inflation</u>																	
Not At All	7,944	3.67***	4.92***	4.94***	4.42***	3.70***	4.71***	4.50***	4.27***	4.36***	4.13***	4.21***	3.97***	3.90***	3.79***	3.90***	3.99***
Not Very	21,289	3.18***	4.33***	4.47***	3.82***	3.25***	4.21◇◇◇	3.89**◇	3.87**◇	4.00***	3.68*◇◇	3.70***	3.71***	3.30***	3.49***	3.58***	3.53***
Fairly Confident	18,738	2.49***	3.22***	3.69***	3.05***	2.26***	3.52***	3.16***	3.23***	2.90***	3.05***	2.80***	2.77***	2.44***	2.33***	2.46***	2.40***
Very Confident	2,508	2.82*◇◇	4.08◇◇◇	4.80**	3.57◇◇◇	2.33***	4.00◇◇	3.63◇◇◇	3.65◇◇◇	2.99**◇	4.07**◇	2.75**◇	2.97◇◇◇	3.15◇◇◇	2.76◇◇◇	3.23◇◇	2.48**◇
<u>Medium Run Inflation</u>																	
Not At All	7,396	5.75***	6.29***	6.73***	6.13***	5.50***	6.38***	6.27***	6.31***	6.23***	5.77***	5.62***	5.79***	5.86***	5.79***	5.55***	5.84***
Not Very	19,808	4.61***	5.67***	5.89***	5.23***	4.59***	5.35◇◇◇	5.21**◇	5.35**◇	5.37***	5.32***	5.02***	4.97***	4.89***	4.88***	4.92***	4.89***
Fairly Confident	17,529	3.54***	4.29***	4.73***	4.01***	3.33***	4.38***	4.11***	4.18***	4.22***	3.90***	3.80***	3.88***	3.52***	3.50***	3.59***	3.52***
Very Confident	2,399	3.64***	4.85**◇	5.39◇◇◇	4.17***	3.27***	4.52◇◇	4.36*◇◇	4.21**◇	3.94⋆⋆⋆	4.23*◇◇	3.71***	3.63***	3.98◇◇◇	4.28	4.04◇◇	3.30***

Notes: The mean (median) of each group variable is tested by confidence level compared to the pooled mean (median) of all other levels of confidence. For example, when testing Austria we are comparing the mean (median) of say Not at All to the mean (median) of all other confidence levels within Austria. *, **, *** denote significance at the 10, 5 and 1%, respectively, for both the two sample t test and the Kruskal-Wallis equality of populations rank test. ⋆,⋆⋆, ⋆⋆⋆ denote significance at the 10, 5 and 1%, respectively, for the two sample t test. ◇,◇◇, ◇◇◇ denote significance at the 10, 5 and 1%, respectively, for the Kruskal-Wallis equality of populations rank test.

Table 8: Determinants of Short Run Inflation Expectations for Disaggregate Confidence Measure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e	SR_INFL_e
Not At All	1.115***	1.105***	0.987***	1.158***	0.970***	0.945***	0.931***
	(0.07)	(0.07)	(0.11)	(0.07)	(0.10)	(0.10)	(0.13)
Not Very Confident	0.601***	0.593***	0.476***	0.620***	0.434***	0.420***	0.395***
	(0.05)	(0.05)	(0.09)	(0.04)	(0.09)	(0.09)	(0.12)
Very Confident	0.454***	0.456***	0.453***	0.458***	0.463***	0.461***	0.459***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Strongly Disagree	-0.029	-0.027	-0.030	-0.015	-0.025	-0.147**	-0.025
	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)	(0.07)
Tend to Disagree	-0.206***	-0.206***	-0.206***	-0.150***	-0.151***	-0.280***	-0.150***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Tend to Agree	-0.065	-0.062	-0.064	-0.023	-0.034	-0.043	-0.032
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Strongly Agree	0.169*	0.187*	0.193**	0.242**	0.234**	0.219**	0.241**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Female	0.942***	0.944***	0.945***	0.949***	0.947***	0.945***	0.948***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age: Young	0.564***	0.562***	0.602***	0.578***	0.578***	0.576***	0.609***
	(0.06)	(0.06)	(0.09)	(0.06)	(0.06)	(0.06)	(0.10)
Age: Old	-0.413***	-0.409***	-0.554***	-0.433***	-0.433***	-0.432***	-0.541***
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)	(0.05)	(0.07)
Interest Rate$_{t-1}$		-0.368*	-0.370*	-0.303**	-0.288**	-0.346***	-0.283**
		(0.21)	(0.21)	(0.12)	(0.12)	(0.12)	(0.12)
GDP Growth$_{t-1}$		-0.026***	-0.025***	-0.082***	-0.082***	-0.080***	-0.082***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$		0.191***	0.194***	0.151***	0.156***	0.148***	0.155***
		(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Young*Not Confident			-0.065				-0.050
			(0.13)				(0.13)
Old*Not Confident			0.251**				0.187*
			(0.10)				(0.10)
Right Wing				-0.194***	-0.196***	-0.352***	-0.197***
				(0.06)	(0.06)	(0.07)	(0.06)
Inflation Target				-1.196***	-1.319***	-1.371***	-1.283***
				(0.07)	(0.09)	(0.09)	(0.09)
Not Conf*Infl Target					0.225**	0.234**	0.166
					(0.10)	(0.10)	(0.10)
Mistrust*Right Wing						0.310***	
						(0.08)	
Country: Austria	-0.044	-0.193**	-0.191**				
	(0.09)	(0.09)	(0.09)				
Country: France	-0.313***	-0.287***	-0.284***				
	(0.09)	(0.09)	(0.09)				
Country: Hong Kong	1.779***	1.387***	1.394***				
	(0.08)	(0.22)	(0.22)				
Country: Italy	0.890***	0.889***	0.903***				
	(0.09)	(0.09)	(0.09)				
Country: Singapore	0.969***	1.000***	0.998***				
	(0.08)	(0.08)	(0.08)				
Country: Spain	0.276***	0.336***	0.348***				
	(0.08)	(0.09)	(0.09)				
Country: Switzerland	-0.489***	-0.318***	-0.304***				
	(0.09)	(0.11)	(0.11)				
Country: UK	-0.609***	-0.299**	-0.288*				
	(0.06)	(0.15)	(0.15)				
Constant	2.869***	2.488***	2.541***	4.000***	4.099***	4.242***	4.118***
	(0.11)	(0.14)	(0.14)	(0.15)	(0.15)	(0.16)	(0.16)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	50074	50074	50074	50074	50074	50074	50074
R-squared	0.073	0.074	0.074	0.068	0.068	0.069	0.068

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. The variables “Not at All”, “Not Very”, and “Very Confident” are those who answered “Not at All”, “Not Very”, and “Very Confident”, respectively, to the question: “How confident, if at all, are you that the [country’s] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?” The variable “Gov. Mistrust” is defined as those who “Strongly Disagree” or “Tend To Disagree” with the statement “I think that the government is currently following the right economic policies for [my country].” Not Conf*Infl Target is the interaction between “Not Confident” and Inflation Target. Mistrust*Right Wing is the interaction between Right Wing and Gov. Mistrust. Young*Not Confident is the interaction between “Not Confident” and the dummy for young-aged individuals. Old*Not Confident is the interaction between “Not Confident” and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are “Fairly Confident” in the Central Bank and do not “Strongly Disagree” or “Tend To Disagree” with the statement “I think that the government is currently following the right economic policies for [my country].”

Table 9: Determinants of Medium Run Inflation Expectations for Disaggregate Confidence Measure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not At All	0.961***	0.969***	1.009***	0.968***	1.271***	1.276***	2.011***	1.261***
	(0.07)	(0.07)	(0.09)	(0.07)	(0.11)	(0.11)	(0.14)	(0.13)
Not Very Confident	0.398***	0.406***	0.445***	0.399***	0.699***	0.702***	1.043***	0.689***
	(0.04)	(0.04)	(0.07)	(0.04)	(0.10)	(0.10)	(0.12)	(0.11)
Very Confident	-0.141**	-0.144**	-0.143**	-0.099	-0.109	-0.108	0.269**	-0.108
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.11)	(0.07)
SR_INFL_e	0.924***	0.926***	0.926***	0.920***	0.921***	0.921***		0.921***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)		(0.01)
Strongly Disagree	0.277***	0.276***	0.277***	0.151***	0.169***	0.193***	0.008	0.169***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.09)	(0.06)
Tend to Disagree	0.142***	0.142***	0.142***	0.039	0.040	0.066	-0.178**	0.040
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.08)	(0.05)
Tend to Agree	-0.144***	-0.146***	-0.145***	-0.260***	-0.240***	-0.238***	-0.277***	-0.241***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.04)
Strongly Agree	0.005	-0.014	-0.017	-0.184**	-0.171**	-0.168**	-0.011	-0.173**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.11)	(0.07)
Female	0.020	0.017	0.017	0.009	0.012	0.012	0.760***	0.012
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.03)
Age: Young	0.180***	0.182***	0.149**	0.165***	0.166***	0.166***	0.610***	0.141**
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)
Age: Old	0.027	0.025	0.085	0.036	0.037	0.036	-0.322***	0.050
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)
Interest Rate$_{t-1}$		0.318*	0.319*	-0.313***	-0.336***	-0.325***	-0.432***	-0.337***
		(0.17)	(0.17)	(0.11)	(0.11)	(0.11)	(0.16)	(0.11)
GDP Growth$_{t-1}$		0.050***	0.049***	0.052***	0.051***	0.051***	-0.024***	0.051***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$		-0.013	-0.015	0.163***	0.155***	0.157***	0.256***	0.155***
		(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Young*Not Confident			0.056					0.042
			(0.10)					(0.10)
Old*Not Confident			-0.104					-0.025
			(0.08)					(0.08)
Right Wing				0.116***	0.120***	0.151***	-0.113	0.121***
				(0.04)	(0.04)	(0.05)	(0.08)	(0.04)
Inflation Target				-0.664***	-0.465***	-0.455***	-1.711***	-0.473***
				(0.07)	(0.08)	(0.08)	(0.11)	(0.08)
Not Conf*Infl Target					-0.367***	-0.368***	-0.169	-0.353***
					(0.10)	(0.10)	(0.13)	(0.10)
Mistrust*Right Wing						-0.062	0.148	
						(0.07)	(0.10)	
Country: Austria	-0.055	0.003	0.002					
	(0.08)	(0.08)	(0.08)					
Country: France	-0.248***	-0.183**	-0.184**					
	(0.08)	(0.08)	(0.08)					
Country: Hong Kong	0.826***	0.685***	0.681***					
	(0.09)	(0.21)	(0.21)					
Country: Italy	-0.869***	-0.747***	-0.754***					
	(0.06)	(0.07)	(0.07)					
Country: Singapore	0.185**	0.095	0.095					
	(0.07)	(0.08)	(0.08)					
Country: Spain	-0.868***	-0.778***	-0.784***					
	(0.07)	(0.07)	(0.07)					
Country: Switzerland	0.041	0.142	0.135					
	(0.07)	(0.10)	(0.10)					
Country: UK	-0.275***	-0.808***	-0.813***					
	(0.05)	(0.12)	(0.12)					
Constant	1.335***	1.300***	1.284***	1.306***	1.146***	1.118***	4.995***	1.153***
	(0.09)	(0.13)	(0.14)	(0.14)	(0.14)	(0.15)	(0.20)	(0.15)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44762	44762	44762	46785	44762	44762	44762	44762
R-squared	0.521	0.521	0.522	0.517	0.518	0.518	0.072	0.518

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. The variables "Not at All", "Not Very", and "Very Confident" are those who answered "Not at All", "Not Very", and "Very Confident", respectively, to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" The variable "Gov. Mistrust" is defined as those who "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]." Not Conf *Infl Target is the interaction between "Not Confident" and Inflation Target. Mistrust*Right Wing is the interaction between Right Wing and Gov. Mistrust. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" in the Central Bank and do not "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]."

Table 10: Mean and Median Comparison for Expected Inflation for Combined Confidence Measure

	Whole Sample		Truncated at Top and Bottom 5%	
Statistic	Short Run Inflation	Medium Run Inflation	Short Run Inflation	Medium Run Inflation
Mean	3.41	4.70	2.73	3.79
Median	2.00	3.00	2.00	3.00

Table 11: Confidence Conditioned on Not Distrusting Government

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SR_INFL_e	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	0.512***	0.252**	0.205	0.538***	0.649***	0.646***	0.808***
	(0.05)	(0.10)	(0.15)	(0.04)	(0.11)	(0.14)	(0.14)
SR_INFL_e				0.891***	0.891***	0.891***	
				(0.02)	(0.02)	(0.02)	
Female	0.832***	0.830***	0.831***	0.114***	0.115***	0.114***	0.813***
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)
Age: Young	0.561***	0.562***	0.599***	0.177***	0.176***	0.169**	0.640***
	(0.09)	(0.09)	(0.11)	(0.06)	(0.06)	(0.07)	(0.10)
Age: Old	-0.558***	-0.555***	-0.653***	-0.011	-0.012	-0.009	-0.467***
	(0.07)	(0.07)	(0.08)	(0.05)	(0.05)	(0.06)	(0.08)
Right Wing	-0.378***	-0.384***	-0.388***	0.131**	0.134**	0.134**	-0.181**
	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)	(0.09)
Inflation Target	-1.159***	-1.302***	-1.270***	-0.465***	-0.404***	-0.406***	-1.577***
	(0.08)	(0.10)	(0.10)	(0.07)	(0.08)	(0.08)	(0.11)
Interest Rate$_{t-1}$	-0.262*	-0.244	-0.242	0.001	-0.007	-0.007	-0.148
	(0.16)	(0.16)	(0.16)	(0.13)	(0.13)	(0.13)	(0.19)
GDP Growth$_{t-1}$	-0.104***	-0.104***	-0.103***	0.025***	0.025***	0.025***	-0.061***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$	0.128***	0.132***	0.131***	0.097***	0.095***	0.095***	0.184***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Not Conf*Infl Target		0.338***	0.264**		-0.147	-0.142	0.189
		(0.12)	(0.12)		(0.12)	(0.12)	(0.15)
Young*Not Confident			-0.082			0.016	
			(0.18)			(0.14)	
Old*Not Confident			0.243*			-0.009	
			(0.14)			(0.11)	
Constant	4.280***	4.386***	4.402***	1.325***	1.279***	1.281***	5.129***
	(0.19)	(0.19)	(0.20)	(0.17)	(0.17)	(0.17)	(0.22)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	27836	27836	27836	25044	25044	25044	26111
R-squared	0.074	0.075	0.075	0.530	0.530	0.530	0.073

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as those individuals who have answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" Not Conf*Infl Target is the interaction between "Not Confident" and Inflation Target. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the central bank.

