# Nominal Rigidities, Rational Inattention, and the Optimal Price Index Stabilization Policy[*]

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**Abstract**

The Optimal Price Index (OPI) stabilization policy traditionally assigns *greater* importance to stabilize prices in sectors with stickier prices based on multi-sector models with full information or exogenous information frictions. The current paper challenges this prevailing policy prescription by introducing rational inattention. Surprisingly, the OPI attaches a *smaller* weight to a sector with stickier prices. This counterintuitive result stems from the *endogenous* relationship between attention and nominal rigidities: firms in sectors with more flexible prices pay less attention to macroeconomic conditions. We provide empirical evidence that supports this mechanism.

Keywords: Sticky Prices, Endogenous Information Acquisition, Price Index Stabilization, Optimal Policy

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# 1 Introduction

High inflation, such as the ongoing one associated with the Covid-19 crisis, harms social welfare. There is a consensus among policymakers and academic researchers that the stabilization of inflation should be one of the primary mandates of central banks. However, there remains a debate about which inflation index central banks should stabilize. Within the policy circle, policymakers have been tracking the Consumer Price Index (CPI), which is defined as the inflation index weighted by consumption weights (or sizes of sectors). Academic researchers, however, have suggested that the optimal price index should consider sectoral heterogeneities, such as the heterogeneous degrees of frequency of price adjustment observed in the data (Aoki 2001, Benigno 2004 and Mankiw and Reis 2003). Specifically, these papers advocate a price index that attaches a *bigger* weight to a sector with stickier prices. We refer to this as the Stickiness-adjusted Price Index (SPI).

This paper studies the optimal price index (OPI) policy. In contrast to conventional wisdom, our model suggests an OPI that assigns a *smaller* weight to a sector with stickier prices. The stabilization of SPI results in higher welfare loss compared to simple CPI stabilization. The key to our findings is the presence of information frictions and the *endogenous* relationship between attention and nominal rigidities: firms in sectors with more flexible prices pay less attention to macroeconomic conditions. We provide direct empirical evidence that supports this mechanism.

More in detail, we consider the OPI policy in a multi-sector economy with nominal rigidities and rational inattentive firms. Monopolistic competitive firms that operate and set prices in different sectors are subject to unobserved sector-specific supply shocks. Firms observe noisy signals about the state (sectoral supply shocks) of the economy. The signals are idiosyncratic, which gives rise to dispersed beliefs. Importantly, following the rational inattention literature (Sims 2003 and Mackowiak and Wiederholt 2009), the precision of the signal is an endogenous choice: firms choose the optimal amount of information by balancing the cost of processing information with its benefit. Firms are subject to nominal rigidities in addition to information frictions. Specifically, only a fraction of firms are allowed to set their prices optimally. The remaining fraction of firms are staggered with their previous prices. The degree of nominal rigidities — fraction of price-staggered firms — is heterogeneous across sectors. The two frictions give rise to price dispersions that harm social welfare. First, dispersed beliefs lead to price dispersions among price-resetting firms. This is called the dispersed belief price dispersion component. Second, there is a price dispersion across the types of firms: price-staggered and price-resetting firms. This is called the Calvo price dispersion component. The current paper highlights the interaction of the two frictions that have been shown separately by the empirical literature to be relevant in the data. See, for example, Nakamura and Steinsson (2008) and Gorodnichenko and Weber (2016) for the heterogeneous *infrequent* price adjustment across sectors, and Coibion and Gorodnichenko (2015) and Andrade et al. (2016) for information frictions and the dispersed beliefs that can arise due to rational inattention.[1]

We emphasize the importance of joint consideration of nominal rigidities and endogenous information choice. Proposition 2 shows that firms in a sector with more flexible prices pay less attention to macroeconomic conditions. This result suggests that sectors with less nominal frictions are associated with more severe information frictions due to firms' endogenous choices. The intuition for the interaction of two frictions is as follows. Firms know their types, i.e., whether they can adjust prices. In response to a shock, price resetting firms in a sector with more flexible prices adjust prices to a lesser extent. Firms' responsiveness to shocks is proportional to the marginal benefit of acquiring information. In the extreme case when firms desired prices react very little to the unobserved state of the economy, the benefit of acquiring information is limited. Therefore, price flexibility reduces firms' incentive to obtain more information.

The model prescribes an OPI that challenges conventional wisdom due to the endogenous relationship between nominal frictions and information choice. The baseline model can be adapted to feature full information and exogenous information frictions with minimal modifications. We illustrate that the conventional wisdom holds in a model with full information (Benigno 2004) or exogenous information frictions (Ou et al. 2021): the OPI attaches a *bigger* weight to a sector with stickier prices. In contrast, when the amount of information firms acquire is an endogenous choice, Figure 2 and Proposition 4 demonstrate that the OPI can be altered *qualitatively*: it attaches a *smaller* weight to a sector with stickier prices.

The dispersed belief price dispersion component drives the result. Consider an economy under CPI stabilization. Proposition 5 shows that the dispersed belief price dispersion component *increases* in a sector's degree of nominal rigidities if information frictions

[1]Note that nominal rigidities in this paper refer to infrequent price adjustments. This is different from a separate literature where nominal frictions arise due to information frictions; see, for example, Angeletos et al. (2016) and Mankiw and Reis (2002). The joint consideration of information frictions and infrequent price adjustment frictions exists in the literature; see, e.g., Nimark (2008) and Ou et al. (2021) for different purposes.

are exogenous. In contrast, when information is an endogenous choice, the dispersed belief price dispersion component *decreases* in the degree of nominal rigidities. In other words, the dispersed belief price dispersion component in a relatively flexible price sector plays an increasingly important role when information is endogenous, making stabilizing prices in a relatively flexible price sector more important.

Using the model as a laboratory, we evaluate the performance of the CPI stabilization. As a comparison, the performance of the SPI stabilization is also evaluated. The SPI corresponds to the optimal price index computed in an otherwise equivalent model, assuming full information. Surprisingly, the stabilization of CPI is associated with a smaller social welfare loss in our model than the stabilization of SPI. Moreover, the paper also discusses how monetary policy shapes firms' endogenous attention choices.

We present empirical evidence that supports the key mechanism of the paper. Following Song and Stern (2022) and Flynn and Sastry (2022), we use the frequency of macroeconomic keywords in the firms' annual reports as a proxy for firms' attention to macroeconomic conditions. To this end, we use about 200,000 U.S. public companies' annual reports on Form 10-K and calculate the frequency of macroeconomic keywords mentioned by dividing the number of occurrences by the total number of words in each report. The firm-level attention data is aggregated into NAICS 6-digit level to study its correlation with the frequency of price adjustment constructed by Pasten, Schoenle, and Weber (2020). The data confirms the key mechanism highlighted in Proposition 2: firms in sectors with more flexible prices pay less attention to macroeconomic conditions.

**Literature Review** Our paper highlights the interaction between nominal frictions and endogenous information choice, which has important policy implications as it qualitatively alters the optimal price index stabilization policy. In doing so, the paper contributes to three strands of literature.

The first strand of literature examines optimal price index stabilization policy. Aoki (2001), Mankiw and Reis (2003), Benigno (2004) explore the implications of the heterogeneity in the degree of nominal rigidity for the design of optimal price index. Subsequent works introduce additional features to revisit the optimal price index, such as the input-output structure (Huang and Liu 2005 and Rubbo 2022), the incomplete financial market (Anand, Prasad, and Zhang 2015), the capital accumulation (Basu and Leo 2016), and exogenous information frictions (Ou et al. 2021). Our analysis differs from previous literature by introducing endogenous information. The newly introduced mechanism leads to *qualitatively* different policy implications.

The second strand of literature investigates the implications of rational inattention for the conduct of monetary policy. For example, Mackowiak and Wiederholt (2009), Afrouzi and Yang (2021), and Yang (2022) examines the implications of rational inattention to the effects of monetary policy. Paciello and Wiederholt (2014) and Li and Wu (2016) investigate the design of optimal monetary policy. Particularly, Paciello and Wiederholt (2014) studies a *one-sector* economy with *flexible prices* and finds that a strict price stabilization policy is even optimal in response to markup shocks if the price-setting firms are rational inattentive.[2] We consider a *multi-sector* setting with *sticky prices*. The multi-sector feature of the model allows us to investigate firms' heterogeneous information choices resulting from heterogeneous nominal rigidities that ultimately lead to surprising policy recommendations.

The third strand of literature highlights the implications of sector heterogeneities for the effects of monetary policy: see, for example, Alvarez, Lippi, and Oskolkov (2022), Carvalho (2006), Carvalho and Schwartzman (2015), Carvalho, Dam, and Lee (2020), Gautier and Bihan (2018), Höynck, Li, and Zhang (2022), Nakamura and Steinsson (2008), and Pasten, Schoenle, and Weber (2020). Our paper illustrates that exogenous sector heterogeneities can lead to endogenous sector heterogeneities in the degree of information frictions, which have relevant policy implications.

# 2 Model

The model consists of three types of agents: a representative household, a central bank, and firms. The household makes decisions regarding consumption and labor supply, with the optimization of consumption giving rise to the demand curve faced by firms. Labor is the unique factor of production for firms. The central bank commits to stabilizing a price index.

[2]Our paper focuses on firms' endogenous information choice and firm heterogeneities. The paper is related to a parallel literature that studies household information choice and heterogeneity: see, for example, Broer, Kohlhas, Mitman, and Schlafmann (2022), Gaballo (2016), Luo et al. (2017), Tutino (2013), Yin (2021), and Luo, Nie, and Yin (2022). More broadly, the paper is related to the literature that studies the implications of rational inattention for macroeconomics following the seminal work of Sims (2003): see, e.g., Luo (2008), Van Nieuwerburgh and Veldkamp (2010), Mondria (2010), Matějka and McKay (2012), Maćkowiak and Wiederholt (2015), Pasten and Schoenle (2016), Matějka (2016), Stevens (2020), Zorn (2020), Ellison and Macaulay (2021), Miao, Wu, and Young (2022), Ilut and Valchev (2023), and Turen (2023). See also Maćkowiak, Matějka, and Wiederholt (2023) for a literature review and Veldkamp (2023) for a textbook treatment of the topic.