Table 12: Disaggregate Measure of Confidence In Central Bank Conditioned on Not Distrusting Government

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SR_INFL_e	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not At All	0.954***	0.681***	0.634***	0.946***	1.087***	1.081***	1.439***
	(0.14)	(0.17)	(0.20)	(0.14)	(0.17)	(0.19)	(0.22)
Not Very Confident	0.534***	0.278***	0.229	0.474***	0.605***	0.599***	0.793***
	(0.06)	(0.10)	(0.15)	(0.05)	(0.11)	(0.14)	(0.14)
Very Confident	0.531***	0.537***	0.535***	-0.129*	-0.133*	-0.133*	0.280**
	(0.11)	(0.11)	(0.11)	(0.07)	(0.07)	(0.07)	(0.11)
SR_INFL_e				0.891***	0.891***	0.891***	
				(0.02)	(0.02)	(0.02)	
Female	0.847***	0.846***	0.846***	0.117***	0.117***	0.117***	0.827***
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)
Age: Young	0.561***	0.563***	0.599***	0.178***	0.177***	0.169**	0.640***
	(0.09)	(0.09)	(0.11)	(0.06)	(0.06)	(0.07)	(0.10)
Age: Old	-0.555***	-0.553***	-0.651***	-0.011	-0.012	-0.009	-0.466***
	(0.07)	(0.07)	(0.08)	(0.05)	(0.05)	(0.06)	(0.08)
Right Wing	-0.374***	-0.380***	-0.384***	0.132**	0.136**	0.136**	-0.175*
	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)	(0.09)
Inflation Target	-1.167***	-1.310***	-1.278***	-0.473***	-0.400***	-0.402***	-1.579***
	(0.08)	(0.10)	(0.10)	(0.07)	(0.08)	(0.08)	(0.11)
Interest Rate_{t-1}	-0.270*	-0.253	-0.251	0.007	-0.001	-0.001	-0.153
	(0.16)	(0.16)	(0.16)	(0.13)	(0.13)	(0.13)	(0.19)
GDP Growth_{t-1}	-0.104***	-0.104***	-0.103***	0.025***	0.025***	0.025***	-0.061***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation_{t-1}	0.133***	0.137***	0.136***	0.095***	0.093***	0.094***	0.187***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Not Conf*Infl Target		0.336***	0.263**		-0.175	-0.170	0.166
		(0.12)	(0.12)		(0.12)	(0.12)	(0.15)
Young*Not Confident			-0.080			0.018	
			(0.17)			(0.14)	
Old*Not Confident			0.243*			-0.007	
			(0.14)			(0.11)	
Constant	4.197***	4.301***	4.318***	1.343***	1.289***	1.292***	5.074***
	(0.19)	(0.19)	(0.20)	(0.17)	(0.17)	(0.17)	(0.22)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	27836	27836	27836	25044	25044	25044	26111
R-squared	0.076	0.076	0.076	0.530	0.531	0.531	0.073

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. The variables "Not at All", "Not Very", and "Very Confident" are those who answered "Not at All", "Not Very", and "Very Confident", respectively, to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" Not Conf*Infl Target is the interaction between "Not Confident" and Inflation Target. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" in the Central Bank.

Table 13: Determinants of Inflation Expectations with Higher Order Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)
	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	0.649***	0.673***	0.560***	1.101***	0.546***	1.110***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
SR_INFL_e			0.928***		0.931***	
			(0.01)		(0.01)	
Gov. Mistrust	-0.035	-0.051	0.362***	0.267***	0.349***	0.238***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Female	0.911***	0.897***	-0.004	0.722***	0.007	0.722***
	(0.04)	(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
Age: Young	0.554***	0.554***	0.183***	0.612***	0.182***	0.610***
	(0.06)	(0.06)	(0.05)	(0.07)	(0.05)	(0.08)
Age: Old	-0.419***	-0.429***	0.037	-0.308***	0.029	-0.334***
	(0.05)	(0.05)	(0.04)	(0.06)	(0.04)	(0.06)
Constant	2.556***	3.707**	1.310***	3.618***	0.172	1.752
	(0.15)	(1.56)	(0.14)	(0.18)	(0.56)	(1.51)
Time*Country FE	Yes	No	Yes	Yes	No	No
Time*Region FE	No	Yes	No	No	Yes	Yes
N	50074	50074	44762	46785	44762	46785
R-squared	0.074	0.097	0.522	0.073	0.532	0.092

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as those individuals who have answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the central bank. Interaction term coefficients omitted from table.

Table 14: Confidence and Inflation Expectations With 5% Truncation

	(1) SR_INFL_e	(2) SR_INFL_e	(3) SR_INFL_e	(4) LR_INFL_e	(5) LR_INFL_e	(6) LR_INFL_e	(7) LR_INFL_e
Not Confident	0.477***	0.402***	0.388***	0.472***	0.729***	0.705***	1.210***
	(0.02)	(0.04)	(0.06)	(0.03)	(0.09)	(0.11)	(0.11)
SR_INFL_e				1.247***	1.247***	1.248***	
				(0.02)	(0.02)	(0.02)	
Gov. Mistrust	0.121***	0.120***	0.120***	0.276***	0.278***	0.278***	0.423***
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)
Female	0.300***	0.300***	0.300***	-0.032	-0.030	-0.031	0.335***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
Age: Young	0.128***	0.128***	0.153***	0.194***	0.194***	0.122**	0.352***
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)
Age: Old	-0.113***	-0.113***	-0.168***	0.003	0.004	0.049	-0.120**
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)
Right Wing	-0.038	-0.039	-0.040	0.129***	0.133***	0.135***	0.073
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)
Inflation Target	-1.376***	-1.426***	-1.406***	-0.157**	0.018	-0.008	-1.763***
	(0.03)	(0.04)	(0.04)	(0.06)	(0.07)	(0.07)	(0.09)
Interest Rate$_{t-1}$	0.047	0.053	0.055	-0.324***	-0.345***	-0.347***	-0.250*
	(0.06)	(0.06)	(0.06)	(0.11)	(0.11)	(0.11)	(0.13)
GDP Growth$_{t-1}$	-0.034***	-0.034***	-0.034***	0.048***	0.048***	0.048***	0.005
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation$_{t-1}$	0.163***	0.165***	0.165***	0.063***	0.056**	0.056**	0.260***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
Not Conf*Infl Target		0.092*	0.057		-0.320***	-0.276***	-0.183
		(0.05)	(0.05)		(0.10)	(0.10)	(0.11)
Young*Not Confident			-0.043			0.122	
			(0.06)			(0.10)	
Old*Not Confident			0.096**			-0.081	
			(0.05)			(0.08)	
Constant	3.461***	3.498***	3.505***	0.169	0.040	0.053	4.384***
	(0.07)	(0.07)	(0.07)	(0.13)	(0.14)	(0.14)	(0.16)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	43748	43748	43748	39578	39578	39578	39578
R-squared	0.181	0.181	0.181	0.402	0.402	0.402	0.097

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as those individuals who have answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" Not Conf*Infl Target is the interaction between "Not Confident" and Inflation Target. Young*Not Confident is the interaction between "Not Confident" and the dummy for young-aged individuals. Old*Not Confident is the interaction between "Not Confident" and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the central bank.

Table 15: Exploring Deflationary Bias

	(1)	(2)	(3)	(4)	(5)	(6)
Short-run Exp						IV
Not Confident	0.660***	0.650***	0.650***	0.386**	0.329**	-1.310
	(0.153)	(0.153)	(0.153)	(0.130)	(0.109)	(1.957)
Gov. Mistrust	-0.0290	-0.0311	-0.0311	-0.0317	-0.117	
	(0.154)	(0.154)	(0.154)	(0.154)	(0.102)	
Inflation Target			-1.305***	-1.449***	-0.258	-0.947
			(0.130)	(0.157)	(0.309)	(0.776)
infl_target_nc				0.321	0.148	1.615
				(0.237)	(0.282)	(1.806)
below					-4.239***	-4.371***
					(0.754)	(0.806)
below_nc					-0.749	-0.551
					(0.412)	(0.479)
Female	0.915***	0.916***	0.916***	0.914***	0.682***	0.697***
	(0.207)	(0.206)	(0.206)	(0.206)	(0.124)	(0.125)
Age: Young	0.558**	0.556**	0.556**	0.556**	0.462**	0.460***
	(0.227)	(0.227)	(0.227)	(0.227)	(0.169)	(0.156)
Age: Old	-0.414**	-0.410**	-0.410**	-0.410**	-0.360***	-0.360***
	(0.150)	(0.150)	(0.150)	(0.150)	(0.0864)	(0.0799)
$InterestRate\_t-1$		-0.355	-0.355	-0.377	-0.233	-0.352
		(0.342)	(0.342)	(0.349)	(0.236)	(0.257)
$GDPGrowth\_t-1$		-0.0247	-0.0247	-0.0233	0.0524**	0.0587***
		(0.0140)	(0.0140)	(0.0141)	(0.0161)	(0.0196)
$Inflation\_t-1$		0.194*	0.194*	0.194*	-0.0322	-0.0307
		(0.0941)	(0.0941)	(0.0939)	(0.0391)	(0.0416)
Constant	2.430***	2.224***	3.516***	3.642***	4.695***	5.440***
	(0.229)	(0.221)	(0.353)	(0.317)	(0.218)	(0.928)
Observations	50,074	50,074	50,074	50,074	50,074	50,074
R-squared	0.070	0.071	0.071	0.072	0.297	0.292

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. “Not Confident” is defined as those individuals who have answered “Not at All” or “Not Very” to the question: “How confident, if at all, are you that the [country’s] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?” Not Conf*Infl Target is the interaction between “Not Confident” and Inflation Target. Young*Not Confident is the interaction between “Not Confident” and the dummy for young-aged individuals. Old*Not Confident is the interaction between “Not Confident” and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are “Fairly Confident” or “Very Confident” in the central bank.

8. Conclusion

tbw...

Table 16: Exploring Deflationary Bias

	(1)	(2)	(3)	(4)	(5)	(6)
Medium Run Exp						IV
Not Confident	1.103***	1.103***	1.103***	1.043***	1.064***	3.105**
	(0.170)	(0.170)	(0.170)	(0.0672)	(0.0701)	(1.481)
Gov. Mistrust	0.265	0.265	0.265	0.265	0.152	
	(0.188)	(0.188)	(0.188)	(0.188)	(0.150)	
Inflation Target			-1.965***	-2.015***	-0.609	-0.371
			(0.301)	(0.245)	(0.434)	(0.557)
infl_target_nc				0.0736	0.0827	-1.832
				(0.232)	(0.204)	(1.377)
below					-3.960***	-3.860***
					(0.582)	(0.574)
below_nc					-1.711***	-1.873***
					(0.331)	(0.357)
Female	0.730***	0.729***	0.729***	0.729***	0.659***	0.641***
	(0.112)	(0.111)	(0.111)	(0.110)	(0.0865)	(0.0808)
Age: Young	0.605***	0.606***	0.606***	0.606***	0.565***	0.568***
	(0.158)	(0.158)	(0.158)	(0.158)	(0.124)	(0.118)
Age: Old	-0.313*	-0.312*	-0.312*	-0.312*	-0.313***	-0.310***
	(0.141)	(0.139)	(0.139)	(0.139)	(0.0843)	(0.0826)
$InterestRate\_t-1$		-0.0962	-0.0962	-0.101	-0.107	0.0540
		(0.205)	(0.205)	(0.201)	(0.197)	(0.179)
$GDPGrowth\_t-1$		0.0256*	0.0256*	0.0260*	0.0325***	0.0255***
		(0.0138)	(0.0138)	(0.0137)	(0.00868)	(0.00989)
$Inflation\_t-1$		0.170**	0.170**	0.170**	0.0460	0.0396
		(0.0724)	(0.0724)	(0.0724)	(0.0488)	(0.0474)
Constant	3.498***	5.248***	5.248***	5.292***	6.209***	4.519***
	(0.147)	(0.314)	(0.314)	(0.257)	(0.236)	(0.741)
Observations	46,785	46,785	46,785	46,785	46,785	46,785
R-squared	0.070	0.070	0.070	0.070	0.254	0.248

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. “Not Confident” is defined as those individuals who have answered “Not at All” or “Not Very” to the question: “How confident, if at all, are you that the [country’s] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?” Not Conf*Infl Target is the interaction between “Not Confident” and Inflation Target. Young*Not Confident is the interaction between “Not Confident” and the dummy for young-aged individuals. Old*Not Confident is the interaction between “Not Confident” and the dummy for old-aged individuals. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are “Fairly Confident” or “Very Confident” in the central bank.

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Appendix A. Appendix

Appendix B. Proofs

B.1. The Marginal Utility with Respect to Consumption

$$U^A(C_t,\tau_t,\phi_t) = \tilde{\alpha_1}(\tau_t,\phi_t) - \tilde{\alpha_2}(\tau_t)\, e^{-\delta C_t}$$
$$\text{where } \tilde{\alpha_1}(\tau_t,\phi_t) = \alpha_1 + \alpha_2\tau_t - \alpha_3(\phi_t)\,\tau_t^2$$
$$\text{and } \quad \tilde{\alpha_2}(\tau_t) = \alpha_1 + \alpha_2\tau_t$$

So $U^A(C_t,\tau_t,\phi_t)$ becomes

$$U^A(C_t,\tau_t,\phi_t) = \alpha_1 + \alpha_2\tau_t - \alpha_3(\phi_t)\,\tau_t^2 - (\alpha_1+\alpha_2\tau_t)\,e^{-\delta C_t}$$
$$\text{where } \tau_t = \psi_{1,t}\left(1-e^{-\delta C_t}\right) + \varepsilon_t^{\tau}$$

Taking the derivative of the utility function with respect to consumption we have:

$$\frac{U^A}{\partial C_t} = \alpha_2\frac{\tau_t}{\partial C_t} - 2\alpha_3(\phi_t)\,\tau_t\frac{\tau_t}{\partial C_t} + \alpha_1\delta e^{-\delta C_t} + \alpha_2\left(-\tau_t\delta e^{-\delta C_t} + e^{-\delta C_t}\frac{\tau_t}{\partial C_t}\right)$$
$$\text{where } \frac{\tau_t}{\partial C_t} = \delta\psi_{1,t}e^{-\delta C_t}$$

Plugging in for $\frac{\tau_t}{\partial C_t}$:

$$\frac{U^A}{\partial C_t} = \alpha_2\psi_{1,t}\delta e^{-\delta C_t} - 2\alpha_3(\phi_t)\,\psi_{1,t}^2\delta e^{-\delta C_t} + 2\alpha_3(\phi_t)\,\psi_{1,t}^2\delta e^{-2\delta C_t} - 2\alpha_3(\phi_t)\,\psi_{1,t}\varepsilon_t^{\tau}\delta e^{-\delta C_t}$$
$$+\alpha_1\delta e^{-\delta C_t} - \alpha_2\psi_{1,t}\delta e^{-\delta C_t} + \alpha_2\delta e^{-2\delta C_t} - \alpha_2\varepsilon_t^{\tau}\delta e^{-\delta C_t} + \alpha_2\psi_{1,t}\delta e^{-2\delta C_t}$$

Which simplifies to:

$$U_{C,t}^A = \left[-2\alpha_3(\phi_t)\,\psi_{1,t} - \alpha_2\right]\varepsilon_t^{\tau_t}\delta e^{-\delta C_t} + \left[\alpha_1 - 2\alpha_3(\phi_t)\,\psi_{1,t}^2\right]\delta e^{-\delta C_t}$$
$$+\left[2\alpha_3(\phi_t)\,\psi_{1,t} + \alpha_2\right]\psi_{1,t}\delta e^{-2\delta C_t} + \alpha_2\delta e^{-2\delta C_t}$$

The steady state for the marginal utility with respect to consumption is:

$$U_C^A = \left[-2\alpha_3(\phi)\,\psi_1 - \alpha_2\right]\varepsilon^{\tau}\delta e^{-\delta C} + \left[\alpha_1 - 2\alpha_3(\phi)\,\psi_1^2\right]\delta e^{-\delta C}$$
$$+\left[2\alpha_3(\phi)\,\psi_1 + \alpha_2\right]\psi_1\delta e^{-2\delta C} + \alpha_2\delta e^{-2\delta C}$$

B.1.1. The Log-Linearized Marginal Utility with Respect to Consumption

$$U_C^A\hat{U_{C,t}^A} = \left[-2\alpha_3(\phi)\varepsilon^{\tau}\delta e^{-\delta C} - 4\alpha_3(\phi)\psi_1\delta e^{-\delta C} + 4\alpha_3(\phi)\psi_1\delta e^{-2\delta C} + \alpha_2\delta e^{-2\delta C}\right]\psi\hat{\psi_{1,t}}$$
$$+\left[-\left(-2\alpha_3(\phi)\psi_1 - \alpha_2\right)\varepsilon^{\tau}\delta^2e^{-\delta C} - \left(\alpha_1 - 2\alpha_3(\phi)\psi_1^2\right)\delta^2e^{-\delta C}\right.$$
$$\left.-2\left(2\alpha_3(\phi)\psi_1 + \alpha_2\right)\psi_1\delta^2e^{-2\delta C} - 2\alpha_2\delta^2e^{-2\delta C}\right]C\hat{C}_t$$
$$+\left[\left(-2\alpha_3(\phi)\psi_1 - \alpha_2\right)\delta e^{-\delta C}\right]\varepsilon^{\tau}\hat{\varepsilon_t^{\tau}}$$

Cleaning up the log-linearization:

$$
\begin{aligned}
U_C^A \hat{U_{C,t}^A} = [&-2\alpha_3(\phi)\varepsilon^\tau\psi_1\delta e^{-\delta C} + \alpha_2\varepsilon^\tau\delta e^{-\delta C} - \alpha_2\varepsilon^\tau\delta e^{-\delta C} + \alpha_1\delta e^{-\delta C} - \alpha_1\delta e^{-\delta C} \\
&- 2\alpha_3(\phi)\psi_1^2\delta e^{-\delta C} - 2\alpha_3(\phi)\psi_1^2\delta e^{-\delta C} + 2\alpha_3(\phi)\psi_1^2\delta e^{-2\delta C} + 2\alpha_3(\phi)\psi_1^2\delta e^{-2\delta C} \\
&+ \alpha_2\delta e^{-2\delta C} - \alpha_2\delta e^{-2\delta C} + \alpha_2\psi_1\delta e^{-2\delta C}]\hat{\psi_{1,t}} \\
&- \delta[(-2\alpha_3(\phi)\psi_1 - \alpha_2)\,\varepsilon^\tau\delta e^{-\delta C} + \left(\alpha_1 - 2\alpha_3(\phi)\psi_1^2\right)\delta e^{-\delta C} + (2\alpha_3(\phi)\psi_1 + \alpha_2)\,\psi_1\delta^2 e^{-2\delta C} \\
&+ (2\alpha_3(\phi)\psi_1 + \alpha_2)\,\psi_1\delta^2 e^{-2\delta C} + \alpha_2\delta^2 e^{-2\delta C} + \alpha_2\delta^2 e^{-2\delta C}]C\hat{C}_t \\
&+ [(-2\alpha_3(\phi)\psi_1 - \alpha_2)\,\delta e^{-\delta C}]\varepsilon^\tau\hat{\varepsilon_t^\tau}
\end{aligned}
$$

Using the definition of the steady state of marginal utility with respect to consumption:

$$
\begin{aligned}
\hat{U_{C,t}^A} = &\left[\frac{U_C^A - \delta\left[\left(\alpha_2\varepsilon^\tau + \alpha_1 + 2\alpha_3(\phi)\psi_1^2\right)\delta e^{-\delta C} + (\alpha_2 - 2\alpha_3(\phi)\psi_1)\,e^{-2\delta C}\right]}{U_C^A}\right]\hat{\psi_{1,t}} \\
&- \delta C\left[\frac{U_C^A + \delta\left[(2\alpha_3(\phi)\psi_1 + \alpha_2)\,\psi_1 + 2\alpha_2\right]e^{-2\delta C}}{U_C^A}\right]\hat{C}_t \\
&- \left[\frac{\left[2\alpha_3(\phi)\psi_1 + \alpha_2\right]\varepsilon^\tau\delta e^{-\delta C}}{U_C^A}\right]\hat{\varepsilon_t^\tau}
\end{aligned}
$$

$$
\begin{aligned}
\hat{U_{C,t}^A} = &\left[1 - \frac{\delta\left[\left(\alpha_2\varepsilon^\tau + \alpha_1 + 2\alpha_3(\phi)\psi_1^2\right)\delta e^{-\delta C} + (\alpha_2 - 2\alpha_3(\phi)\psi_1)\,e^{-2\delta C}\right]}{U_C^A}\right]\hat{\psi_{1,t}} \\
&- \delta C\left[1 + \frac{\delta\left[(2\alpha_3(\phi)\psi_1 + \alpha_2)\,\psi_1 + 2\alpha_2\right]e^{-2\delta C}}{U_C^A}\right]\hat{C}_t \\
&- \left[\frac{\left[2\alpha_3(\phi)\psi_1 + \alpha_2\right]\varepsilon^\tau\delta e^{-\delta C}}{U_C^A}\right]\hat{\varepsilon_t^\tau}
\end{aligned}
$$

B.1.2. Log-Linearizing the Euler Equation

$$
U_{C,t}^A = \beta E_t U_{C,t+1}^A \frac{1+i_t}{\pi_{t+1}}
$$

When we log-linearize we get:

$$
U_C^A \hat{U_{C,t}^A} = \frac{\beta U_C^A}{\pi} i\hat{i_t} + \frac{\beta U_C^A(1+i)}{\pi^2}\pi\hat{\pi_{t+1}} + \frac{\beta(1+i)}{pi}U_C^A\hat{U_{C,t+1}^A}
$$

This simplifies to:

$$
\hat{U_{C,t}^A} = \frac{\beta i}{\pi}\hat{i_t} + \frac{\beta(1+i)}{\pi}\hat{\pi_{t+1}} + \frac{\beta(1+i)}{\pi}\hat{U_{C,t+1}^A}
$$

B.2. Proof of Proposition 1

The *standard* Markov-Perfect equilibrium is given by a vector $y_H, \pi_H, i_H, y_L, \pi_L, i_L$ that solves the following system of linear equations:

$$
\begin{aligned}
y_H &= [(1-p_H)y_H + p_H y_L] + \sigma\left[(1-p_H)\pi_H + p_H\pi_L - i_H + r^*\right] + \tau_H, && (29)\\
\pi_H &= \kappa y_H + \beta\left[(1-p_H)\pi_H + p_H\pi_L\right], && (30)\\
0 &= \lambda(y_H - y^*) + \kappa\pi_H, && (31)\\
y_L &= [(1-p_L)y_H + p_L y_L] + \sigma\left[(1-p_L)\pi_H + p_L\pi_L - i_L + r^*\right] + \tau_L, && (32)\\
\pi_L &= \kappa y_L + \beta\left[(1-p_L)\pi_H + p_L\pi_L\right], && (33)
\end{aligned}
$$

and

$$i_L = 0, \tag{34}$$

and satisfies the non-negativity of the nominal interest rate in the high state

$$i_H > 0, \tag{35}$$

ϕ_L denotes the Lagrangian multiplier on the ZLB constraint in the low state:

$$\phi_L := \lambda y_L + \kappa\pi_L. \tag{36}$$

We will prove the four preliminary propositions (Proposition 1.A-1.D), and use these propositions to prove the main proposition (Proposition 1) on the necessary and sufficient conditions for the existence of the standard Markov Perfect equilibrium.

Let

$$A(\lambda) := -\beta\lambda p_H, \tag{37}$$
$$B(\lambda) := \kappa^2 + \lambda(1 - \beta(1 - p_H)), \tag{38}$$
$$C := \frac{(1-p_L)}{\sigma\kappa}(1 - \beta p_L + \beta p_H) - p_L, \tag{39}$$
$$D := -\frac{(1-p_L)}{\sigma\kappa}(1 - \beta p_L + \beta p_H) - (1 - p_L) = -1 - C, \tag{40}$$

and

$$E(\lambda) := A(\lambda)D - B(\lambda)C. \tag{41}$$

Assumption 1.A: $E(\lambda) \neq 0$.

Throughout the rest of this proof, we will assume that Assumption 1.A holds.

Proposition 1.A: There exists a vector $y_H, \pi_H, i_H, y_L, \pi_L, i_L$ that solves (29)-(34).

Proof:
We can rearrange the system of equations (29)-(34) and eliminate y_H and y_L.
Using (31) we have:

$$y_H = y^* - \frac{\kappa}{\lambda}\pi_H$$

We substitute this value for y_H into equation (30):

$$\begin{aligned}
\pi_H &= \kappa y_H + \beta[(1-p_H)\pi_H + p_H\pi_L] \\
&= \kappa[y^* - \frac{\kappa}{\lambda}\pi_H] + \beta[(1-p_H)\pi_H + p_H\pi_L] \\
\beta p_H \pi_L + \kappa y^* &= \pi_H + \frac{\kappa^2}{\lambda}\pi_H - \beta(1-p_H)\pi_H
\end{aligned}$$

if we multiply this expression by λ:

$$[\kappa^2 + \lambda(1 - \beta(1-p_H))]\pi_H - \beta\lambda p_H \pi_L = \kappa\lambda y^* \tag{42}$$

When we solve for y_H in equation 30 and y_L in equation 33 we have:

$$y_H = \frac{1}{\kappa}\pi_H - \frac{1}{\kappa}\beta[(1-p_H)\pi_H + p_H\pi_L] \tag{43}$$
$$y_L = \frac{1}{\kappa}\pi_L - \frac{1}{\kappa}\beta[(1-p_L)\pi_H + p_L\pi_L] \tag{44}$$

We substitute these values for y_H and y_L into equation 32:

$$
\begin{aligned}
(1-p_L)\left[\frac{1}{\kappa}\pi_L-\frac{1}{\kappa}\beta[(1-p_L)\pi_H+p_L\pi_L]\right] &= (1-p_L)\left[\frac{1}{\kappa}\pi_H-\frac{1}{\kappa}\beta[(1-p_H)\pi_H+p_H\pi_L]\right] \\
&\quad +\sigma[(1-p_L)\pi_H+p_L\pi_L+r^*]+\tau_L \\
\left[\frac{(1-p_L)}{\kappa}(1-\beta p_L+\beta p_H)-\sigma p_L\right]\pi_L &= \left[\frac{(1-p_L)}{\kappa}(1-\beta+\beta p_H+\beta-\beta p_L)+\sigma(1-p_L)\right]\pi_H+\sigma r^*+\tau_L
\end{aligned}
$$

$$
\left[\frac{(1-p_L)}{\kappa}(1-\beta p_L+\beta p_H)-\sigma p_L\right]\pi_L-\left[\frac{(1-p_L)}{\kappa}(1+\beta p_H-\beta p_L)+\sigma(1-p_L)\right]\pi_H=\sigma r^*+\tau_L \tag{45}
$$

Therefore we have two unknowns, π_H and π_L, and two equations:

$$
\begin{aligned}
&\begin{bmatrix} A(\lambda) & B(\lambda) \\ C & D \end{bmatrix}\begin{bmatrix}\pi_L \\ \pi_H\end{bmatrix}=\begin{bmatrix}\kappa\lambda y^* \\ r_L\end{bmatrix} \\
\Rightarrow &\begin{bmatrix}\pi_L \\ \pi_H\end{bmatrix}=\frac{1}{A(\lambda)D-B(\lambda)C}\begin{bmatrix} D & -B(\lambda) \\ -C & A(\lambda)\end{bmatrix}\begin{bmatrix}\kappa\lambda y^* \\ r_L\end{bmatrix}
\end{aligned} \tag{46}
$$

where $r_L = r^*+\frac{1}{\sigma}\tau_L$.
Therefore, we have:

$$
\pi_H=\frac{A(\lambda)}{E(\lambda)}r_L-\frac{C}{E(\lambda)}\kappa\lambda y^* \tag{47}
$$

and

$$
\pi_L=\frac{-B(\lambda)}{E(\lambda)}r_L+\frac{D}{E(\lambda)}\kappa\lambda y^* \tag{48}
$$

This gives us the following Phillips Curves in both states:

$$
\begin{aligned}
y_H &= y^*-\frac{\kappa}{\lambda}\pi_H \\
y_H &= \frac{\beta\kappa p_H}{E(\lambda)}r_L+\left(1-\frac{C}{E(\lambda)}\kappa^2\right)y^*
\end{aligned} \tag{49}
$$

$$
\begin{aligned}
y_L &= \frac{1}{\kappa}\left[\pi_L-\beta\left[(1-p_L)\pi_H+p_L\pi_L\right]\right] \\
y_L &= -\frac{(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda}{\kappa E(\lambda)}r_L-\lambda\left[(1-\beta)C+(1-\beta p_L)\right]\frac{y^*}{E(\lambda)}
\end{aligned} \tag{50}
$$

Proposition 1.B: Suppose (29)-(34) are satisfied. Then $\phi_L<0$ if and only if $E(\lambda)<0$
Proof: Notice that

$$
\begin{aligned}
\phi_L &= \lambda y_L+\kappa\pi_L \\
\phi_L &= -\left[\frac{\lambda}{\kappa}\left[(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda\right]+\kappa B(\lambda)\right]\frac{\tau_L}{E(\lambda)} \\
&\quad +\left[-(\lambda+\kappa^2)-\frac{(\lambda-\lambda\beta+\kappa^2)}{\sigma\kappa}(1-\beta p_L+\beta p_H)+\frac{(\lambda-\lambda\beta+\kappa^2)}{\sigma\kappa}(1-\beta p_L+\beta p_H)p_L+(\lambda+\kappa^2)p_L\right]\lambda\frac{y^*}{E(\lambda)}
\end{aligned} \tag{51}
$$

Thus $\left[-(\lambda+\kappa^2)-\frac{(\lambda-\lambda\beta+\kappa^2)}{\sigma\kappa}(1-\beta p_L+\beta p_H)+\frac{(\lambda-\lambda\beta+\kappa^2)}{\sigma\kappa}(1-\beta p_L+\beta p_H)p_L+(\lambda+\kappa^2)p_L\right]\leq 0$ if $p_L\leq 1$.