Firms in the model produce differentiated goods and operate in monopolistic competitive markets. There are two sectors in the economy indexed by $k$, and firms that operate in different sectors are heterogeneous in productivity and degree of nominal rigidity. Monopolistic competitive firms set prices without fully observing the level of productivity in each sector due to information frictions. Firms are assumed to be inattentive to publicly available information due to the cost of paying attention.

Importantly, the precision of the signals that firms receive, or in other words, the degree of information frictions that firms face, is an endogenous choice in the model. The key novel insight of the paper is to illustrate that heterogeneous nominal frictions matter for endogenous information choice, which in turn alters the optimal monetary policy prescription. Given the importance of firms in the model, we begin with the description of their problems.

## 2.1 Model Setup

**Firms** Firms in the model face two frictions: information frictions and nominal frictions. The nominal frictions are introduced to reflect the infrequent price adjustments observed in the data. We assume that a fraction of firms $(1-\theta_k)$ in sector $k$ have the freedom to change their prices, while the remaining firms $(\theta_k)$ are unable to do so. Firms know their types, i.e., they know whether they can adjust prices.

A firm $i$ in sector $k$ (referred to as firm $ki$) produces differentiated goods $(Y_{ki})$ using the following production function:

$$Y_{ki} = A_k L_{ki}. \tag{2.1}$$

Price resetting firms choose their prices and their attention to macroeconomic conditions (i.e. sectoral productivities) simultaneously to maximize expected profits. We first obtain firms' optimal price setting rules given the information/signals firms have chosen and then turn to firms' optimal attention problem.

Given the information set of a firm $i$ in sector $k$, a re-optimizing firm chooses an optimal price to maximize its own expectation of profits:

$$\max_{P_{k,i}} E\left[\left(P_{ki}Y_{ki} - W_k L_{ki}\right)|I_{ki}\right], \tag{2.2}$$

where $E$ denotes the expectation operator, $I_{ki}$ denotes the information set of the firm $ki$,

$P_{ki}$ and $Y_{ki}$ are the price and quantity of goods produced by the firm, and $W_k L_{ki}$ is the labor income. This profit maximization problem gives rise to the optimal price resetting rule:

$$p^*_{ki} = E[p^\diamond_{ki} | I_{ki}], \tag{2.3}$$

where a small letter denotes the log deviation of the variable from its initial value at the non-stochastic solution. $p^\diamond_{ki}$ denotes the profit-maximizing price of firm $ki$ had this firm fully observed the states of the world (Mackowiak and Wiederholt 2009):

$$p^\diamond_{ki} = p + x + u_k, \tag{2.4}$$

where $x = y - y^N$ is the output gap, $y^N \equiv n_1 a_1 + n_2 a_2$ is the natural output defined as the level of output that would prevail in the absence of nominal and information frictions.[3] $n_1$ and $n_2$ indicate the sizes of the two sectors, $u_1 = n_1(a_2 - a_1)$ and $u_2 = n_2(a_1 - a_2)$. We consider the case where the size of the two sectors is the same, i.e., $n_1 = n_2 = 0.5$ to exclude heterogeneity that arises from sector sizes and to focus our analysis on heterogeneous nominal frictions. As a result, $u = u_1 = -u_2 = 0.5(a_2 - a_1)$, which captures the asymmetric nature of sectoral shocks.

Firms do not observe $a_1$ and $a_2$. Instead, a firm $ki$ has access to a pool of information about unobserved states. Before delving into firms' decisions on how much attention to allocate to a particular signal, let's first discuss *which* signals are relevant for firms.

To this end, consider a general signal structure:

$$\boldsymbol{s}^*_{ki} = \boldsymbol{M}^*_k \boldsymbol{a} + \boldsymbol{e}^*_{ki} \tag{2.5}$$

where $\boldsymbol{a} = (a_1, a_2)'$ is the vector of sectoral shocks with a variance-covariance matrix $\boldsymbol{\Sigma}_{aa}$, $\boldsymbol{s}^*_{ki} = (s_{ki,1}, s_{ki,2})'$ is the vector of signals, and $\boldsymbol{M}^*_k$ is a $2 \times 2$ matrix representing the weights of these shocks. The vector of observational errors, $\boldsymbol{e}^*_{ki} = (e^*_{1,ki}, e^*_{2,ki})'$, is a 2-dimensional Gaussian vector, and its variance-covariance matrix is $\Sigma^*_{e,k}$.

The information structure is general: firms have access to a continuum of signals—the information pool—with the functional form 2.5 for any $\boldsymbol{M}$ and $\Sigma^*_{e,k}$. Our paper focuses on firms' decisions regarding the aggregate *amount of information*, which will be defined later, that they acquire. Given the richness of the information pool, in addition to their decisions on the amount of information, firms need to decide which signals to focus on to

[3]Detailed derivation can be found in Appendix B.1.

allocate their attention.

To ease the notation burden, at this point, we anticipate a result of the paper that will be shown in Section 2.2. Specifically, latter, Proposition 1 shows that a firm $ki$ optimally chooses to allocate its attention to one signal of the following form:

$$s_{ki} = u + e_{ki}, e_{ki} \sim N(0, \sigma_{e,k}^2). \tag{2.6}$$

We now proceed with the description of the model to anticipate this finding. However, readers should be aware that our findings are derived under the general information structure 2.5. The intuition for this result is that, in our model, $u$ is the sufficient unobserved state that determines firms' profits. Therefore, to maximize profit, it is sufficient for firms to allocate attention exclusively to $s_{ki}$.

This signal $s_{ki}$ characterizes the information set of the firm. Importantly, the degree of noise ($\sigma_{e,k}^2$) contained in the signal is an endogenous choice that we will now discuss.

Following Mackowiak and Wiederholt (2009) and Mackowiak et al. (2009), we transform the profit maximization problem into a minimization problem where the objective function is the profit loss plus the cost of paying attention. The details can be found in Appendix B.2. As a result, the attention choice problem in sector $k$ becomes:

$$\min_{\kappa_k} E\left[\frac{\epsilon - 1}{2}(p_{ki}^{\diamond} - p_{ki}^{*})^2\right] + \lambda f(\kappa_k) \tag{2.7}$$

subject to the constraint on information flow $I(\sigma_u^2, \hat{\sigma}_{uk}^2)$:

$$I(\sigma_u^2, \hat{\sigma}_{uk}^2) \leq \kappa_k, \tag{2.8}$$

where $\hat{\sigma}_{uk}^2 = var(u|s_{ki}) = E[(u - E[u|s_{ki}])^2|s_{ki}]$ is the posterior variance and $\epsilon$ measures the curvature of the demand curve faced by firms that will be introduced in the household's problem. $\kappa_k$ is the control variable that measures the *amount of information* firms in sector $k$ acquire. $f(\kappa_k)$ indicates a cost function, and $\lambda$ is a key parameter that characterizes the cost of information acquisition, hence determining the degree of information frictions in the economy. According to the information theory:

$$I(\sigma_u^2, \hat{\sigma}_{uk}^2) = \frac{1}{2}\log_2\left(\frac{\sigma_u^2}{\hat{\sigma}_{uk}^2}\right). \tag{2.9}$$

$I(\sigma_u^2, \hat{\sigma}_{uk}^2)$ measures the amount of information contained in $s_{ki}$ as the difference between unconditional uncertainty (measured by entropy) and conditional uncertainty.

For a given choice of information flow constraint $k_k$, equations (2.8) and (2.9) determines the precision of the signal $s_{ki}$ that firms observe. Firms' endogenous attention choice is modeled as the minimization problem described by (2.7) subject to the constraint on information flow and the two equations that characterize firms' price setting behavior (2.3) and (2.4).

Once firms have determined their optimal attention choices (precisions of $s_{ki}$), they update their beliefs using Bayes' rule:

$$E(u|s_{ki}) = K_k s_{ki}, \tag{2.10}$$

where $K_k \equiv \frac{\sigma_u^2}{\sigma_u^2 + \sigma_{e,k}^2}$ denotes the Kalman gain. It is important to note that in firms' attention choice, choosing the constraint on information flow $k_k$, conditional uncertainty $\hat{\sigma}_{uk}^2$, precision of the signal $1/\sigma_{e,k}^2$, or the Kalman gain $K_k$ are equivalent.

**Household** The representative household's utility is influenced by consumption and labor supply. The utility function is represented as:

$$U(C, \{L_k\}) = log(C) - \sum_{k=1}^{2} L_k, \tag{2.11}$$

where $L_k$ is the labor supply to sector $k$, and

$$C \equiv \left[ \sum_{k=1}^{2} n_k^{1/\eta} C_k^{(\eta-1)/\eta} \right]^{\eta/(\eta-1)} \tag{2.12}$$

is the aggregate consumption. $\eta$ reflects the elasticity of substitution across sectors.

$$C_k \equiv \left[ n_k^{-1/\epsilon} \int_{n_k} C_{k,i}^{(\epsilon-1)/\epsilon} di \right]^{\epsilon/(\epsilon-1)} \tag{2.13}$$

with $\epsilon$ measuring the elasticity of substitution within a sector.

The consumer's income comes from various sources, including wages earned from labor supply ($W_k L_k$) in sector $k$, profits from firms ($\sum_{k=1}^{2} \Pi_k$), and a lump-sum transfer or tax received from the government ($T$). The budget constraint can be expressed as:

$$PC = \sum_{k=1}^{2} W_k L_k + \sum_{k=1}^{2} \Pi_k + T, \tag{2.14}$$

where $P \equiv \left(\sum_{k=1}^{2} n_k P_k^{1-\eta}\right)^{1/(1-\eta)}$ and $P_k \equiv \left(\int_0^1 P_{k,i}^{1-\epsilon} di\right)^{1/(1-\epsilon)}$ represent the aggregate prices.

The consumer optimally determines their demand for the variety $i$ within sector $k$ ($C_{k,i}$) and across sectors ($C_k$) as follows:

$$C_{k,i} = \left(\frac{P_{k,i}}{P_k}\right)^{-\epsilon} \frac{1}{n_k} C_k \qquad C_k = \left(\frac{P_k}{P}\right)^{-\eta} n_k C \tag{2.15}$$

**Monetary Policy** Following the literature on optimal price index stabilization, as discussed in, for example, Woodford (2011a), we assume the central bank conducts a price index stabilization policy. This policy gives the central bank the capacity to stabilize a specified aggregate price index. Specifically, the policy is formulated as:

$$\omega p_1 + (1-\omega) p_2 = 0 \tag{2.16}$$

Here, the central bank's control variable is the price index $\omega p_1 + (1-\omega)p_2$, and the central bank's choice of weight $\omega$ plays a crucial role. Intuitively, $\omega$ and $1-\omega$ indicate the weights attached to sector 1 and sector 2's prices, respectively.

Within the framework of the price index stabilization policy, we examine three distinct policies. The first is referred to as the Consumer Price Index (CPI) stabilization policy and is represented by $\omega = n_1$. The second is the Optimal Price Index (OPI) stabilization policy, in which $\omega$ is optimally selected to minimize the ex-ante (unconditional) expected welfare loss in the model with information and nominal frictions. The third is the Sticky Price Index (SPI) stabilization policy. According to the SPI stabilization policy, the central bank computes the $\omega$ to minimize the ex-ante expected welfare loss in the model with nominal rigidities but without information frictions ($\sigma_{e,k}^2 = 0$).

The welfare loss function is derived as the second-order approximation of the household's utility function:

$$E\mathbb{L} = E\Big[\epsilon \sum_{k=1}^{2} n_k \int_i (p_{ki} - p_k)^2 di + \sigma x^2 + \eta n_1 n_2 (\widetilde{p}_1 - \widetilde{p}_2)^2\Big], \tag{2.17}$$

where $\widetilde{p}_k \equiv p_k - p_k^N$. $E\mathbb{L}$ denotes the expected welfare loss expressed as a fraction of steady-state consumption (up to additive terms independent of policy). Note that the expectation is taken unconditionally to reflect that the central bank needs to make a policy decision, i.e., choose the price index, before the realization of shocks and signals.

## 2.2 Solution of the Model

**Timing of the Model** The model consists of four stages. In the first stage, the central bank decides on the inflation index to stabilize, represented by $\omega$. In the second stage, the fundamental shock $u$ is drawn by nature. During the third stage, nature selects firms that are allowed to adjust their prices. These firms adjust their prices, simultaneously decide on their level of attention, and receive a signal $s_{ki}$ about the fundamental shock. Firms' price-setting rules determine their supply curve in the goods market. Finally, in the fourth stage, the representative household observes the state of the economy and makes consumption and labor decisions, while the goods and labor markets are cleared.

**Solution Method** The solution for a given choice of price index stabilization rule $\omega$ is obtained as follows. First, solve the model for given precisions of signals to obtain the pricing functions governed by the Kalman gains. Then, substitute the pricing functions to the firms' attention choice problem and solve for the optimal attention choice.

Specifically, given the precision of firms' signals, we conjecture the following policy functions:

$$p_{1i}^* = \varphi_1 E(u|s_{1i}) \quad p_{2i}^* = -\varphi_2 E(u|s_{2i}) \quad x = \phi_x u, \tag{2.18}$$

where firms update their beliefs according to (2.10). The conjectured solution is motivated by the fact that the solution must be linear in a linear model, and firms' optimal actions are linear functions of their perceived state of the world.

The policy functions must satisfy firms' price-setting rules (2.3), the belief updating rule (2.10), and the monetary policy rule (2.16). Therefore, the solution must satisfy the following equations that characterize firms' responsiveness to shocks:

$$\varphi_1 = \frac{2(1-\theta_2)(1-\omega)K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}, \tag{2.19}$$

$$\varphi_2 = \frac{2(1-\theta_1)\omega K_1}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}, \tag{2.20}$$

and $\phi_x = \frac{(1-\theta_2)(1-\omega)K_2-(1-\theta_1)\omega K_1}{(1-\theta_2)(1-\omega)K_2+(1-\theta_1)\omega K_1} - \frac{(1-\theta_1)(1-\theta_2)(1-\omega)-(1-\theta_1)(1-\theta_2)\omega}{(1-\theta_2)(1-\omega)K_2+(1-\theta_1)\omega K_1} K_1 K_2$. Equations (2.18) and (2.4) imply that $p^{\diamond}_{ki} = \varphi_k u$ for $k = 1, 2$.

With policy functions and the information flow constraint (2.8), the attention choice problem (2.7) can be rewritten as:

$$\max_{\kappa_k} -\frac{(\epsilon-1)}{2}\varphi_k^2 2^{-2\kappa_k}\sigma_u^2 - \lambda f(\kappa_k). \tag{2.21}$$

In the baseline model, following Paciello and Wiederholt (2014), we assume an exponential cost function $f(\kappa_k) = 2^{2\kappa_k}$ because of its analytical convenience. Our findings are robust to alternative cost functions.

The optimal attention choice is associated with the following amount of attention ($\kappa_k$):

$$\kappa_k = \max\left(\frac{1}{2}\log_2\left(\frac{(\epsilon-1)\varphi_k^2\sigma_u^2}{2\lambda}\right)^{\frac{1}{2}}, 0\right) \tag{2.22}$$

Accordingly, the optimal conditional uncertainty and Kalman gain can be written as :

$$\hat{\sigma}_{uk}^2 = min\left\{\left(\frac{2\lambda\sigma_u^2}{(\epsilon-1)\varphi_k^2}\right)^{\frac{1}{2}}, \sigma_u^2\right\}, \tag{2.23}$$

$$K_k = \max\left\{1 - \left(\frac{2\lambda}{(\epsilon-1)\varphi_k^2\sigma_u^2}\right)^{\frac{1}{2}}, 0\right\}. \tag{2.24}$$

Note that the amount of attention $\kappa_k$ and the Kalman gains ($K_k$) must be positive.

Finally, we obtain the a system of equations for $\varphi_1$ and $\varphi_2$ by substituting equation (2.24) to (2.19) and (2.20).

To understand the parameters that determine the degree of information frictions, it is useful to introduce the following definition:

$$K^s \equiv 1 - \left( \frac{2\lambda}{(\epsilon - 1)\sigma_u^2} \right)^{\frac{1}{2}}. \tag{2.25}$$

$K^s$ represents the Kalman gain selected by firms in a counterfactual symmetric economy with $\theta_1 = \theta_2$ and $\omega_1 = 0.5$. The analytical expression (2.25) indicates that the degree of information frictions is proportional to the cost of information acquisition: $K^s$ decreases as $\lambda$ increases.

**The Welfare Loss and its Sub-components** Given the solution of the model, the calculation of social welfare loss according to (2.17) is straightforward. Among all components of the welfare loss function, the price dispersion component is the quantitatively relevant component (see, e.g., Woodford 2011b and Galí 2015). The key mechanisms that we highlight in this paper work through this component. The price dispersion component can be decomposed into the Calvo price dispersion and Dispersed-belief price dispersion components:

$$\underbrace{\epsilon \sum_{k=1}^{2} n_k \int_i (p_{ki} - p_k)^2 di}_{\text{Price dispersion}} = \underbrace{\epsilon \sum_{k=1}^{2} n_k (1 - \theta_k)\theta_k E[p_k^{*2}]}_{\text{Calvo price dispersion}} + \underbrace{\epsilon \sum_{k=1}^{2} n_k (1 - \theta_k) E\left( \int_i (p_{ki}^* - p_k^*)^2 di \right)}_{\text{Dispersed-belief price dispersion}}.$$

The results presented in this paper are derived based on the fully micro-founded welfare loss function (2.17). However, the discussions in the remaining of the paper are centered around the price dispersion component given its relevance.

**The Optimal Choice of Signals** To ease the presentation of the model, we have anticipated the finding that, in the model, firms choose to allocate attention to one signal, equation 2.6, out of a continuum of signals 2.5. We now establish this result.

**Proposition 1.** *Consider the economy described above with a general signal structure where firms have access to a continuum of signals of the functional form:* $\boldsymbol{s}_{ki}^* = \boldsymbol{M}_k^* \boldsymbol{a} + \boldsymbol{e}_{ki}^*$ *for any* $\boldsymbol{M}_k^*$ *and variance-covariance matrix* $\Sigma_{e,k}^*$*. A firm ki optimally chooses to narrow its attention to one signal:* $s_{ki} = u + e_{ki}, e_{ki} \sim N(0, \sigma_{e,k}^2)$.

*Proof.* See Appendix C.1. □

The intuition for this result is that, in our model, $u$ is the sufficient unobserved state that determines firms' profits, as observed in the solution of the model 2.18. Other signals, other linear combinations of $a_1$ and $a_2$, are only useful to the extent that they can be informative about $u$. Therefore, focusing on $s_{ki}$ is sufficient to minimize firms' profit losses.

The remainder of the paper focuses on firms' choices of $\kappa_k$, i.e., $\sigma^2_{e,k}$. To clarify the terminology used in this paper, the term "attention allocation" refers to firms' choice of the amount of information $\kappa_k$ (or $\sigma^2_{e,k}$).

# 3 The Key Mechanism: Attention Allocations and Nominal Rigidity

The endogenous relationship between nominal rigidities and attention allocation is the key to the results presented in the next section. The following proposition summarizes the key mechanism.

**Proposition 2.** *Consider the economy described above, the responsiveness of prices to shocks ($\varphi_k$) and the amount of information ($\kappa_k$) acquired by firms in sector $k$ increase with $\theta_k$, for any given monetary policy rule $\omega \in (0, 1)$. That is, $\frac{\partial \varphi_k}{\partial \theta_k} > 0$, $\frac{\partial \kappa_k}{\partial \theta_k} > 0$, and $\frac{\partial \sigma_{e,k}}{\partial \theta_k} < 0$ for a fixed $\omega$.*

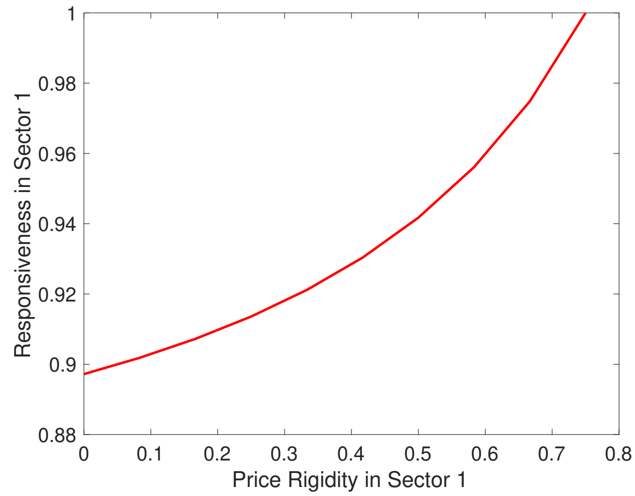
*Proof.* See Appendix C.2. □

The main takeaway is that firms operating in a sector with *stickier prices* tend to pay *more attention* when they are allowed to adjust prices.