As outlined in Nakata and Schmidt (2014), we also have that $\tau_L<0,(1-\beta p_L)\kappa^2>0,(1-\beta)(1+\beta p_H-\beta p_L)\lambda\geq 0$, and $\kappa B(\lambda)\geq 0$. Thus when $y^*=0$, we find as in Nakata and Schmidt (2014) that if $\phi_L<0$, then $E(\lambda)<0$. Also, if $E(\lambda)<0$, then $\phi_L < 0$.

However, if $y^* > 0$, given that:

$$-\left[\frac{\lambda}{\kappa}\left[(1-\beta p_L)\kappa^2 + (1-\beta)(1+\beta p_H - \beta p_L)\lambda\right] + \kappa B(\lambda)\right] r_L > (p_L - 1)\left[\frac{(\lambda - \lambda\beta + \kappa^2)}{\sigma\kappa}(1-\beta p_L + \beta p_H) + (\lambda + \kappa^2)\right]\lambda y^*$$

then we come to the same conclusion as above that if $\phi_L < 0$, then $E(\lambda) < 0$ and also if $E(\lambda) < 0$, then $\phi_L < 0$.

Proposition 1.C: $E(\lambda) < 0$ **if and only if** $p_L^* < (\Theta_{-p_L})$
Proof: Let $E(\cdot)$ be a function of p_H and p_L for a moment.

$$\begin{aligned} E(p_H, p_L) =& A(p_H, p_L)D - B(p_H, p_L)C \qquad (52)\\ =& -\beta p_H \lambda(-1-C) - \left[\kappa^2 + \lambda\left(1 - \beta(1-p_H)\right)\right] C \\ =& \beta p_H \lambda - \left[\kappa^2 + \lambda(1-\beta)\right]\left[\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L + \beta p_H) - p_L\right] \end{aligned} \qquad (53)$$

Let $\Gamma = \kappa^2 + \lambda(1-\beta)$.

$$\begin{aligned} E(p_H, p_L) =& \\ =& \beta p_H \lambda - \Gamma\left[\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L + \beta p_H) - p_L\right] \\ =& -\Gamma\beta\frac{1}{\sigma\kappa}p_L^2 + \Gamma\left[\frac{1}{\sigma\kappa}(1+\beta+\beta p_H) + 1\right]p_L + \beta\lambda p_H - \Gamma\frac{1}{\sigma\kappa}(1+\beta p_H) \\ :=& q_2 p_L^2 + q_1 p_L + q_0 \end{aligned} \qquad (54)$$

Where we have that:

$$q_0 := \beta\lambda p_H - \Gamma\frac{1}{\sigma\kappa}(1+\beta p_H) \qquad (55)$$

$$q_1 := \Gamma\left[\frac{1}{\sigma\kappa}(1+\beta+\beta p_H) + 1\right] \qquad (56)$$

$$q_2 := -\Gamma\beta\frac{1}{\sigma\kappa} \qquad (57)$$

The function, $E(\cdot,\cdot)$, has the following two properties:
Property 1: $E(p_H, 1) > 0$ **for any** $0 \leq p_H \leq 1$.

$$\begin{aligned} E(p_H, p_L) =& -\Gamma\beta\frac{1}{\sigma\kappa} + \Gamma\left[\frac{1}{\sigma\kappa}(1+\beta+\beta p_H) + 1\right] + \beta\lambda p_H - \Gamma\frac{1}{\sigma\kappa}(1+\beta p_H) \\ =& \Gamma + \beta\lambda p_H > 0 \end{aligned} \qquad (58)$$

Property 2: $E(p_H, p_L)$ **is maximized at** $p_L > 1$ **for any** $0 \leq p_H \leq 1$.

$$
\begin{aligned}
\frac{\partial E(p_H,p_L)}{\partial p_L} =& 2q_2 p_L^* + q_1 = 0 \\
\leftrightarrow p_L^* =& -\frac{q_1}{2q_2} \\
=& \frac{\Gamma\left[\frac{1}{\sigma\kappa}\left(1+\beta+\beta p_H\right)+1\right]}{2\Gamma\beta\frac{1}{\sigma\kappa}} \\
=& \frac{\left[\frac{1}{\sigma\kappa}\left(2\beta+(1-\beta)+\beta p_H\right)+1\right]}{2\beta\frac{1}{\sigma\kappa}} > 1
\end{aligned} \tag{59}
$$

$$ \tag{60} $$

Property 1 and Property 2 imply together that i) one root of $E(\cdot, p_L)$ is below 1 and ii) $E(\cdot, p_L) < 0$ below this root. We will call this root $p_L^*(\Theta_{-p_L})$

$$
p_L^*(\Theta_{-p_L}) := \frac{-q_1 + \sqrt{q_1^2 - 4q_2 q_0}}{2q_2}. \tag{61}
$$

Based on the properties outlined above, if $E(\lambda) < 0$, then $p_L < p_L^*(\Theta_{-p_L})$. Likewise, if $p_L < p_L^*(\Theta_{-p_L})$, then $E(\lambda) < 0$. This completes the proof of Proposition 1.C. Proposition 1.C. holds irregardless of whether the system of linear equations (29)-(34) is satisfied or not.

Proposition 1.D: Suppose (29)-(34) are satisfied and $E(\lambda) < 0$. Then $i_H > 0$ if and only if $p_H < p_H^*(\Theta_{-p_H})$.

Proof: We i_H is equal to the following:

$$
\begin{aligned}
i_H =& \tau_H + \frac{1}{\sigma}\left[-p_H y_H + p_H y_L\right] + \left[(1-p_H)\pi_H + p_H \pi_L\right] \\
=& -\frac{\tau_L}{E(\lambda)}\frac{\beta\Gamma}{\sigma\kappa} + \frac{y^*}{E(\lambda)}\left[\left(\frac{(1-p_L)\beta}{\sigma\kappa}\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \frac{\beta\lambda - \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta}{\sigma}\right]p_H^2 \\
& - \frac{\tau_L}{E(\lambda)}\left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda\right]p_H \\
& + \frac{y^*}{E(\lambda)}\left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right) + \frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right]p_H \\
& + \tau_H + \frac{y^*}{E(\lambda)}\left[-\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda\right]
\end{aligned} \tag{62}
$$

Because we have that $E(\lambda) < 0$, then $i_H > 0$. Thus we have that:

$$
\begin{aligned}
i_H =& -\frac{\tau_L}{E(\lambda)}\frac{\beta\Gamma}{\sigma\kappa} + \frac{y^*}{E(\lambda)}\left[\left(\frac{(1-p_L)\beta}{\sigma\kappa}\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \frac{\beta\lambda - \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta}{\sigma}\right]p_H^2 \\
& - \frac{\tau_L}{E(\lambda)}\left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda\right]p_H \\
& + \frac{y^*}{E(\lambda)}\left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right) + \frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right]p_H \\
& + \tau_H + \frac{y^*}{E(\lambda)}\left[-\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda\right] > 0
\end{aligned} \tag{63}
$$

we can multiply the entire equation by $-E(\lambda)$, to get the following:

$$
\begin{aligned}
&\left[\tau_L \frac{\beta\Gamma}{\sigma\kappa} - y^* \left(\frac{(1-p_L)\beta}{\sigma\kappa}\frac{[-\lambda(1-\beta)+1]}{\sigma} - \frac{\beta\lambda - \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta}{\sigma}\right)\right] p_H^2 \\
&+ \tau_L \left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda\right] p_H \\
&- y^* \left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right) + \frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right] p_H \\
&- \tau_H E(\lambda) - y^* \left[-\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda\right] > 0 \\
&\left[\tau_L \frac{\beta\Gamma}{\sigma\kappa} - \frac{y^*\beta}{\sigma^2\kappa}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right]\right] p_H^2 \\
&+ \tau_L \left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda - \tau_H\beta\lambda + \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta\right] p_H \\
&- y^* \left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right) + \frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right] p_H \\
&+ \tau_H\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right) + y^*\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda > 0
\end{aligned}
\tag{64}
$$

Dividing both sides by Γ and by $-\tau_L$, we get the following:

$$
\begin{aligned}
&\left[-\frac{\beta}{\sigma\kappa} + \frac{y^*\beta}{\tau_L\Gamma\sigma^2\kappa}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right]\right] p_H^2 \\
&- \frac{1}{\Gamma}\left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda - \tau_H\beta\lambda + \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta\right] p_H \\
&- \frac{y^*}{-\tau_L\Gamma}\left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right) + \frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right] p_H \\
&- \frac{\tau_H}{\tau_L}\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right) + \frac{y^*}{-\tau_L\Gamma}\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda > 0
\end{aligned}
\tag{65}
$$

Let

$$P(p_H) = \phi_2 p_H^2 + \phi_1 p_H + \phi_0 \tag{66}$$

where

$$\phi_0 := -\frac{\tau_H}{\tau_L}\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right) + \frac{y^*}{-\tau_L\Gamma}\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\kappa\lambda \tag{67}$$

$$\phi_1 := -\frac{1}{\Gamma}\left[\frac{(1-\beta p_L)\Gamma}{\sigma\kappa} + \kappa^2 + \lambda - \tau_H\beta\lambda + \Gamma\frac{(1-p_L)}{\sigma\kappa}\beta\right] \tag{68}$$

$$- \frac{y^*}{-\tau_L\Gamma}\left[\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)\frac{[-\lambda(1-\beta)+1]}{\sigma} - \lambda\left(\frac{(1-\beta p_L)}{\sigma} + \kappa\right)\right] \tag{69}$$

$$- \frac{y^*}{-\tau_L\Gamma}\left[\frac{-\Gamma\left(\frac{(1-p_L)}{\sigma\kappa}(1-\beta p_L) - p_L\right)}{\sigma} - \frac{(1-p_L)}{\sigma\kappa}\beta\kappa\lambda\right] \tag{70}$$

$$\phi_2 := \left[-\frac{\beta}{\sigma\kappa} + \frac{y^*\beta}{\tau_L\Gamma\sigma^2\kappa}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right]\right] \tag{71}$$

Property 1: $\phi_0 > 0$

Proof: We have that when $p_H = 0$ that $i_H = \tau_H + \pi_H > 0$. Because $E(\lambda) < 0$, the sign of i_H is the same as the sign of $\phi_2 p_H^2 + \phi_1 p_H + \phi_0 > 0$. Therefore, $\phi_0 > 0$. This completes the proof of Property 1.

Property 2: $\phi_2 < 0$

In order for $\phi_2 < 0$, we must have that:

$$
\begin{aligned}
-\frac{\beta}{\sigma\kappa} + \frac{y^*\beta}{\tau_L \Gamma \sigma^2 \kappa}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] &< 0 \\
\frac{y^*\beta}{\tau_L \Gamma \sigma^2 \kappa}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] &< \frac{\beta}{\sigma\kappa} \\
\frac{y^*}{\tau_L \Gamma \sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] &< 1
\end{aligned} \tag{72}
$$

We have by assumption that $\tau_L < 0$; thus, when we multiply across by τ_L, we flip the inequality sign:

$$
\tau_L < \frac{y^*}{\Gamma\sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] \tag{73}
$$

The binding constraint on τ_L depends on whether $\lambda\kappa\sigma > (1-p_L)(\kappa^2+1)$. When $\lambda\kappa\sigma < (1-p_L)(\kappa^2+1)$, $\frac{y^*}{\Gamma\sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] > 0$, thus the binding constraint on τ_L is that $\tau_L < 0$. However, if $\lambda\kappa\sigma > (1-p_L)(\kappa^2+1)$, then $\frac{y^*}{\Gamma\sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right] < 0$, therefore, $\tau_L < \frac{y^*}{\Gamma\sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right]$.

$$
\tau_L < \begin{cases} \frac{y^*}{\Gamma\sigma}\left[(1-p_L)(\kappa^2+1) - \lambda\kappa\sigma\right], & \text{iff } \lambda\kappa\sigma > (1-p_L)(\kappa^2+1) \\ 0, & \text{iff otherwise} \end{cases}
$$

Property 1 and Property 2, $\phi_0 > 0$ and $\phi_2 < 0$, imply that one root of (66) is non-negative and $i_H > 0$ if and only if p_H is below this non-negative root, given by

$$
p_H^*(\Theta_{-p_H}) := \frac{-\phi_1 - \sqrt{\phi_1^2 - 4\phi_0\phi_2}}{2\phi_2}. \tag{74}
$$

This completes the proof of Proposition 1.D.

With these four preliminary propositions (1.A -1.D), we have what we need to prove Proposition 1.

Proposition 1: There exists a vector $\{y_H, \pi_H, ß_H, y_L, \pi_L, i_L\}$ that solves the system of linear equations (29)-(34) and satisfies $\phi_L < 0$ and $i_H > 0$ if and only if $p_L < p_L^*(\Theta_{-p_L})$ and $p_H < p_H^*(\Theta_{-p_H})$.

Proof of "if" part: Suppose that $p_L < p_L^*(\Theta_{-p_L})$ and $p_H < p_H^*(\Theta_{-p_H})$. According to Proposition 1.A there exists a vector $\{y_H, \pi_H, ß_H, y_L, \pi_L, i_L\}$ that solves the system of linear equations (29)-(34). According to Proposition 1.B and 1.C, $E(\lambda) < 0$ and $\phi_L < 0$. According to Proposition 1.D and the fact that $E(\lambda) < 0$, $i_H > 0$. This completes the "if" part of the proof.

Proof of "only if" part: Suppose that $\phi_L < 0$ and $i_H > 0$. According to Proposition 1.A there exists a vector $\{y_H, \pi_H, ß_H, y_L, \pi_L, i_L\}$ that solves the system of linear equations (29)-(34). According to Proposition 1.B and 1.C, $E(\lambda) < 0$ and $p_L < p_L^*(\Theta_{-p_L})$. According to Proposition 1.D and the fact that $E(\lambda) < 0$, $p_H < p_H^*(\Theta_{-p_H})$. This completes the "only if" part of the proof.

B.3. Proof of Proposition 2

We characterize the sign of inflation and output depending on whether it is low or high state. We will use the restriction regarding τ_L that guarantees us the existence and $E(\lambda) < 0$, the inequalities on $A(\lambda)$, $A(\lambda) < 0$; $B(\lambda)$, $B(\lambda) > 0$; C and D. Namely that when $E(\lambda) < 0$, $C > 0$ and $D < 0$.

When $y^* = 0$, we get, as in Nakata and Schmidt (2014), that $\pi_H \leq 0$, $\pi_L < 0$, $y_H > 0$ and $y_L < 0$.

However, when y^* does not equal zero, our equations are augmented.

$$\pi_H = \frac{A(\lambda)}{E(\lambda)}\tau_L - \frac{C}{E(\lambda)}\kappa\lambda y^*$$

Given that $-\frac{C}{E(\lambda)}\kappa\lambda y^*$ is a positive number, it is possible under certain conditions for π_H to be positive. Whenever, $y^* > \frac{A(\lambda)\tau_L}{C\kappa\lambda}$ then $\pi_H > 0$. Under the assumption that restrictions for the existence of equilibrium are satisfied (proposition 1) we can conclude that:

$$\pi_H = \begin{cases} \frac{A(\lambda)}{E(\lambda)}\tau_L - \frac{C}{E(\lambda)}\kappa\lambda y^* \leq 0, & \text{iff } y^* \leq -\frac{\beta p_H}{\kappa C}\tau_L \\ \frac{A(\lambda)}{E(\lambda)}\tau_L - \frac{C}{E(\lambda)}\kappa\lambda y^* > 0, & \text{iff otherwise} \end{cases}$$

Note that $-\frac{\beta p_H}{\kappa C}\tau_L = \frac{A(\lambda)\tau_L}{C\kappa\lambda}$.

$$\pi_L = \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^*$$

Given that $\frac{D}{E(\lambda)}\kappa\lambda y^* > 0$, it is possible under certain conditions for π_L to be positive. Whenever $y^* > \frac{B(\lambda)\tau_L}{D\kappa\lambda}$, then $\pi_H > 0$.

$$\pi_L = \begin{cases} \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^* < 0, & \text{iff } y^* < \frac{B(\lambda)\tau_L}{D\kappa\lambda} \\ \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^* \geq 0, & \text{iff otherwise} \end{cases}$$

$$y_H = \frac{\beta\kappa p_H}{E(\lambda)}\tau_L + \left(1 - \frac{C}{E(\lambda)}\kappa^2\right) y^*$$

Given that $\left(1 - \frac{C}{E(\lambda)}\kappa^2\right) y^* > 0$, y_H will be even more positive when y^* does not equal zero.

$$y_H = \frac{\beta\kappa p_H}{E(\lambda)}\tau_L + \left(1 - \frac{C}{E(\lambda)}\kappa^2\right) y^* > 0 \tag{75}$$

$$y_L = -\frac{(1-\beta p_L)\kappa^2 + (1-\beta)(1+\beta p_H - \beta p_L)\lambda}{\kappa E(\lambda)}\tau_L - \lambda\left[(1-\beta)C + (1-\beta p_L)\right]\frac{y^*}{E(\lambda)}$$

Given that $-\lambda\left[(1-\beta)C + (1-\beta p_L)\right]\frac{y^*}{E(\lambda)} > 0$, it is possible under certain conditions for y_L to be positive. If $y^* > \frac{(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda}{-\lambda[(1-\beta)C+(1-\beta p_L)]\kappa}\tau_L$, then y_L is positive.

$$y_L = \begin{cases} -\frac{(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda}{\kappa E(\lambda)}\tau_L - \lambda\left[(1-\beta)C + (1-\beta p_L)\right]\frac{y^*}{E(\lambda)} < 0, & \text{iff } y^* < \frac{(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda}{-\lambda[(1-\beta)C+(1-\beta p_L)]\kappa}\tau_L \\ -\frac{(1-\beta p_L)\kappa^2+(1-\beta)(1+\beta p_H-\beta p_L)\lambda}{\kappa E(\lambda)}\tau_L - \lambda\left[(1-\beta)C + (1-\beta p_L)\right]\frac{y^*}{E(\lambda)} \geq 0, & \text{iff otherwise} \end{cases}$$

B.4. Proof of Proposition 3

In this proposition we characterize how λ affects inflation and output in the low and high state. We will use the restriction that $E(\lambda) < 0$, $\tau_L < 0$ and the inequalities on $A(\lambda)$, $A(\lambda) < 0$; $B(\lambda)$, $B(\lambda) > 0$; C and D. Namely that when $E(\lambda) < 0$, $C > 0$ and $D < 0$.

When y^* is equal to zero, our results are identical to Nakata and Schmidt (2014). In other words, $\frac{\partial \pi_H}{\partial \lambda} < 0$, $\frac{\partial \pi_L}{\partial \lambda} < 0$, $\frac{\partial y_L}{\partial \lambda} < 0$. However, when y^* does not equal to zero, the results are modified depending on the value of y^*

$$
\begin{aligned}
\frac{\partial \pi_H}{\partial \lambda} =& \frac{A'(\lambda)E(\lambda) - A(\lambda)E'(\lambda)}{E(\lambda)^2}\tau_L - \frac{E(\lambda) - \lambda E'(\lambda)}{E(\lambda)^2} C\kappa y^* \\
=& \frac{A'(\lambda)\left[-A(\lambda) - A(\lambda)C - B(\lambda)C\right] - A(\lambda)\left[-A'(\lambda) - A'(\lambda)C - B'(\lambda)C\right]}{E(\lambda)^2}\tau_L \\
& - \frac{\left[-A(\lambda) - A(\lambda)C - B(\lambda)C\right] - \lambda\left[-A'(\lambda) - A'(\lambda)C - B'(\lambda)C\right]}{E(\lambda)^2} C\kappa y^* \\
=& \frac{-\beta p_H \lambda\left(1 - \beta + \beta p_H\right) + \beta p_H\left(\kappa^2 + \left(1 - \beta + \beta p_H\right)\lambda\right)}{E(\lambda)^2} C\tau_L \\
& - \frac{\left[\beta\lambda p_H + \beta\lambda p_H C - \left[\kappa^2 + \lambda\left(1 - \beta(1 - p_H)\right)\right] C\right] - \lambda\left[\beta p_H + \beta p_H C - \left(1 - \beta(1 - p_H)\right) C\right]}{E(\lambda)^2} C\kappa y^* \\
=& \frac{\beta p_H \kappa^2}{E(\lambda)^2} C\tau_L + \frac{\kappa^2 C}{E(\lambda)^2} C\kappa y^* \qquad (76) \\
& \qquad (77)
\end{aligned}
$$

$$
\begin{aligned}
\frac{\partial \pi_L}{\partial \lambda} =& \frac{-B'(\lambda)E(\lambda) + E'(\lambda)B(\lambda)}{E(\lambda)^2}\tau_L + \frac{E(\lambda) - \lambda E'(\lambda)}{E(\lambda)^2} D\kappa y^* \\
=& \frac{A'(\lambda)B(\lambda) - A(\lambda)B'(\lambda)}{E(\lambda)^2} D\tau_L - \frac{\kappa^2 C}{E(\lambda)^2} D\kappa y^* \\
=& -\frac{\beta p_H \kappa^2}{E(\lambda)^2} D\tau_L - \frac{\kappa^2 C}{E(\lambda)^2} D\kappa y^* \qquad (78)
\end{aligned}
$$

$$
\begin{aligned}
\frac{\partial y_H}{\partial \lambda} =& \frac{-\beta\kappa p_H E'(\lambda)}{E(\lambda)^2}\tau_L - \frac{-E'(\lambda)}{E(\lambda)^2} C\kappa^2 y^* \\
=& \frac{-\beta\kappa p_H\left(A'(\lambda)D - B'(\lambda)C\right)}{E(\lambda)^2}\tau_L - \frac{-\left(A'(\lambda)D - B'(\lambda)C\right)}{E(\lambda)^2} C\kappa^2 y^* \\
=& \frac{-\beta\kappa p_H}{E(\lambda)^2}\left[\beta p_H - (1 - \beta)C\right]\tau_L - \frac{\left[\beta p_H - (1 - \beta)C\right]}{E(\lambda)^2} C\kappa^2 y^* \qquad (79) \\
& \qquad (80)
\end{aligned}
$$

$$
\begin{aligned}
\frac{\partial y_L}{\partial \lambda} =& \frac{(1 - \beta)(1 - \beta p_L + \beta p_H)E(\lambda) - \left((1 - \beta p_L)\kappa^2 + (1 - \beta)(1 - \beta p_L + \beta p_H)\lambda\right) E'(\lambda)}{\kappa E(\lambda)^2}\tau_L \\
& - \frac{E(\lambda) - \lambda E'(\lambda)}{E(\lambda)^2}\left[(1 - \beta)C + (1 - \beta p_L)\right] y^* \\
=& \left[\frac{(1 - \beta)(1 - \beta p_L + \beta p_H)\left[A(\lambda)D - B(\lambda)C\right]}{\kappa E(\lambda)^2}\right]\tau_L \\
& - \left[\frac{\left((1 - \beta p_L)\kappa^2 + (1 - \beta)(1 - \beta p_L + \beta p_H)\lambda\right)\left[A'(\lambda)D - B'(\lambda)C\right]}{\kappa E(\lambda)^2}\right]\tau_L + \frac{\kappa^2 C}{E(\lambda)^2}\left[(1 - \beta)C + (1 - \beta p_L)\right] y^* \\
=& \frac{\beta\kappa p_H}{E(\lambda)^2}\left[(1 - \beta)C + (1 - \beta p_L)\right]\tau_L + \frac{\kappa^2 C}{E(\lambda)^2}\left[(1 - \beta)C + (1 - \beta p_L)\right] y^* \qquad (81)
\end{aligned}
$$

In all of these cases, as long as $y^* < -\frac{\beta p_H}{\kappa C}\tau_L$. However, if $y^* \geq -\frac{\beta p_H}{\kappa C}\tau_L$, then $\frac{\partial \pi_L}{\partial \lambda} \geq 0$, $\frac{\partial \pi_H}{\partial \lambda} \geq 0$, $\frac{\partial y_H}{\partial \lambda} \geq 0$, and $\frac{\partial y_L}{\partial \lambda} \geq 0$.

B.5. Proof Proposition X

In this proposition we characterize how p_H affects inflation and output in the low and high state. We will use the restriction that $E(\lambda) < 0$, $\tau_L < 0$ and the inequalities on $A(\lambda)$, $A(\lambda) < 0$; $B(\lambda)$, $B(\lambda) > 0$; C and D. Namely that when $E(\lambda) < 0$, $C > 0$ and $D < 0$.

$$
\begin{aligned}
E(\lambda) =& - \beta\lambda p_H \left[-1 - C\right] - \left[\kappa^2 + \lambda(1 - \beta(1 - p_H))\right] C \\
E(\lambda) =& \beta\lambda p_H + \beta\lambda p_H C - \kappa^2 C - \lambda C + \lambda\beta C - \beta\lambda p_H C \\
E(\lambda) =& \beta\lambda p_H - C\left[\kappa^2 + \lambda - \beta\lambda\right] \\
E(\lambda) =& \beta\lambda p_H - \left[\frac{1-p_L}{\sigma\kappa}(1 - \beta p_L + \beta p_H) - p_L\right]\left[\kappa^2 + \lambda(1-\beta)\right]
\end{aligned}
$$

$$
\frac{\partial E(\lambda)}{\partial p_H} = \beta\lambda - \frac{1-p_L}{\sigma\kappa}\beta[\kappa^2 + \lambda(1-\beta)]
$$

$$
\frac{\partial C}{\partial p_H} = \frac{1-p_L}{\sigma\kappa}\beta
$$

$$
\frac{\partial A}{\partial p_H} = -\beta\lambda
$$

$$
\begin{aligned}
\frac{\partial \pi_H}{\partial p_H} =& \frac{\frac{\partial A(\lambda)}{\partial p_H}E(\lambda) - A(\lambda)\frac{\partial E(\lambda)}{\partial p_H}}{E(\lambda)^2}\tau_L - \frac{\frac{\partial C}{\partial p_H}E(\lambda) - C\frac{\partial E(\lambda)}{\partial p_H}}{E(\lambda)^2}\kappa\lambda y^* \\
\frac{\partial \pi_H}{\partial p_H} =& \frac{-\beta\lambda E(\lambda) + \beta\lambda p_H\left(\beta\lambda - \frac{1-p_L}{\sigma\kappa}\beta[\kappa^2 + \lambda(1-\beta)]\right)}{E(\lambda)^2}\tau_L && (82) \\
& - \frac{\left(\frac{1-p_L}{\sigma\kappa}\beta\right)E(\lambda) - C\left(\beta\lambda - \frac{1-p_L}{\sigma\kappa}\beta[\kappa^2 + \lambda(1-\beta)]\right)}{E(\lambda)^2}\kappa\lambda y^* && (83) \\
\frac{\partial \pi_H}{\partial p_H} =& \frac{\frac{1-p_L}{\sigma\kappa}\left((1-\beta p_L) - p_L\right)[\kappa^2 + \lambda(1-\beta)]}{E(\lambda)^2}\beta\lambda\tau_L && (84) \\
& - \frac{\frac{1-p_L}{\sigma\kappa}\left((1-\beta p_L) - p_L\right)}{E(\lambda)^2}\beta\kappa\lambda^2 y^* && (85)
\end{aligned}
$$

The first term is positive, whenever:

$$
\begin{aligned}
-\frac{1-p_L}{\sigma\kappa}(1 - \beta p_L + \beta p_H) + p_L <& - p_H\beta\frac{1-p_L}{\sigma\kappa} \\
p_L <& \frac{1-p_L}{\sigma\kappa}(1 - \beta p_L) \\
\beta p_L^2 - (\sigma\kappa + \beta + 1)p_L + 1 >& 0 && (86)
\end{aligned}
$$

The second term is negative, whenever, since it is multiplied by negative 1:

$$
\begin{aligned}
\frac{1-p_L}{\sigma\kappa}(1 - \beta p_L + \beta p_H) - p_L >& p_H\beta\frac{1-p_L}{\sigma\kappa} \\
\beta p_L^2 - (\sigma\kappa + \beta + 1)p_L + 1 >& 0 && (87)
\end{aligned}
$$

Let

$$
\Phi(p_L) = \phi_2 p_L^2 + \phi_1 p_L + \phi_0 \tag{88}
$$

Where

$$\phi_0 = 1 \tag{89}$$

$$\phi_1 = -\sigma\kappa - \beta - 1 \tag{90}$$

$$\phi_2 = \beta \tag{91}$$

$$\tag{92}$$

We have that $\phi_1 < 0$ and $\phi_2 > 0$ since $\sigma\kappa > 0$ and $\beta > 0$. Therefore there exists a non-negative root of $\Phi(p_L)$ and $\Phi(p_L) > 0$ when p_L is below this root. Therefore, we have that:

$$p_L < \frac{\beta + \sigma\kappa + 1 - \sqrt{(\beta + \sigma\kappa + 1)^2 - 4\beta}}{2\beta} \tag{93}$$

Overall, $\frac{\partial \pi_H}{\partial p_H} < 0$ iff $y^* < -\frac{\kappa^2 + \lambda(1-\beta)}{\kappa\lambda}\tau_L$ and $\frac{\partial \pi_H}{\partial p_H} \geq 0$ otherwise.