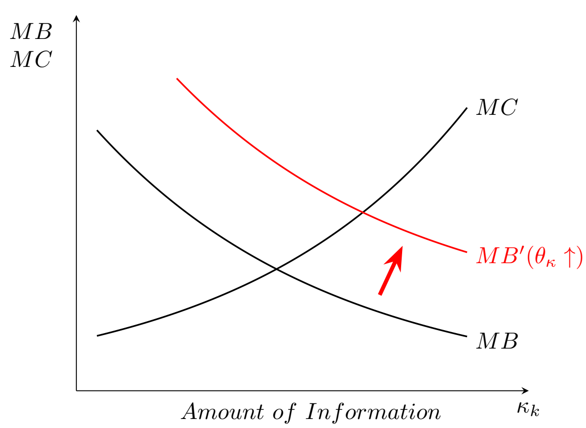
To understand how nominal rigidities affect attention choice, it is important to note that in a sector with stickier prices, re-optimizing firms respond more to the perceived state of the economy, i.e., $\frac{\partial \varphi_1}{\partial \theta_1} > 0$. This result is confirmed by Figure 1a, which plots the solution in the model $\varphi_1$ as a function of $\theta_1$. The underlying intuition is as follows. A positive productivity shock in Sector 2 ($u$ increases) increases aggregate consumption and spills over to Sector 1 as a positive demand shock. In NK models, the effects of demand shocks on the real output gap ($x$) are directly influenced by the degree of nominal rigidity ($\theta_1$): a higher value of $\theta_1$ corresponds to a larger response of $x$ to an increase in $u$.[4] The latter can be verified by the solution for $x$, see equation 2.18 and the expression for $\phi_x$.

[4]This feature holds independent of information frictions. With full information, it can be analytically demonstrated that $\varphi_1$ and $\varphi_x$, the expression beneath equation 2.19, increase as $\theta_1$ rise.

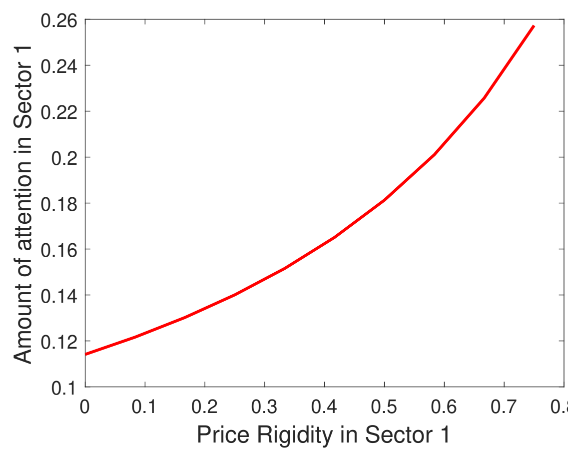
**Figure 1:** Illustration of Proposition 2




**(a)** Responsiveness ($\varphi_k$) and $\theta_k$




**(b)** Marginal Benefit of Attention and $\theta_k$




**(c)** Amount of information ($\kappa_k$) and $\theta_k$

Note: This figure illustrates how nominal rigidities ($\theta_1$) affect information choice ($\kappa_1$ and $\hat{\sigma}_{u,1}$). Panel (b) is a simple example that illustrates how $\theta_1$ affects the marginal benefit (MB) of acquiring information in partial equilibrium. Panels (a) and (c) plot the solutions of a calibrated model. Specifically, Panel (a) and (c) plot the responsiveness $\varphi_1$ and the information choice $K_1$ as a function of $\theta_1$, respectively. The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is set to 0.049, aligning $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3).

Consequently, price re-setting firms in Sector 1 exhibit greater adjustments in prices, as inferred from their respective price-setting rules 2.3 and 2.4. It is important to note that while re-optimizing firms display heightened sensitivity to shocks, it does not imply that the *aggregate* price of the sector becomes more responsive. In fact, a higher value of $\theta_1$ is associated with a decreased sensitivity of $p_1$ to shocks.

Furthermore, the more sensitive firms' prices are to the perceived state of the economy, the higher the marginal benefit of acquiring information. In fact, for firms in sector 1, the marginal benefit (MB) of acquiring information, which can be easily derived from (2.21), is proportional to $\varphi_1$. This relationship is shown graphically in Figure 1b, where the MB curve shifts upwards with higher nominal rigidities ($\theta_k \uparrow$). The marginal cost (MC) curve, on the other hand, is not affected by nominal rigidities. Therefore, in the equilibrium, firms operating in a sector with stickier prices pay more attention when they are allowed to adjust prices. This is evidenced by $\frac{\partial \kappa_1}{\partial \theta_1} > 0$ and $\frac{\partial \hat{\sigma}_{u,1}}{\partial \theta_1} < 0$, as shown in Figure 1c. Moreover, by paying more attention to economic conditions, firms are also subject to a less volatile noise shock, leading to $\frac{\partial \sigma_{e,1}}{\partial \theta_1} < 0$.[5]

**Discussion: Alternative Information Cost Function** Before moving to the paper's main results, we discuss the generality of our findings with respect to the assumed information cost function.

As mentioned above, we have adopted an exponential form $f(\kappa_k) = 2^{2\kappa_k}$ proposed by Paciello and Wiederholt (2014), which permits analytical solutions and is important for the derivations of Propositions presented in this paper. The cost function alters the marginal cost curve. The mechanism we emphasize relies on the marginal benefit of acquiring information, and thus the qualitative insights of our paper are not altered by the specific form of the cost function.

To provide further robustness to our findings, in subsequent analysis, we also consider a linear cost function $f(\kappa_k) = \kappa_k$ as it is conventionally assumed in the literature. With this alternative cost function, the endogenously chosen Kalman gains are determined by the following equation:

$$K_k = max \left\{ 1 - \frac{\lambda}{ln(2)(\epsilon - 1)\varphi_k^2 \sigma_u^2}, 0 \right\}. \tag{3.1}$$

The numerical results presented in Section 4 demonstrate that our findings are robust to the choice of the alternative cost function. Specifically, we compare the policy implications based on a model with an exponential cost function associated with the Kalman

[5] Mackowiak and Wiederholt (2009) and Hellwig and Veldkamp (2009) show that changes in price complementarity alter firms' attention allocation to aggregate conditions. Our model can replicate this well-known finding too.

gains determined by Equation (2.24), and a model with a linear cost function associated with the Kalman gains determined by Equation (3.1).

# 4 The Implications for the Price Stabilization Policy

The existing literature suggests that the central bank should assign less weight to sectors with relatively more flexible prices. This section presents results that challenge this conclusion, based on the endogenous relationship between nominal rigidities and attention choice highlighted in Proposition 2. The proposed mechanisms suggest that the central bank should actually attach more weight to sectors with relatively more flexible prices.

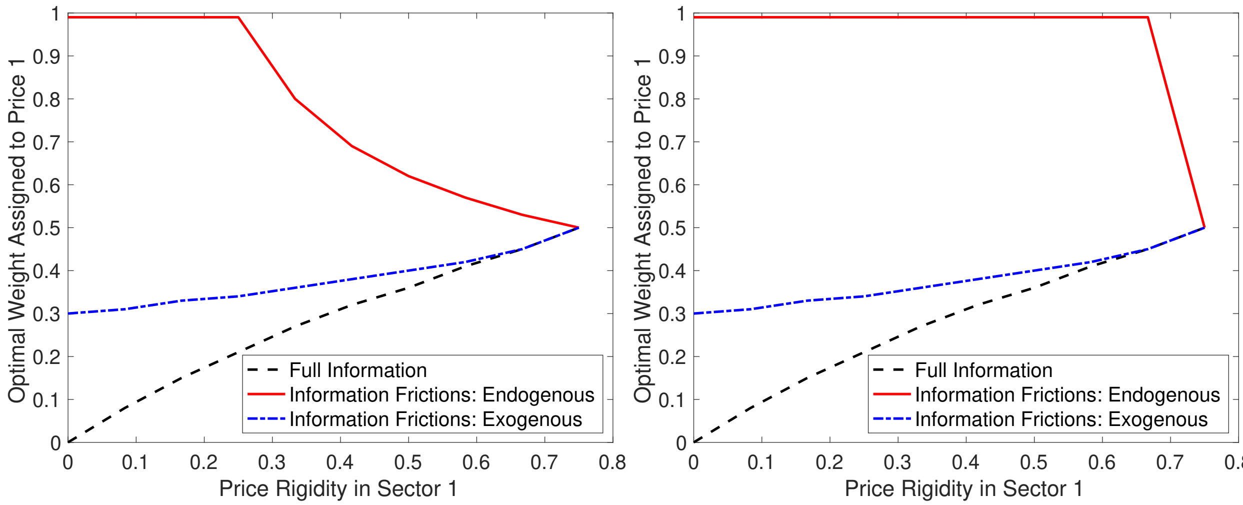
## 4.1 Policy Implication 1: The Optimal Weight Increases with Price Flexibility

We now present the main findings.

**The Optimal Price Index** Figure 2 presents the paper's main finding. It shows the optimal price index stabilization, i.e., the optimal $\omega$, as a function of $\theta_1$ for three alternative models. We fix all the other parameters of the model, including the degree of nominal rigidity in sector 2 ($\theta_2 = 0.75$). We compare the prediction of our baseline rational inattention model (red line) with models assuming full information (black dashed line) and exogenous information frictions (blue dotted line). Panels (a) and (b) present the results under the assumption of an exponential and a linear cost function, respectively. The cost function is a feature of the rational inattention model only, therefore, only the red line is affected across the two panels.

The figure can be read from the right end of the horizontal axis to the left. The point where three curves coincide is the scenario where $\theta_1 = \theta_2 = 0.75$. Under this scenario, sectors are symmetric in all characteristics except that they are subject to asymmetric shocks. As a result, the optimal policy assigns an equal weight ($\omega = 0.5$) to both sectors across the three models considered. As $\theta_1$ decreases (from the right end of the horizontal axis to the left), sectors become more and more heterogeneous in nominal rigidities, which results in an optimal price index that differs from the CPI. Importantly, the policy prescriptions differ across models.