B.6. Proof of Corollary 1

Given that $E(\lambda) < 0$ it directly implies that $\frac{\kappa^2+\lambda(1-\beta)}{\kappa\lambda} > \frac{\beta p_H}{\kappa C}$ which proofs the "ordering" of conditions.

B.7. Proof Proposition X2

In this proposition we characterize how p_L affects inflation and output in the low and high state. We will use the restriction that $E(\lambda) < 0$, $\tau_L < 0$ and the inequalities on $A(\lambda)$, $A(\lambda) < 0$; $B(\lambda)$, $B(\lambda) > 0$; C and D. Namely that when $E(\lambda) < 0$, $C > 0$ and $D < 0$.

$$\frac{\partial E(\lambda)}{\partial p_L} = -(\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]$$

$$\frac{\partial C}{\partial p_L} = -(\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)$$

$$\frac{\partial A}{\partial p_L} = 0$$

$$\frac{\partial \pi_H}{\partial p_L} = \frac{\frac{\partial A(\lambda)}{\partial p_L}E(\lambda) - A(\lambda)\frac{\partial E(\lambda)}{\partial p_L}}{E(\lambda)^2}\tau_L - \frac{\frac{\partial C}{\partial p_L}E(\lambda) - C\frac{\partial E(\lambda)}{\partial p_L}}{E(\lambda)^2}\kappa\lambda y^*$$

$$\frac{\partial \pi_H}{\partial p_L} = \frac{\beta\lambda p_H\left((\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]\right)}{E(\lambda)^2}\tau_L \tag{94}$$

$$- \frac{-\left(\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1\right)E(\lambda) + C\left((\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]\right)}{E(\lambda)^2}\kappa\lambda y^* \tag{95}$$

$$\tag{96}$$

Note that $\frac{\partial E(\lambda)}{\partial p_L} < 0$ and $\frac{\partial C}{\partial p_L} < 0$, as $-2p_L + p_H > -\frac{\sigma\kappa+1}{\beta} - 1$ for any $0 < p_L, p_H < 1$. Thus, it is always the case that $\frac{\partial \pi_H}{\partial p_L} < 0$.

B.8. Proof Proposition X3

In this proposition we characterize how p_L affects inflation and output in the low and high state. We will use the restriction that $E(\lambda) < 0$, $\tau_L < 0$ and the inequalities on $A(\lambda)$, $A(\lambda) < 0$; $B(\lambda)$, $B(\lambda) > 0$; C and D. Namely that when $E(\lambda) < 0$, $C > 0$ and $D < 0$.

$$\pi_L = \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^*$$

Given that $\frac{D}{E(\lambda)}\kappa\lambda y^* > 0$, it is possible under certain conditions for π_L to be positive. Whenever $y^* > \frac{B(\lambda)\tau_L}{D\kappa\lambda}$, then $\pi_H > 0$.

$$\pi_L = \begin{cases} \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^* < 0, & \text{iff } y^* < \frac{B(\lambda)\tau_L}{D\kappa\lambda} \\ \frac{-B(\lambda)}{E(\lambda)}\tau_L + \frac{D}{E(\lambda)}\kappa\lambda y^* \geq 0, & \text{iff otherwise} \end{cases}$$

$$\frac{\partial E(\lambda)}{\partial p_L} = -(\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]$$

$$\frac{\partial D}{\partial p_L} = -\frac{\partial C}{\partial p_L} = (\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)$$

$$\frac{\partial B}{\partial p_L} = 0$$

$$\frac{\partial \pi_L}{\partial p_L} = -\frac{\frac{\partial B(\lambda)}{\partial p_L}E(\lambda) - B(\lambda)\frac{\partial E(\lambda)}{\partial p_L}}{E(\lambda)^2}\tau_L + \frac{\frac{\partial D}{\partial p_L}E(\lambda) - D\frac{\partial E(\lambda)}{\partial p_L}}{E(\lambda)^2}\kappa\lambda y^*$$

$$\frac{\partial \pi_L}{\partial p_L} = \frac{(\kappa^2 + \lambda(1 - \beta(1 - p_H)))\left((\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]\right)}{E(\lambda)^2}\tau_L \tag{97}$$

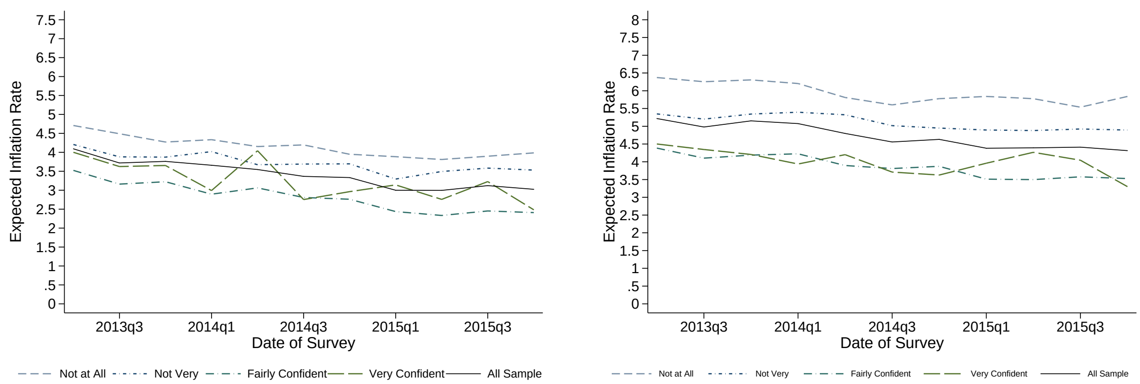
$$+ \frac{\left(\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1\right)E(\lambda) + C\left((\frac{1}{\sigma\kappa}(1 + \beta(1 - 2p_L + p_H)) + 1)[\kappa^2 + \lambda(1 - \beta)]\right)}{E(\lambda)^2}\kappa\lambda y^* \tag{98}$$

(99)

Thus, $\frac{\partial \pi_L}{\partial p_L} < 0$.

Appendix C. Figures-Reputation

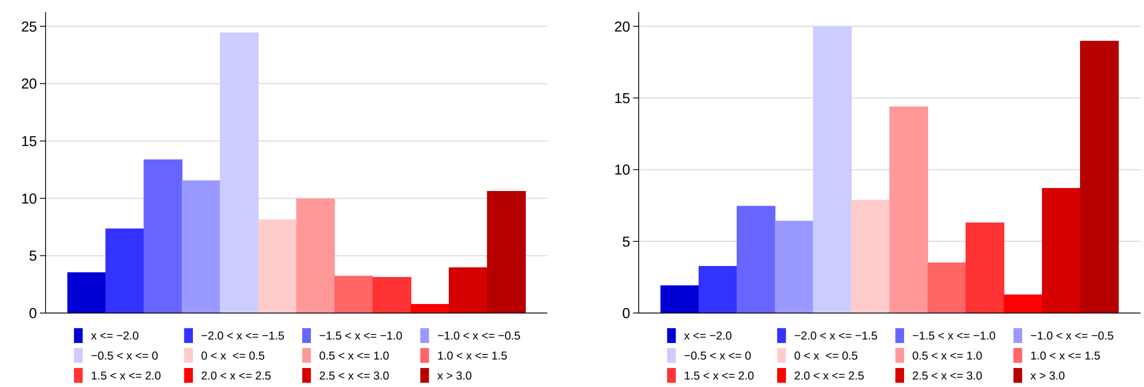
Figure A.1. Evolution of Inflation Expectation by Full Measure of Confidence Level



(a) Short Run (b) Medium Run

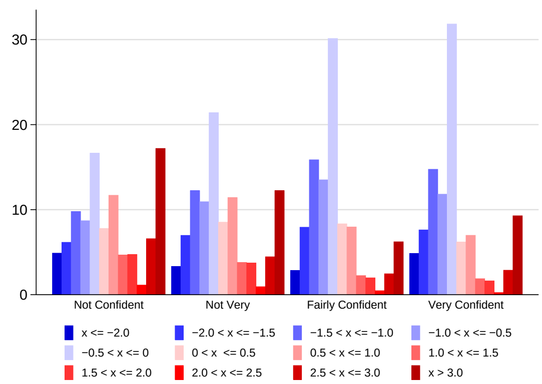
Appendix D. Inflation Target and Central Bank Confidence

Figure A.2. Share of People Based on Distance from Inflation Target

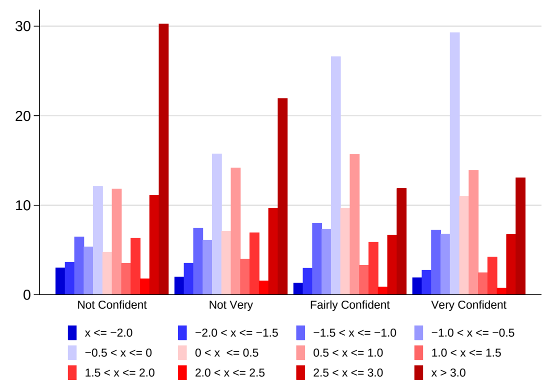


(a) Short Run (b) Medium Run

Figure A.3. Share of Distance from Inflation Target in Each Confidence Level



(a) Short Run



(b) Medium Run

Appendix E. Summary Statistics

Table A.1: Summary Statistics for Expected Inflation Conditioned on Trust in Government

			Political Orientation		Inflation Targeting		Country								
	No. Obs.	Total	Right	Left	No	Yes	Austria	France	Germany	Hong Kong	Italy	Singapore	Spain	Switzerland	UK
Short Run Inflation															
Not At All	1,078	4.06	4.09⋄⋄	3.99⋄⋄	5.03***	3.85***	3.42	2.96***	3.86	5.08**⋄	5.52***	4.94*⋄⋄	4.43⋄⋄⋄	3.74⋄⋄⋄	2.74***
Not Very	9,831	3.81	3.78⋄⋄⋄	3.91⋄⋄⋄	4.87***	3.42***	3.40⋆⋆	3.02***	3.17***	5.35***	4.83⋆⋆⋆	4.32***	3.75⋄⋄⋄	3.46*⋄⋄	2.37***
Fairly Confident	14,090	2.87	2.77***	3.24***	4.32***	2.50***	2.92⋄⋄	2.93⋄⋄	2.34***	5.10***	3.47⋆⋆⋆	3.90***	3.72***	2.04***	1.88***
Very Confident	2,029	3.27	3.12⋆⋆⋆	3.87⋆⋆⋆	5.09***	2.91***	4.18⋄	3.64	3.11	6.06***	3.86⋆⋆	4.64***	5.86***	1.84***	1.89***
Medium Run Inflation															
Not At All	1,022	5.63	5.74⋄⋄⋄	5.38⋄⋄⋄	6.67***	5.40***	5.26	4.59**⋄	5.64	6.91**⋄	6.31	6.34⋄⋄⋄	5.09⋄⋄⋄	6.71	4.65⋆
Not Very	9,207	5.22	5.30***	4.95***	6.69***	4.65***	5.02	4.30***	4.57***	7.36***	5.35⋄⋄⋄	5.93***	4.40***	5.24⋄⋄⋄	3.94***
Fairly Confident	13,198	3.93	3.96*⋄⋄	3.80*⋄⋄	5.62***	3.47***	3.66	3.76⋄⋄⋄	3.35***	6.52***	3.86⋄⋄⋄	5.14***	4.33***	3.40***	3.04***
Very Confident	1,944	4.05	4.00⋄⋄	4.27⋄⋄	5.95***	3.66***	3.99	4.92	3.81	7.50***	4.17⋄⋄	5.27***	6.09***	2.88***	2.88***

		Gender		Age			Survey										
	No. Obs.	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
Short Run Inflation																	
Not At All	1,078	3.37***	5.12***	4.68⋆⋆⋆	4.71**	3.46***	4.83*	3.95	4.42⋄⋄	4.21	4.07	4.00	3.90	4.41	3.86	3.65	3.26*⋄⋄
Not Very	9,831	3.31***	4.37***	4.59***	3.91⋄⋄	3.31	4.12*⋄⋄	3.86⋄⋄⋄	3.97⋄⋄⋄	4.41***	3.85⋄⋄⋄	3.79	3.68⋄	3.50**⋄	3.68⋄⋄⋄	3.70⋄⋄⋄	3.58*⋄⋄
Fairly Confident	14,090	2.58***	3.34***	3.87***	3.24***	2.28***	3.50***	3.34***	3.40***	3.04⋄⋄⋄	3.14***	2.93⋄⋄⋄	2.95⋄⋄	2.54***	2.46***	2.60***	2.50***
Very Confident	2,029	2.90***	4.13***	4.95***	3.83**⋄	2.30***	4.04*⋄⋄	3.91⋄⋄⋄	3.97⋄	3.37⋄⋄	4.16***	2.81	2.83	3.07⋄⋄⋄	2.91⋄⋄⋄	3.31	2.51**⋄
Medium Run Inflation																	
Not At All	1,022	5.26**⋄	6.21**⋄	6.36**	5.88⋄⋄	5.12***	7.59⋆⋆⋆	5.76	5.18	6.16	5.71	5.21	5.86	5.05	5.35	4.05⋆⋆	5.95
Not Very	9,207	4.68***	5.82***	6.08***	5.33	4.64***	5.28⋄	5.31⋄⋄	5.37	5.76***	5.36⋄	5.21	4.83**	5.06⋄	5.12⋄⋄	5.23	4.97⋄⋄⋄
Fairly Confident	13,198	3.63***	4.42***	4.93***	4.21***	3.34***	4.48***	4.62***	4.35***	4.40***	3.92⋄⋄	3.92⋄⋄	4.02	3.63***	3.58***	3.63***	3.59***
Very Confident	1,944	3.71***	4.84***	5.55***	4.35⋄	3.26***	4.50⋄	4.69	4.71	4.28⋄⋄	4.16	3.69	3.53	4.18	4.27⋄⋄	4.11	3.24***

Notes: *, **, *** denote significance at the 10, 5 and 1%, respectively, for both the two sample t test and the Kruskal-Wallis equality of populations rank test. ⋆,⋆⋆, ⋆⋆⋆ denote significance at the 10, 5 and 1%, respectively, for the two sample t test. ⋄,⋄⋄, ⋄⋄⋄ denote significance at the 10, 5 and 1%, respectively, for the Kruskal-Wallis equality of populations rank test.