**Figure 2:** Optimal Price Stabilization Policy




**(a)** Exponential Cost Function (PW) **(b)** Linear Cost Function

Note: This figure plots the optimal price index summarized by $\omega$ as a function of price rigidity in sector 1 ($\theta_1$) in three alternative models: endogenous information frictions (red line), exogenous information frictions (dotted blue line), and full information (dashed black line). The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt 2014 and a linear information cost function, respectively.

The black line replicates the existing findings, which suggest that in a model with full information, the central bank should attach more weight to sectors with stickier prices, as found in previous studies such as Benigno (2004) and Mankiw and Reis (2003).

Our model with information frictions and endogenous information choice offers a perspective that differs from the conventional wisdom. It suggests that the central bank should attach more weight to sectors with more flexible prices in order to maximize social welfare. The key is the endogenous nature of information choice. Indeed, with information frictions alone, as in a model with exogenous information frictions, the policy prescription remains qualitatively unaffected.

Note that the three models share identical structures except for the signals that firms observe. The full information model is nested in our baseline model by setting $\sigma_{e,k} = 0$ for all $k$, whereas in the baseline rational inattention model, $\sigma_{e,k}$ is an endogenous choice. The model with exogenous information frictions sets $\sigma_{e,k}$ exogenously. The calibration of the model is as follows: $\theta_2 = 0.75$, which corresponds to an average price duration of one year in the sticky price sector. The within-sector elasticity of substitution $\epsilon = 11$, which reflects an average price markup of 10%, consistent with recent empirical evidence provided by Edmond et al. (2018). Following Hobijn and Nechio (2019)'s empirical estimate, we set the cross-sector elasticity of substitution $\eta$ to 1. $\sigma_u^2$ is irrelevant for the qualitative findings of the paper, and we set it to 0.02. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. In the model with exogenous information frictions, we calibrate $\sigma_{e,k}$ to match Coibion and Gorodnichenko (2012)'s estimated Kalman gain.

**Analytical Results based on a Simplified Model** Figure 2 characterized the main finding of the paper numerically. Before delving into the discussions of the underlying mechanisms, we provide analytical results based on a simplified model.

In this simplified model, we consider an economy comprising a flexible price sector with $\theta_1 = 0$ and a sticky price sector with $\theta_2 > 0$. Moreover, we assume that the welfare loss function includes only the price dispersion component. It is worth noting that the price dispersion component in the full model is quantitatively the most relevant component of the total welfare loss, as also observed in Woodford (2011b) and Galí (2015).

Based on the simplified economy, Proposition 3 presents the main results for a model with *exogenous* information frictions.

**Proposition 3.** ***[Conventional View]*** *Consider an economy comprising a flexible price sector with $\theta_1 = 0$ and a sticky price sector with $\theta_2 > 0$, and information frictions are **exogenous**. Suppose the welfare loss function is simplified only to include the price dispersion component. The optimal weight on sector 2 ($1 - \omega^*$) is increasing in $\theta_2$: i.e., $\frac{\partial(1-\omega^*)}{\partial\theta_2} > 0$. Furthermore, the optimal weight on sector 2 is larger than or equal to that of sector 1, i.e., $1 - \omega^* \geq \omega^*$.*

*Proof.* See Appendix C.3. □

Proposition 3 provides a policy recommendation that aligns with the current state-of-the-art findings (see, e.g., Aoki 2001, Benigno 2004, Mankiw and Reis 2002, and **?**). Specifically, it states that in the simplified economy, the optimal weight attached to the price of a sticky-price sector *increases* with its degree of price rigidity ($\frac{\partial(1-\omega^*)}{\partial\theta_2} > 0$). Moreover, compared to the stabilization of prices in the flexible price sector, the stabilization of prices in the sticky price sector is *always* more important ($1 - \omega^* \geq \omega^*$).

Interestingly, a qualitatively different policy prescription can be obtained in a model with *endogenous* information choice. Proposition 4 presents these findings.

**Proposition 4.** *Consider an economy comprising a flexible price sector with $\theta_1 = 0$ and a sticky price sector with $\theta_2 > 0$, and information frictions are **endogenous**. Suppose the welfare loss function is simplified only to include the price dispersion component. The optimal weight on sector 2 ($1-\omega^*$) is decreasing in $\theta_2$: i.e., $\frac{\partial(1-\omega^*)}{\partial\theta_2} \leq 0$. Furthermore, the optimal weight on sector 2 is less than sector 1, i.e., $1-\omega^* < \omega^*$, provided that $K^s < \frac{2-\theta_2}{6-5\theta_2}$.*

*Proof.* See Appendix C.4. □

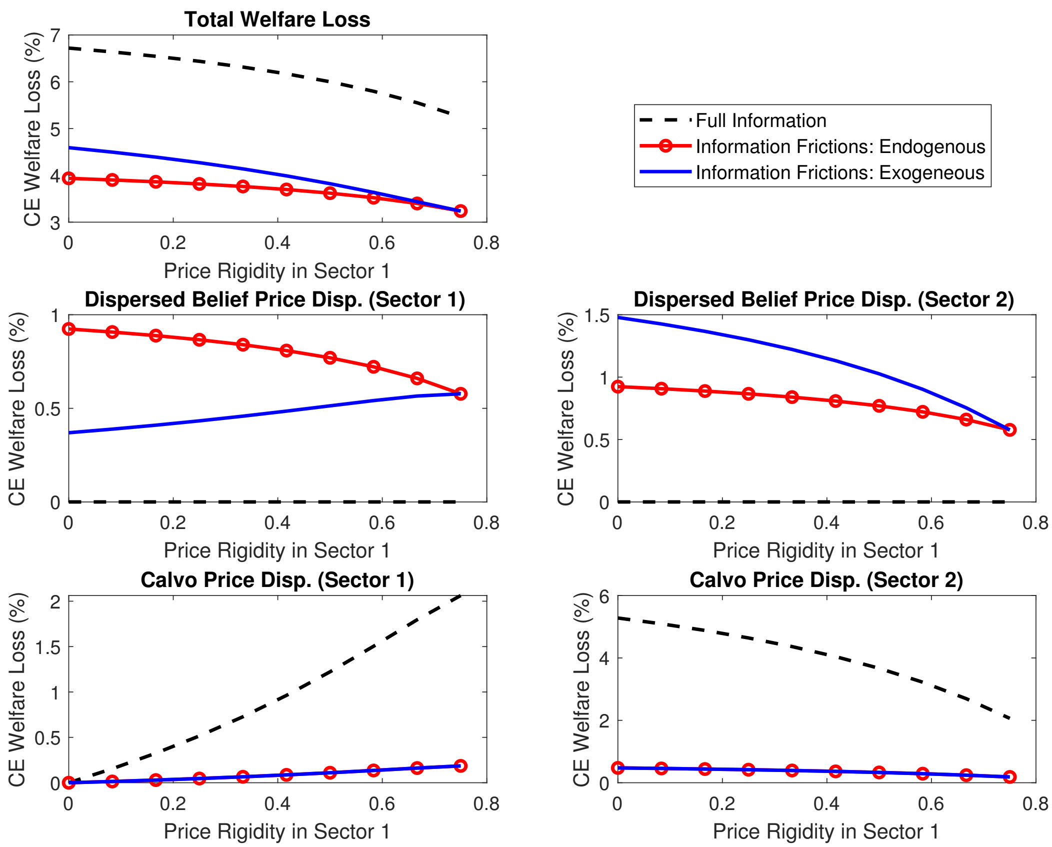
In contrast to the conventional view (Proposition 3), Proposition 4 demonstrates that the optimal weight attached to the price of a sticky-price sector weakly *decreases* in its degree of price rigidity ($\frac{\partial 1-\omega^*}{\partial\theta_2} \leq 0$). Moreover, the stabilization of prices in the flexible price sector is more important ($1-\omega^* < \omega^*$) provided that the strength of the mechanism that we emphasize is strong ($K^s < \frac{2-\theta_2}{6-5\theta_2}$), where $K^s$ is a measure of the degree of information frictions defined in (2.25) and it decreases as $\lambda$ increases. The discussions regarding the intuition for the condition highlighted in Proposition 4 are postponed to Section 4.4. Before delving into that discussion, it is important to understand the mechanisms.

**Understanding the Mechanism I: The Role of Endogenous Information Frictions** To understand why the policy prescription differs from the CPI stabilization policy and why the OPI differs across models, it is useful to decompose the welfare loss under the CPI stabilization policy. Figure 3 shows this decomposition (as a function of $\theta_1$) under alternative models: the model with endogenous information frictions (red lines with circles), the model with exogenous information frictions (blue solid lines), and the model with full information (black dashed lines).

It is apparent that, with full information, the Calvo price dispersion component of the welfare loss dominates. Specifically, as Sector 1's prices become more and more flexible, the welfare loss arising from price dispersions among price-resetting and price-staggered firms in Sector 2 becomes increasingly dominant. The central bank can address this distortion by assigning a higher weight to Sector 2's prices in its price index stabilization policy. This explains the black dashed line in Figure 2.

Information frictions play two roles. First, information frictions dampen firms' responsiveness to fundamental shocks $u$. As a result, differences in prices between price

**Figure 3:** Understanding the Trade-offs: under the CPI Stabilization




Note: This figure plots the total welfare loss and its sub-components related to price dispersions as a function of price rigidity in sector 1 ($\theta_1$) in three alternative models: endogenous information frictions (red line with circles), exogenous information frictions (blue line), and full information (dashed black line). The model is calibrated as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 in the model with an exponential information cost function. In the model with exogenous information frictions, $\sigma_{e,k}$ is calibrated to match the empirically estimated Kalman gain of 0.3.

resetting and staggered firms are smaller. This explains the dampened Calvo price dispersion component in models with information frictions (blue and red lines). Second, heterogeneous beliefs give rise to the dispersed beliefs price dispersion component. Both features are observed in Figure 3. Due to these two reasons, in a model with exogenous information frictions, the OPI stabilization policy requires the central bank to assign relatively more weight to the relatively flexible prices sector, as compared to the counterpart policy in a model with full information. That is, the dotted blue line is above the dashed black line in Figure 2.

However, with exogenous information frictions, the existing literature's policy prescription still holds qualitatively: sectors with relatively more flexible prices receive relatively smaller weight in the OPI. The reason is that, despite the emergence of dispersed beliefs price dispersion component, the price dispersions in Sector 2 are still higher than in Sector 1 when information is exogenous (see blue solid lines in Figure 3). More specifically, the dispersed beliefs price dispersion component in Sector 1 decreases as the degree of price rigidity decreases in Sector 1. As a result, it requires less weight in the OPI as prices become more flexible in Sector 1.

Endogenous information frictions change the previous results *qualitatively*: the dispersed beliefs price dispersion component in Sector 1 is an increasing function of price flexibility in Sector 1. This is a unique feature of the *endogenous* information friction model. As evidenced by the mid-left panel of Figure 3: the slopes of the red and blue lines differ qualitatively. The key mechanism behind this result is already highlighted in Proposition 2: with endogenous information frictions, firms are subject to more noise (pay less attention) if prices are more flexible.

Proposition 5 summarizes this qualitative difference between a model with exogenous and endogenous information. It shows that the highlighted mechanism is not due to a specific calibration chosen to plot the figures.

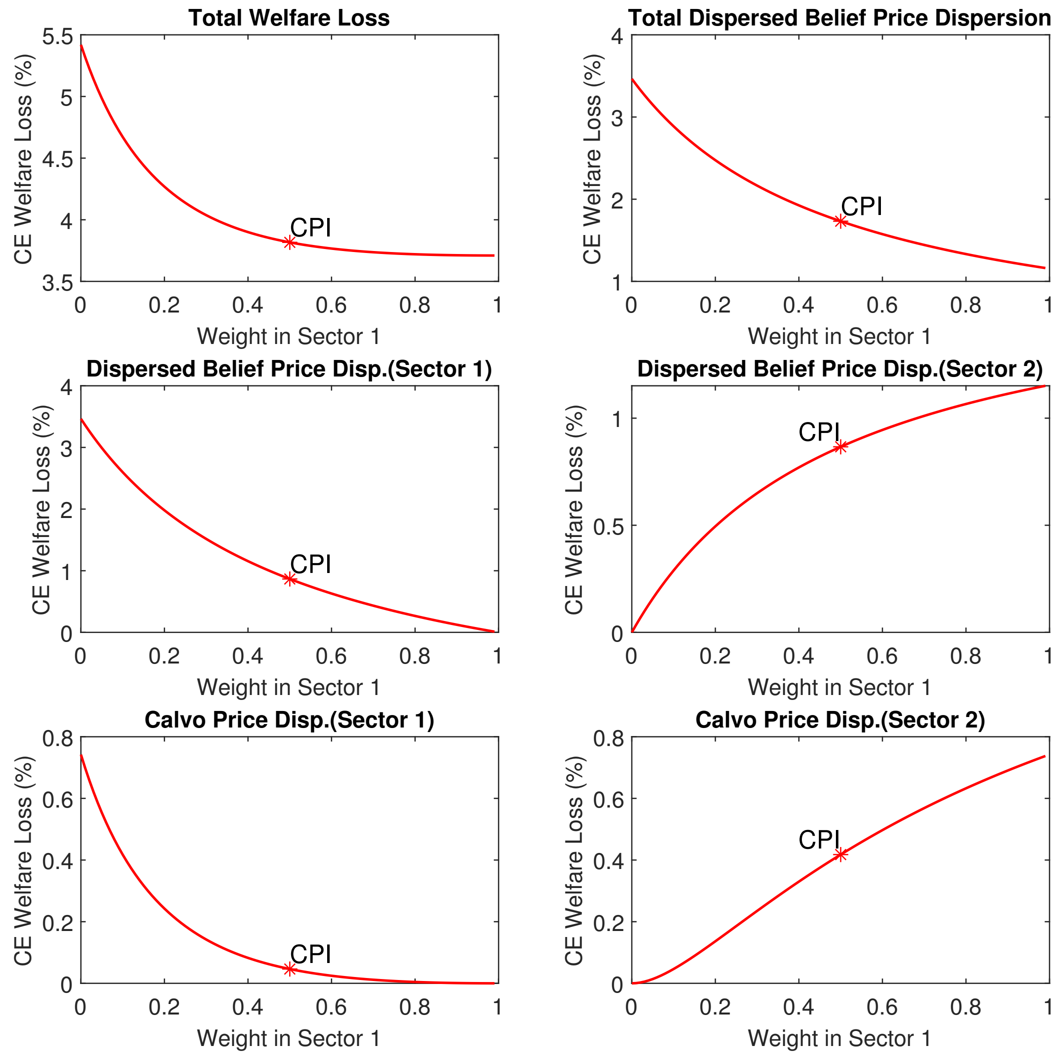
**Proposition 5.** *Consider an economy under CPI stabilization, the dispersed belief price dispersion component of the welfare loss function in sector 1 decreases (increases) in $\theta_1$ in a model with endogenous (exogenous) information frictions.*

*Proof.* See Appendix C.5. □

**Understanding the Mechanism II: the Marginal Benefit/Cost of Increasing $\omega$** The discussion up to this point highlighted that in a model with rational inattention, under the CPI stabilization, the dispersed belief price dispersion component is increasingly important if a sector's price becomes more flexible.

Next, we illustrate why it is optimal to assign a higher weight to a sector with more flexible prices. To this end, we fix the nominal rigidities in both sectors: $\theta_1 = 0.25$ and $\theta_2 = 0.75$. Again, prices in Sector 1 are relatively more flexible than in Sector 2 ($\theta_1 < \theta_2$). In this economy, we compute the total welfare loss function and the price dispersion components *as functions of $\omega$* (weight assigned to Sector 1). Figure 4 plots the results.

**Figure 4:** Understanding the Trade-offs when Information is Endogenous




Note: This figure plots the total welfare loss and its sub-components related to price dispersions as a function of $\omega$ in the baseline model with endogenous information. The red dots indicate the scenarios associated with the CPI stabilization policy ($\omega = 0.5$). Sector 1 is calibrated to be the relatively more flexible sector with $\theta_1 = 0.25$ and $\theta_2 = 0.75$. The remaining parameters are calibrated as follows: $\epsilon = 11$, $\eta = 1$, $\sigma_u^2 = 0.02$, $n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 in the model with an exponential information cost function.

The total welfare loss decreases as the weight attached to Sector 1's price ($\omega$) increases. This is mainly due to the dispersed belief price dispersion component in Sector 1. To understand the trade-offs, consider the status-quo policy of CPI stabilization ($\omega = 0.5$), indicated by the red-dots in Figure 4. Figure 4 illustrates that, in a model with endogenous information, a marginal increase in $\omega$ *reduces* social welfare loss. This feature is not shared with models with perfect or exogenous information, as shown in Figures 8 and 9. Again, the discrepancy between the model predictions originates from the dispersed belief price dispersion components.

The key trade-off is as follows: a marginal increase in $\omega$ reduces the dispersed belief price dispersion component in Sector 1 at the cost of a higher dispersed belief price dispersion component in Sector 2. In the model with endogenous information, the benefit dominates, meaning the total dispersed belief price dispersion component decreases as $\omega$ increases.

Proposition 6 summarizes this marginal benefit and cost analysis. Crucially, endogenous information is key: the marginal benefit dominates in a model with endogenous information. Therefore, a marginal increase in $\omega$ is welfare-improving if information frictions are endogenous when departing from the CPI stabilization.

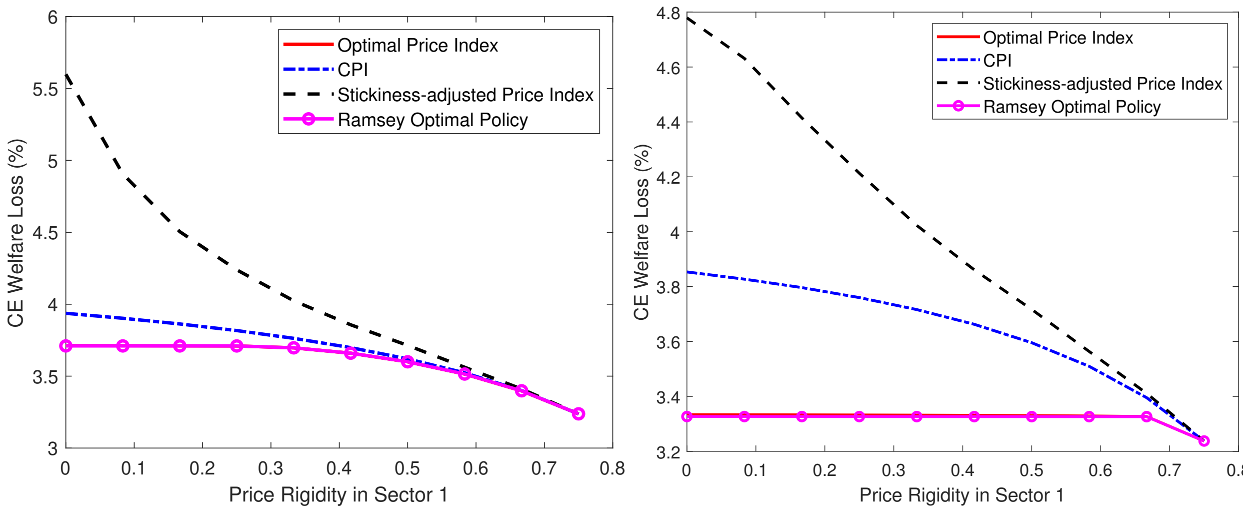
**Proposition 6.** *In an economy under CPI stabilization with $\theta_1 < \theta_2$, the sum of the dispersed belief price dispersion components in both sectors marginally decreases (does not decrease) with respect to $\omega$ in a model with endogenous (exogenous) information frictions.*

*Proof.* See Appendix C.6. □

## 4.2 Policy Implication 2: The Stabilization of CPI is Not Worse than the Stabilization of SPI

Figure 5 presents the second policy implications of the paper. It shows the welfare loss in the baseline model with rational inattention under four alternative monetary policy rules: optimal price index (OPI), Consumer Price Index (CPI), Stickiness-Adjusted Price Index (SPI) stabilization policies, and the Ramsey Optimal Policy. The OPI takes into consideration both information frictions with endogenous information choice and relative nominal rigidity, whereas the SPI is computed ignoring the information frictions feature of the model. Under Ramsey Optimal Policy, the central bank selects allocations optimally without restricting to the simple price stabilization policy. The figure provides insights into how the different monetary policy rules perform in terms of social welfare loss as price rigidity in sector 1 varies. Not surprisingly, the OPI delivers the lowest welfare loss compared to the other two price index stabilization policies. Moreover, as it is well