Table A.2: Share of Confidence Combined Confidence Measure

		Political Orientation		Inflation Targeting		Gov. Trust		Country									
	Total	Right	Left	No	Yes	Trust	Distrust	Austria	France	Germany	Italy	Spain	EU	Hong Kong	Singapore	Switzerland	UK
Not At All	17.16	13.78	24.16	12.23	17.99	4.25	32.13	19.70	27.57	15.88	23.32	25.00	22.47	15.23	9.12	5.65	8.00
Not Very	44.83	43.58	47.41	48.55	44.19	39.40	51.13	53.85	49.98	50.66	42.56	52.38	49.30	57.31	39.43	31.37	32.28
Fairly Confident	33.65	37.71	25.22	35.10	33.40	49.43	15.33	23.98	20.22	30.21	29.82	19.45	25.03	24.64	45.98	53.86	53.12
Very Confident	4.37	4.94	3.20	4.12	4.41	6.92	1.42	2.47	2.24	3.25	4.30	3.18	3.21	2.82	5.48	9.12	6.59

		Gender		Age			Survey										
	Total	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
Not At All	17.16	17.10	17.22	16.29	17.80	17.38	22.39	18.54	20.84	18.01	16.74	17.29	17.35	15.29	15.57	15.46	13.69
Not Very	44.83	39.76	50.03	46.26	45.31	43.94	47.29	46.74	48.39	47.39	44.87	43.75	44.19	42.41	42.58	43.76	43.49
Fairly Confident	33.65	37.52	29.66	32.91	32.44	34.42	27.03	30.63	27.48	30.56	33.82	34.82	34.06	37.44	36.36	35.85	38.34
Very Confident	4.37	5.62	3.09	4.54	4.45	4.26	3.30	4.10	3.28	4.04	4.56	4.14	4.40	4.85	5.49	4.92	4.49

Notes:

Table A.3: Expected Inflation Conditioned on Trust in Government Summary Statistics: Combined Measure

			Political Orientation		Inflation Targeting		Country								
	No. Obs.	Total	Right	Left	No	Yes	Austria	France	Germany	Hong Kong	Italy	Singapore	Spain	Switzerland	UK
Short Run Inflation															
Not Confident	10,909	3.84	3.81⋄⋄⋄	3.92⋄⋄⋄	4.88***	3.47***	3.40⋆⋆	3.01***	3.25***	5.33***	4.90⋆⋆⋆	4.36***	3.82⋄⋄⋄	3.48**⋄	2.40***
Confident	17,407	2.93	2.83⋆⋆⋆	3.31***	4.41***	2.58***	3.08⋄⋄⋄	2.92⋄⋄⋄	2.55***	5.17***	3.55***	4.01***	3.93***	2.14***	1.90***
Medium Run Inflation															
Not Confident	10,229	5.26	5.34***	5.01***	6.69***	4.73***	5.04	4.34	4.70	7.33***	5.45⋄⋄⋄	5.95***	4.47***	5.36⋄⋄⋄	4.02***
Confident	16,158	3.98	4.01⋄⋄⋄	3.88⋄⋄⋄	5.68***	3.55***	3.79	3.84⋄⋄⋄	3.52***	6.65***	3.93⋄⋄⋄	5.18***	4.53***	3.49***	3.07***

		Gender		Age			Survey										
	No. Obs.	Male	Female	Young	Middle	Old	3	4	5	6	7	8	9	10	11	12	13
Short Run Inflation																	
Not Confident	10,909	3.32***	4.43***	4.60***	3.99*⋄⋄	3.33***	4.21**⋄	3.87⋄⋄⋄	4.02⋄⋄⋄	4.39***	3.87⋄⋄⋄	3.81	3.70⋄⋄	3.60*⋄⋄	3.69⋄⋄⋄	3.70⋄⋄⋄	3.55**⋄
Confident	17,407	2.61***	3.44***	3.98***	3.27***	2.30***	3.55***	3.41***	3.50***	3.16**⋄	3.31***	2.94⋄⋄⋄	2.95⋄⋄⋄	2.61***	2.49***	2.70***	2.52***
Medium Run Inflation																	
Not Confident	10,229	4.75***	5.85***	6.10***	5.39	4.69***	5.55⋄⋄	5.36⋄⋄	5.35	5.80***	5.40⋄	5.21	4.94*	5.06⋄	5.14⋄⋄	5.13	5.05⋄⋄⋄
Confident	16,158	3.66***	4.52***	5.04***	4.20***	3.38***	4.46***	4.69***	4.45***	4.50***	4.01⋄⋄	3.94⋄⋄⋄	4.02	3.70***	3.70***	3.75**⋄	3.56***

Notes: *, **, *** denote significance at the 10, 5 and 1%, respectively, for both the two sample t test and the Kruskal-Wallis equality of populations rank test. ⋆,⋆⋆, ⋆⋆⋆ denote significance at the 10, 5 and 1%, respectively, for the two sample t test. ⋄,⋄⋄, ⋄⋄⋄ denote significance at the 10, 5 and 1%, respectively, for the Kruskal-Wallis equality of populations rank test.

Appendix F. Analysis of Age and Confidence

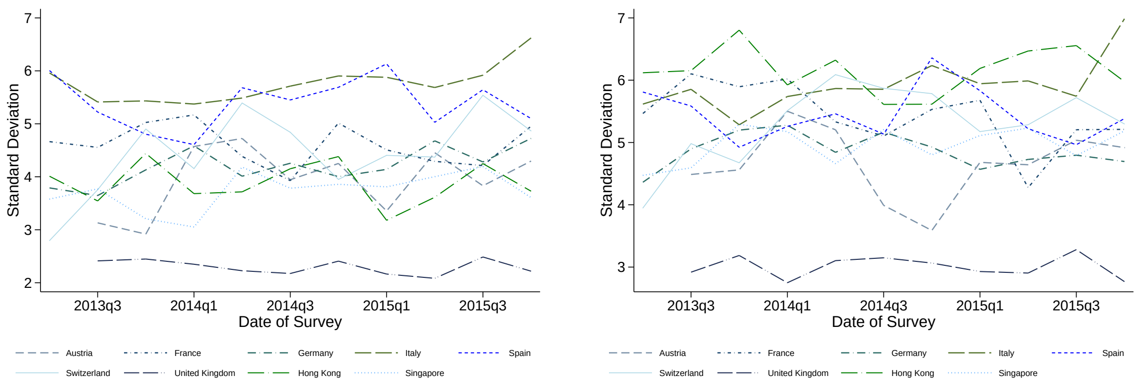
Table A.4: Effect of CB Confidence on Std. Dev of Inflation Expectations

	(1)	(2)	(3)
	Not Confident	Not Confident	Not Confident
Age: Young	0.001	0.001	-0.002
	(0.01)	(0.01)	(0.00)
Age: Old	-0.022***	-0.018***	-0.006
	(0.00)	(0.00)	(0.00)
Female	0.103***	0.103***	0.096***
	(0.00)	(0.00)	(0.00)
Constant	0.582***	0.657***	0.401***
	(0.00)	(0.01)	(0.01)
Time Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes
N	75403	75403	75403
R-squared	0.012	0.019	0.109

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Not Confident is a dummy variable that is equal to 1 when an individual is not confident in the central bank. An individual is not confident if she indicates she was "Not At All" confident in the central bank or "Not Very" confident in the central bank. Otherwise the individual is confidence and has indicated that she is "Fairly confident" in the central bank or "Very Confident" in the central bank.

Appendix G. Standard Deviation of Inflation Expectation and Central Bank Confidence

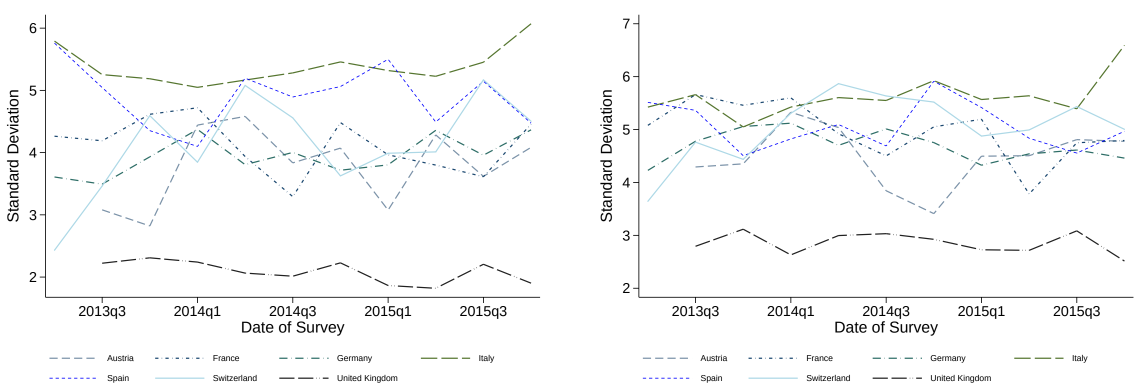
Figure A.4. Standard Deviation of Inflation Expectations Over Time



(a) Short Run (b) Medium Run

G.1. Inflation Target and Central Bank Confidence

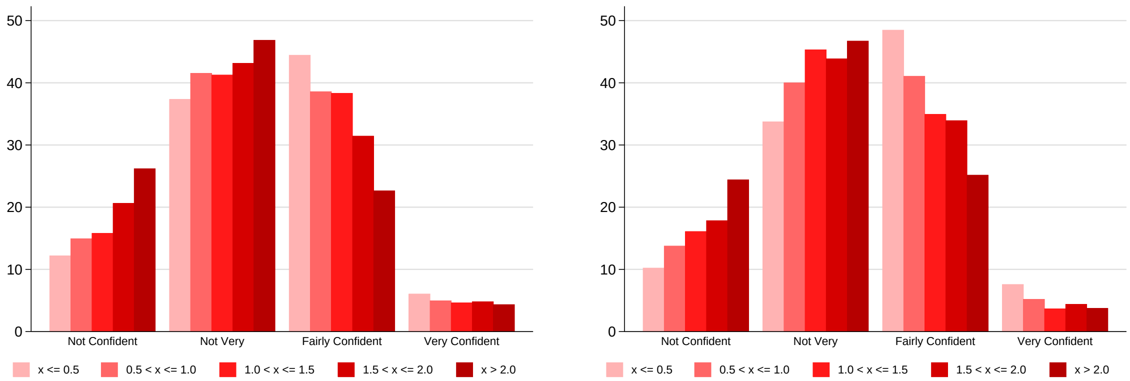
Figure A.5. Standard Deviation of Absolute Distance Between Target and Inflation Expectations



(a) Short Run (b) Medium Run

Appendix H. Inflation Target and Central Bank Confidence

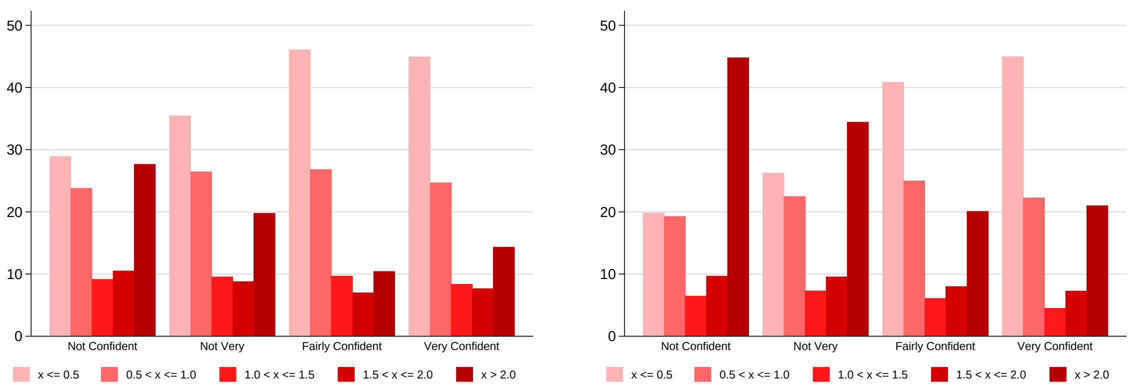
Figure A.6. Confidence Level Shares By Absolute Distance from Inflation Target



(a) Short Run

(b) Medium Run

Figure A.7. Share of Absolute Distance from Inflation Target in Each Confidence Level