**Figure 5:** Welfare Loss under the Stabilization of Alternative Price Indexes




**(a)** Exponential Cost Function　　**(b)** Linear Cost Function

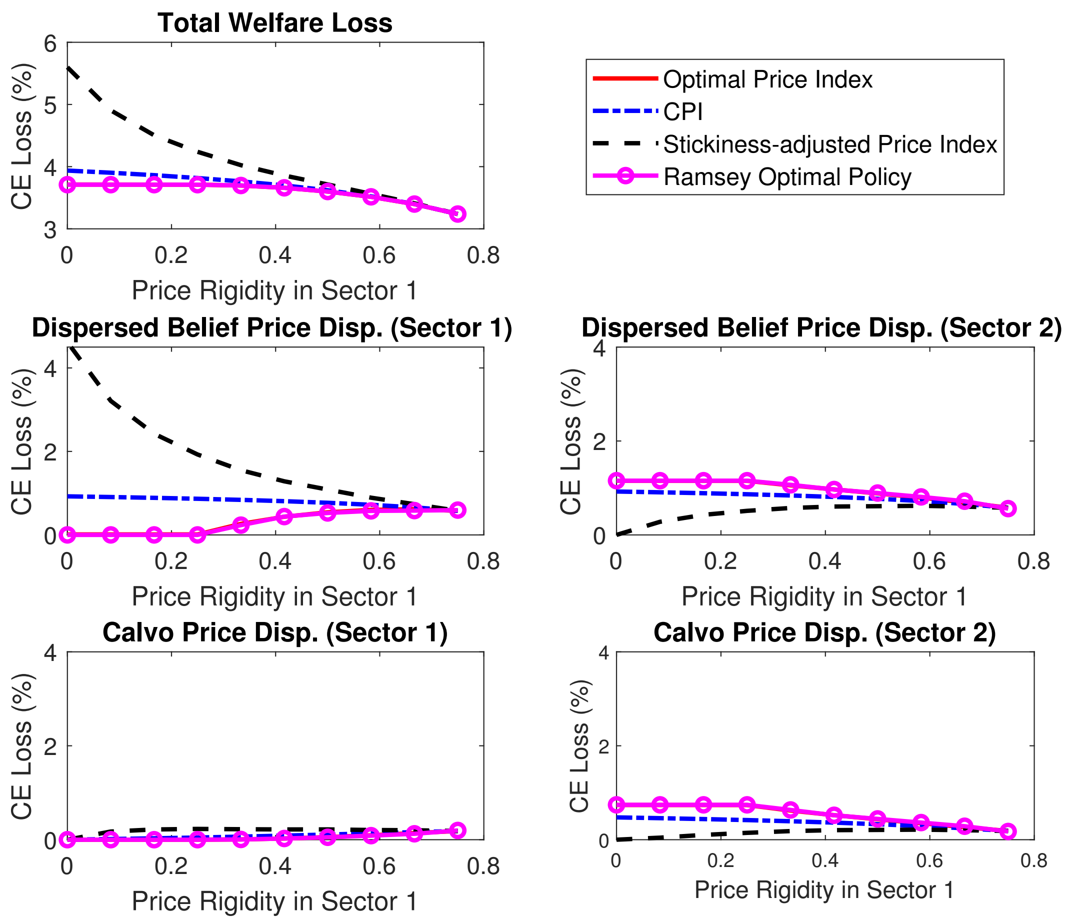
Note: The figure shows the total social welfare loss as a function of price rigidity in sector 1 in the baseline model with rational inattention under four alternative monetary policy rules: the stabilization of the optimal price index (red line), CPI (dotted blue line), the stickiness-adjusted price index (dashed black line), and the Ramsey Optimal Policy (pink line with circles), respectively. The model calibration is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

known in the literature, the OPI stabilization policy can effectively achieve allocations that are very close to those obtained under the Ramsey Optimal policy.

Interestingly, Figure 5 shows that the stabilization of CPI is better than the stabilization of SPI in terms of social welfare.

**Understanding the Mechanisms** Figure 6 illustrates the source of the welfare gain using the CPI relative to the SPI stabilization by plotting the sub-components of the welfare loss function (related to price dispersions) under alternative policies: the stabilization of optimal price index (red line), CPI (dotted blue line), and stickiness-adjusted price index (dashed black line), respectively. The SPI stabilization policy, by assigning more weight to the relatively stickier price sector (Sector 2), leads to a substantial welfare loss due to dispersed belief price dispersions in Sector 1.

**Figure 6:** Understanding the Sources of Welfare Gain




Note: the figure plots the total social welfare loss and its subcomponents related to price dispersions as a function of price rigidity in sector 1 in the baseline model with rational inattention under three alternative monetary policy rules: the stabilization of optimal price index (red line), CPI (dotted blue line), and stickiness-adjusted price index (dashed black line), respectively. The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 in the model with an exponential information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain.

## 4.3 Monetary Policy Shapes Endogenous Attention Choice

The analysis thus far has focused on the impact of endogenous attention choice on monetary policy. In this section, we explore the reciprocal relationship between monetary policy and attention choice, specifically how monetary policy influences firms' attention allocation. We also provide insights into firms' attention choices in counterfactual monetary policy scenarios.

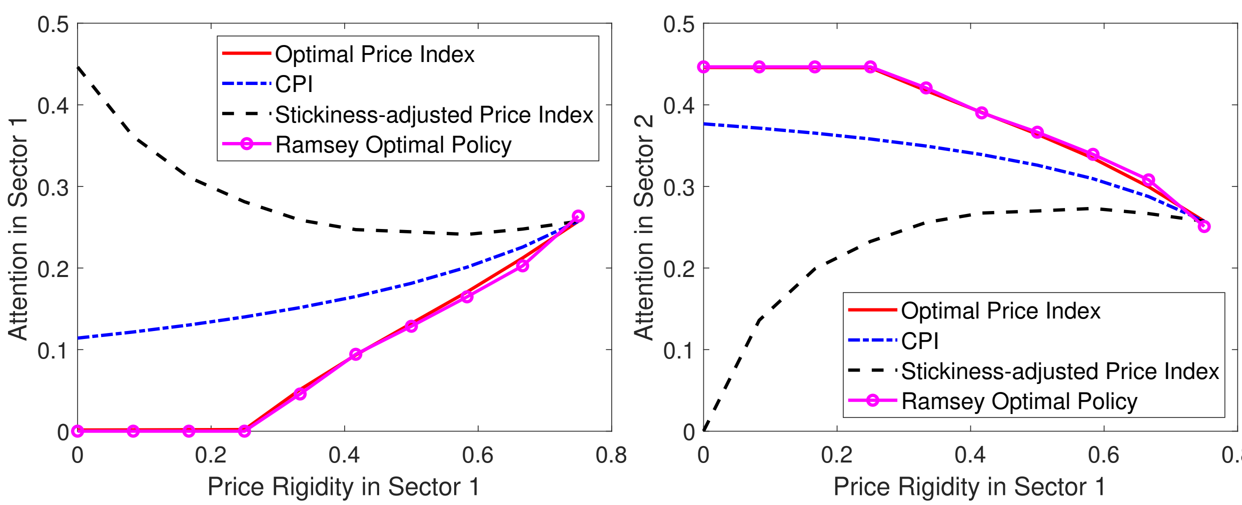
**Proposition 7.** *Consider the economy described above, the responsiveness of prices to shocks* ($\varphi_1$) *and the amount of information* ($\kappa_1$) *acquired by firms in sector* 1 *decrease with* $\omega$, *That is,* $\frac{\partial \varphi_1}{\partial \omega} < 0$, $\frac{\partial \kappa_1}{\partial \omega} < 0$, *and* $\frac{\partial \sigma_{e,1}}{\partial \omega} > 0$.

*Proof.* See Appendix C.7. □

Proposition 7 shows that firms in a sector pay less attention to economic conditions if the central bank assigns a higher weight to the stabilization of prices in this sector.

The intuition for Proposition 7 is straightforward. First, monetary policy affects firms' responsiveness to shocks ($\varphi_1$). Specifically, if the central bank assigns more weight to the stabilization of sector 1's prices ($\omega$ increases), firms in this sector respond less to shocks ($\varphi_1$ decreases). Since $\varphi_1$ captures the marginal benefit of paying attention, less responsive firms are then less attentive to economic conditions. Therefore, $\frac{K_1}{\omega} < 0$. Consequently, $\sigma_{e,1}$ increases with $\omega$.

**Figure 7:** Attention Choice Under Alternative Policy Rules




**(a)** Amount of Information in Sector 1 ($\kappa_1$) **(b)** Amount of Information in Sector 2 ($\kappa_2$)

Note: the figure plots the amount of information ($\kappa_k$) as a function of price rigidity in sector 1 in the baseline model with rational inattention under four alternative monetary policy rules: the stabilization of optimal price index (red line), CPI (dotted blue line), stickiness-adjusted price index (dashed black line), and the Ramsey Optimal Policy (pink line with circles), respectively. The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda = 0.049$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3).

This result suggests a potential risk of adopting the optimal price index recommended by the baseline model: firms in a sector with more flexible prices may pay very little attention to the overall economic conditions. Figure 7 illustrates the amount of information firms acquire ($\kappa_k$) as a function of price rigidity in sector 1 in the rational inattention model under four monetary policy rules: the stabilization of optimal price index (red line), CPI (dotted blue line), stickiness-adjusted price index (dashed black line), and the Ramsey Optimal Policy (pink line with circles) respectively. The left and right panels show the attention choices for firms in Sectors 1 and 2, respectively.

Under CPI stabilization, firms in a sector with more flexible prices pay less attention to macroeconomic conditions. The OPI stabilization policy leads to even less information acquisition by firms in the more flexible price sector compared to the CPI stabilization policy, which is optimal in our model. In contrast, under the SPI stabilization, firms in the stickier price sector may acquire very little information. Compared to the extreme attention choice outcomes under the OPI and SPI stabilization policies, firms in the CPI stabilization world make more balanced attention choices.