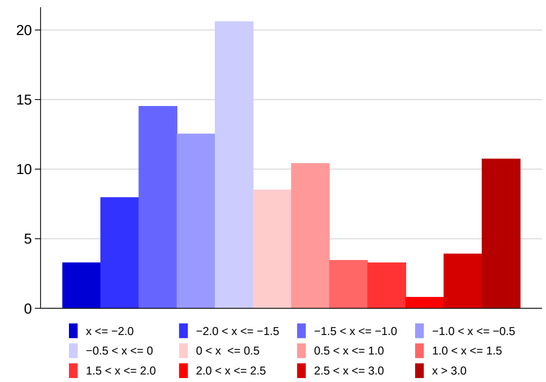


(a) Short Run

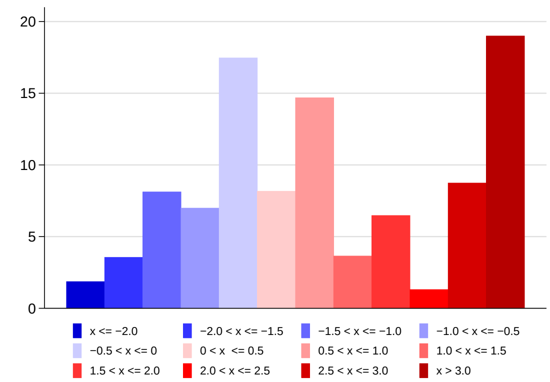
(b) Medium Run

H.1. Excluding Switzerland

Figure A.8. Share of People Based on Distance from Inflation Target

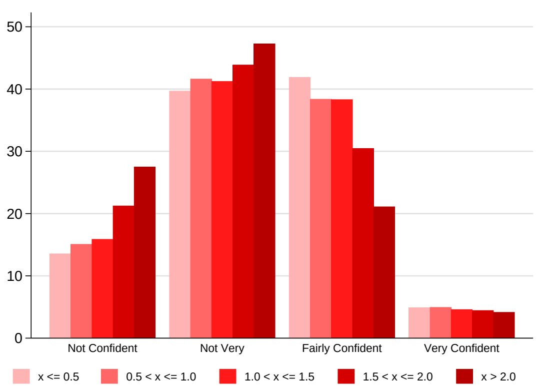


(a) Short Run

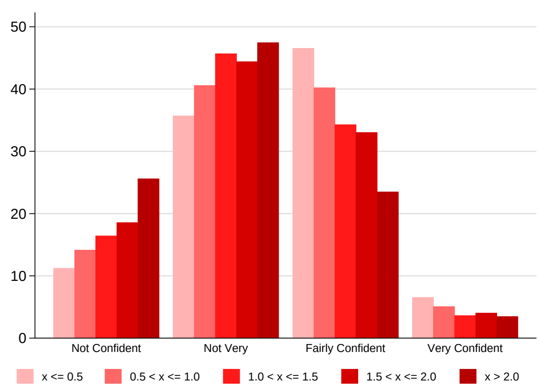


(b) Medium Run

Figure A.9. Confidence Level Shares By Absolute Distance from Inflation Target

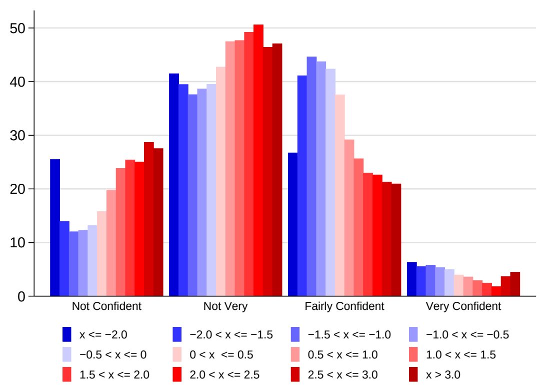


(a) Short Run

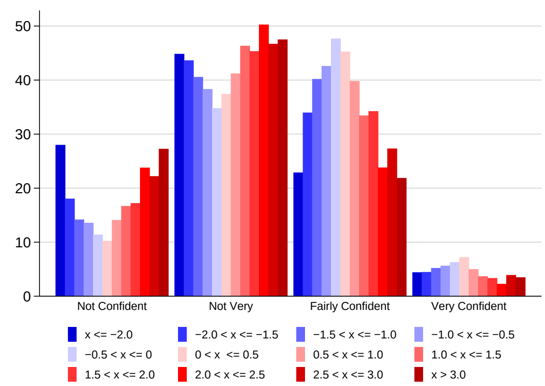


(b) Medium Run

Figure A.10. Confidence Level Shares By Distance from Inflation Target

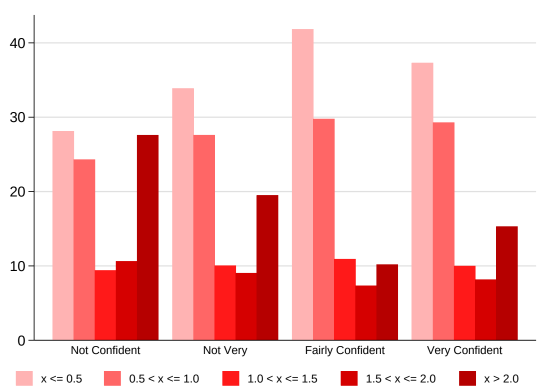


(a) Short Run

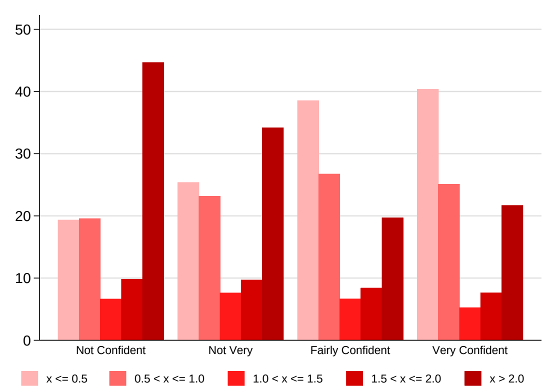


(b) Medium Run

Figure A.11. Share of Absolute Distance from Inflation Target in Each Confidence Level

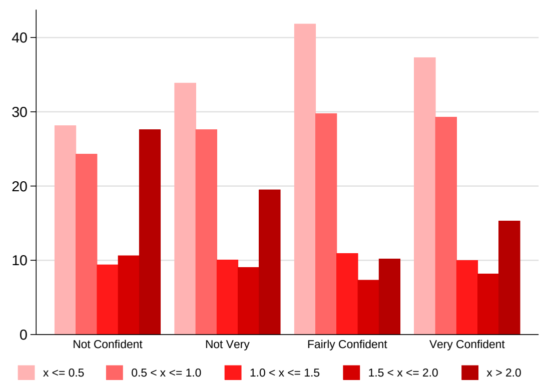


(a) Short Run

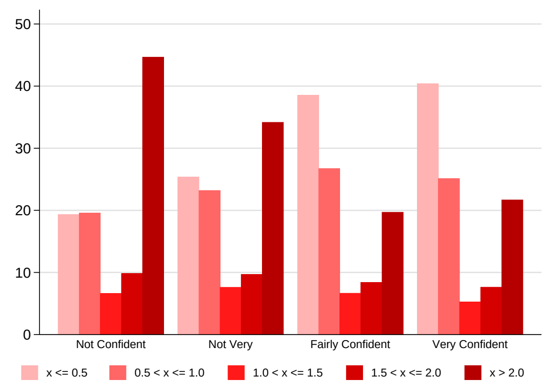


(b) Medium Run

Figure A.12. Share of Distance from Inflation Target in Each Confidence Level



(a) Short Run



(b) Medium Run

Appendix I. Conditioned Measure Including Time and Country Interaction Term

Table A.5: Determinants of Inflation Expectations

	(1) SR_INFL_e	(2) SR_INFL_e	(3) LR_INFL_e	(4) LR_INFL_e	(5) LR_INFL_e
Not Confident	0.453***	0.453***	0.517***	0.904***	0.517***
	(0.06)	(0.06)	(0.05)	(0.07)	(0.05)
SR_INFL_e			0.896***		0.896***
			(0.02)		(0.02)
Female	0.844***	0.844***	0.104**	0.817***	0.104**
	(0.05)	(0.05)	(0.04)	(0.06)	(0.04)
Age: Young	0.547***	0.547***	0.190***	0.645***	0.190***
	(0.09)	(0.09)	(0.06)	(0.10)	(0.06)
Age: Old	-0.567***	-0.567***	0.003	-0.458***	0.003
	(0.07)	(0.07)	(0.05)	(0.08)	(0.05)
GDP Growth$_{t-1}$		0.257***			0.048
		(0.09)			(0.11)
Inflation$_{t-1}$		0.102			-0.153
		(0.12)			(0.12)
Constant	2.324***	2.029***	1.370***	3.438***	1.630***
	(0.16)	(0.30)	(0.17)	(0.22)	(0.30)
Time*Country FE	Yes	Yes	Yes	Yes	Yes
N	27836	27836	25044	26111	25044
R-squared	0.088	0.088	0.535	0.080	0.535

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. "Not Confident" is defined as individuals who answered "Not at All" or "Not Very" to the question: "How confident, if at all, are you that the [country's] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?" The variable "Gov. Mistrust" is defined as those who "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]". The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are "Fairly Confident" or "Very Confident" in the Central Bank and do not "Strongly Disagree" or "Tend To Disagree" with the statement "I think that the government is currently following the right economic policies for [my country]". Interaction term coefficients omitted from table.

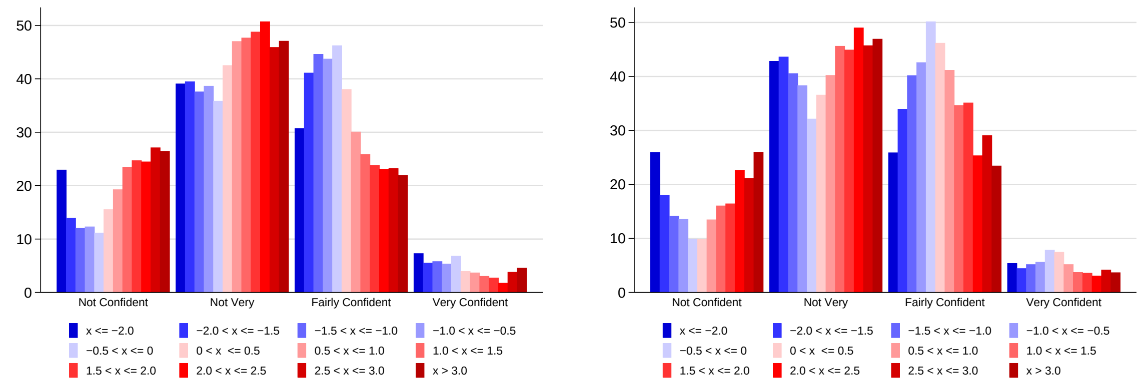
Appendix J. Conditioned Measure of Confidence For European Union Countries

Table A.6: Determinants Inflation Expectations

	(1)	(2)	(3)	(4)	(5)
	SR_INFL_e	SR_INFL_e	LR_INFL_e	LR_INFL_e	LR_INFL_e
Not Confident	0.736***	0.706***	0.674***	1.203***	0.689***
	(0.12)	(0.12)	(0.08)	(0.13)	(0.08)
SR_INFL_e			0.881***		0.878***
			(0.02)		(0.02)
Female	0.925***	1.265***	0.099**	0.863***	0.007
	(0.07)	(0.09)	(0.05)	(0.07)	(0.06)
Age: Young	0.730***	0.882***	0.111	0.727***	0.082
	(0.12)	(0.15)	(0.07)	(0.12)	(0.09)
Age: Old	-0.541***	-0.808***	0.008	-0.426***	0.012
	(0.08)	(0.11)	(0.06)	(0.09)	(0.08)
GDP Growth$_{t-1}$	-0.014	-0.012	0.029***	0.028*	0.019
	(0.01)	(0.07)	(0.01)	(0.02)	(0.04)
Inflation$_{t-1}$	0.497***	0.487***	-0.127	0.341**	-0.109
	(0.13)	(0.18)	(0.09)	(0.14)	(0.12)
Not Conf * Austria	-0.497*	-0.505*	0.093	0.027	0.087
	(0.26)	(0.27)	(0.21)	(0.29)	(0.21)
Not Conf * France	-0.805***	-0.795***	-0.309	-0.806**	-0.320
	(0.27)	(0.27)	(0.20)	(0.31)	(0.20)
Not Conf * Italy	0.457*	0.431*	-0.163	0.168	-0.169
	(0.25)	(0.25)	(0.15)	(0.27)	(0.15)
Not Conf * Spain	-1.074***	-1.067***	-0.664***	-1.416***	-0.678***
	(0.26)	(0.26)	(0.18)	(0.26)	(0.18)
Not Conf * UK	-0.408***		-0.098	-0.305*	
	(0.14)		(0.12)	(0.17)	
Country: Austria	0.083	0.016	0.229	-0.089	0.222
	(0.21)	(0.23)	(0.15)	(0.20)	(0.16)
Country: France	0.640***	0.621***	0.109	0.557**	0.106
	(0.21)	(0.24)	(0.14)	(0.23)	(0.16)
Country: Italy	1.153***	1.137***	-0.477***	0.618***	-0.488***
	(0.15)	(0.24)	(0.10)	(0.17)	(0.15)
Country: Spain	1.789***	1.745***	-0.206	1.335***	-0.197
	(0.21)	(0.27)	(0.14)	(0.21)	(0.17)
Country: UK	-0.501***		-0.192	-0.652***	
	(0.16)		(0.13)	(0.19)	
Constant	1.575***	1.608***	1.563***	2.783***	1.565***
	(0.31)	(0.42)	(0.23)	(0.34)	(0.30)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	19252	13090	17048	17739	11593
R-squared	0.068	0.057	0.562	0.048	0.578
Coefficient Test					
Austria=France	0.058	0.064	0.545	0.032	0.593
Austria=Italy	0.000	0.001	0.000	0.006	0.001
Austria=Spain	0.000	0.000	0.037	0.000	0.083
France=Italy	0.022	0.029	0.000	0.803	0.000
France=Spain	0.000	0.000	0.062	0.004	0.079
Italy=Spain	0.002	0.005	0.040	0.001	0.037

Notes: *, **, *** denote significance at the 10, 5, and 1%, respectively. Standard errors are clustered at individual level. “Not Confident” is defined as individuals who answered “Not at All” or “Not Very” to the question: “How confident, if at all, are you that the [country’s] Monetary Authority is currently pursuing the correct policies in order to achieve price stability (i.e., inflation around 2%) over the medium term (i.e., the next 3 - 5 years)?” The variable “Gov. Mistrust” is defined as those who “Strongly Disagree” or “Tend To Disagree” with the statement “I think that the government is currently following the right economic policies for [my country]”. Mistrust*Right Wing is the interaction between Right Wing and Gov. Mistrust. Not Conf*[Country] is the interaction between “Not Confident” and the country. The baseline is the response from middle-aged males living in Germany in Survey 3 who say that they are “Fairly Confident” or “Very Confident” in the Central Bank and do not “Strongly Disagree” or “Tend To Disagree” with the statement “I think that the government is currently following the right economic policies for [my country]”.

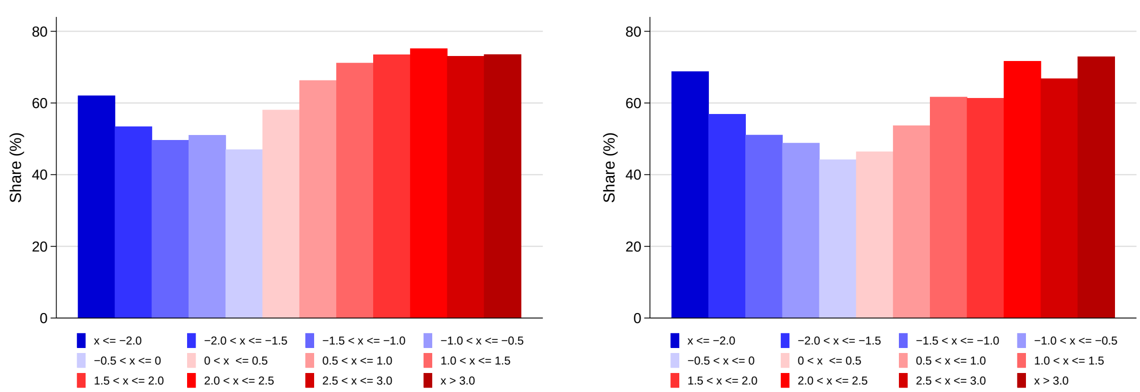
Figure A.13. Confidence Level Shares By Distance from Inflation Target



(a) Short Run

(b) Medium Run

Figure A.14. Confidence Level Shares By Distance from Inflation Target



(a) Short Run

(b) Medium Run