## 4.4 Discussions and Robustness Checks

The mechanisms highlighted in the paper exist independent of the parameter calibration. However, the strength of the mechanisms and whether they can overturn conventional wisdom is a quantitative result. This section provides robustness checks of the baseline findings by changing the key parameters

**Discussion of the Condition in Proposition 4** Proposition 4 hints at the important parameters, specifically $\lambda$ (or $K^s$) and $\theta_2$, that determine the strength of the proposed mechanism.

$\lambda$ characterizes the degree of information frictions. In the extreme case when $\lambda = 0$, information acquisition is costless, and the model collapses to a model with full information. Naturally, the mechanisms that we highlight depend on $\lambda$. Proposition 4 analytically demonstrates, in a special case, that as $\lambda$ increases (or equivalently, as $K^s$ decreases), the proposed channel is more likely to dominate.

The baseline findings are reported under standard calibrations. The robustness of the numerical results is tested by re-calibrating $\lambda$ to a smaller, alternative value. Figures 10 and 11 illustrate that the main findings remain robust even under this alternative calibration of $\lambda$, which matches the degree of information frictions estimated by Mackowiak and

Wiederholt (2009) and Coibion and Gorodnichenko (2015).

The other parameter highlighted in Proposition 4 is $\theta_2$. According to the condition in Proposition 4, a smaller value of $\theta_2$ reduces the likelihood of overturning the conventional view of stabilizing the sticky price sector's prices. The intuition behind this is as follows. As discussed in previous sections, the degree of nominal rigidity in a sector determines the extent of dispersed-belief price dispersion in that sector. The mechanism we emphasize exists in both sectors (sticky and flexible), but it is much stronger in the flexible price sector. Consequently, the optimal policy stabilizes prices in the flexible price sector. With a smaller $\theta_2$, the proposed mechanism becomes stronger in the sticky price sector, resulting in a greater pressure for the optimal policy to focus on price stability in that sector.

To test the robustness of our baseline findings, we evaluate them under the condition of a smaller $\theta_2$, specifically $\theta_2 = 0.6$, which corresponds to an average price duration of 2.5 quarters in the stickier price sector. Figures 12 and 13 demonstrates that the main findings remain qualitatively the same.

**Alternative Weights in the Welfare Loss Function** Another parameter that is important for our findings is $\epsilon$, which determines the importance of price dispersions relative to the output gap and relative price gap in the social welfare loss function (2.17). Since our mechanisms work through the price dispersions component, a smaller $\epsilon$ can reduce the quantitative relevance of the mechanisms. Figures 14 and 15 present the two policy implications under an alternative calibration of $\epsilon = 6$, which corresponds to a steady state markup of 1.2.[6] The main findings of the paper are robust to this alternative calibration.

# 5 Empirical Evidence

The key to our findings is the endogenous relationship between attention and nominal rigidities: see Proposition 2. Specifically, firms in sectors with more flexible prices pay less attention to macroeconomic conditions. We provide direct empirical evidence that supports this mechanism.

**Empirical Proxy of Firms' Attention to Macroeconomic Conditions** Following Song and Stern (2022) and Flynn and Sastry (2022), we use the frequencies of macroeconomic

[6] Edmond et al. (2018) estimated that the aggregate markup had raised from 1.1 to 1.25.

keywords in firms' reports as a proxy for firms' attention. The previous literature demonstrated that these measures are sensible proxies of firms' attention. Song and Stern (2022) and Flynn and Sastry (2022) focused on the cyclicality of the constructed attention and Song and Stern (2022) documented the heterogeneous effects of monetary policy on firms' market values depending firms' attentions to macroeconomic conditions. In this paper, we document the correlation between attention and the frequency of price adjustment (FPA).

Our text data is derived from U.S. public company's annual report on Form 10-K.[7] All companies with their securities traded on a US exchange and subject to Section 13 or 15(d) of the US Securities Exchange Act of 1934 must file these reports. As it is summarized by SEC (2011): "Among other things, the 10-K offers a detailed picture of a company's business, the risks it faces, and the operating and financial results for the fiscal year. Company management also discusses its perspective on the business results and what is driving them". Therefore, these reports contain information about what firms pay attention to.

We use the frequency of macroeconomic keywords that appear in the report as a proxy for the amount of attention (the amount of information) that firms pay to the associated macroeconomic topic/condition. To calculate word counts, we employ the method proposed by Loughran and McDonald (2011). This process involves parsing the filings by removing numbers and "stop words," such as connectors, and mapping each word to a dictionary containing all words in the sample. Subsequently, we apply the same topics and keywords (see Table 2) used by Song and Stern (2022) to construct attention intensity measures. Specifically, attention intensity $\hat{\kappa}^j_{i,t}$ represents the number of times the topic $j$ is mentioned divided by the total number of words in the filing by a firm $i$ at time $t$:

$$\hat{\kappa}^j_{i,t} = \frac{Total\ topic\ j\ words_{i,t}}{Total\ words_{i,t}}.$$

Our empirical assumption is that *conditional on* firm using the selected macroeconomic keywords in its report, the frequency of these keywords is proportional to the firm's attention to the macroeconomic condition. Our proxy coincides with the intensity measure of the attention that was defined by Song and Stern (2022). A clarification of the identification assumption is useful at this point. Specifically, we do not rule out the possibility that companies might be very attentive to macroeconomic conditions; however, they might

[7]The body of the 10-K filings is retrieved from The Notre Dame Software Repository for Accounting and Finance (SRAF). The SRAF is a repository of financial and accounting data maintained by the University of Notre Dame, and it is available at: https://sraf.nd.edu/data/stage-one-10-x-parse-data/

use a set of words that are different from our selected keywords due to their writing style. Therefore, ranking companies that do not use the selected keywords as paying less attention than a company that mentions a keyword once is inappropriate because it is possible that these companies might be very attentive to macroeconomic conditions but use a set of words that are different from our selected keywords due to their writing style. Therefore, we drop these observations and rely on the frequency of macroeconomic keywords as a proxy for attention only among firms that use these keywords in their report.

**Merging the Attention Data with Frequency of Price Adjustment Data** We use the FPA constructed by Pasten et al. (2020). Relying on the micro-level data behind the construction of the Producer Price Index, the authors construct the frequency of price adjustment at NAICS 6-digit level. The sectoral level data is suitable for our analysis because our model rely on the correlation between the FPA and attention at *sectoral* level. To merge the two datasets, the firm-level attention data is aggregated in NAICS 6-digit sector level by computing the sales-weighted average of firms within each sector.[8]

In the final data, for each topic $j$, we observe $\hat{\kappa}_{k,j}$ the average attention paid by firms in a sector $k$ and the frequency of price adjustment $FPA_k$.

**Empirical Results** To investigate the relationship between firms' attention to macroeconomic conditions and the degree of nominal rigidity, we estimate the following regression:

$$100 \times log(\hat{\kappa}_{k,j}) = \alpha + \beta \times FPA_k + FE + u_{k,j}, \tag{5.1}$$

where $FE$ indicates fixed effects.[9]

Table 1 reports the estimation results. The parameter of interest is $\beta$ associated with the variable $FPA_k$. Across all specifications that we consider — consistent with the model — the estimated $\hat{\beta}$ is negative. That is, in sectors with more flexible prices (bigger $FPA_k$), firms pay less attention to macroeconomic conditions as measured by the frequency of macroeconomic keywords used in firms' reports. Column (1) reports the result of estimating the baseline model (5.1) without controlling any fixed effects. In Column (2), we

[8]We first construct the average attention and average sale (from Compustat) for each firm. The sectoral attention data is then sale-weighted average within each sector.

[9]Within each sector, there are nine measures of attention corresponding to different topics, along with one measure of firm-specific productivity (FPA). The equation 5.1 is estimated using pooled OLS.

**Table 1:** Regression Results

| | (1) | (2) | (3) |
|---|---|---|---|
| $\hat{\beta}$ | -33.19*** | -26.97*** | -27.58*** |
| | (8.18) | (6.44) | (6.92) |
| Topic FE | NO | YES | NO |
| Sector × Topic FE | NO | NO | YES |
| Observations | 3303 | 3303 | 3303 |
| Adjusted R-squared | 0.005 | 0.384 | 0.421 |

Note: This table report the estimated $\hat{\beta}$ from $100 \times log(\hat{k}_{k,j}) = \alpha + \beta \times FPA_k + FE + u_{k,j}$ , where FPA indicates the frequency of price adjustment. $\hat{k}_{k,j}$ measures the amount of information. In the fixed effects, Sector FE refers to the 2-digit NAICS sector, and Topic to the group of keywords used to measure attention. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

control for Topics fixed effects. In Column (3), we control for Topics times Sector (NAICS 2-digit) fixed effects. These fixed effects address all potential confounding factors that are common at the NAICS 2-digit level. The main finding remains unaffected.

To address a potential concern that the findings were driven by extreme observations, namely firms that mentioned macroeconomic keywords only once, we re-estimate the empirical models using observations that exclude these firms. Table 3 demonstrates the empirical observation is robust to the exclusion of extreme firms.

# 6 Conclusion

Most central banks in advanced economies stabilize the CPI, defined as the price index weighted by consumption weights (or sizes of sectors). The existing academic literature stresses the importance of considering cross-sector heterogeneities. The dominating view is that the optimal price index should attach a bigger weight to prices in sectors with relatively stickier prices. This paper challenges this policy prescription by introducing rational inattention to the existing frameworks.

We demonstrate that with endogenous information choice, specifically rational inattention, firms in sectors with more flexible prices gather less information. In other words, sectors with less degrees of nominal frictions are endogenously associated with more significant information frictions. These increased information frictions make prices more dispersed among price resetting firms in flexible price sectors, thereby increasing social welfare loss. Consequently, our model prescribes an Optimal Price Index (OPI) policy that places greater importance on stabilizing prices in sectors with more flexible prices.

We compare the performance of CPI stabilization with that of the Stabilized Price Index (SPI) policy. The SPI represents the optimal price index computed in an equivalent model assuming full information. We find that stabilizing the CPI yields superior results in terms of social welfare.

To support these findings, we provide empirical evidence that substantiates the core mechanism, employing the frequency of macroeconomic keywords in firms' reports as a proxy for firms' attention to unobserved macroeconomic conditions. Consistent with our model's mechanism, we illustrate that firms in sectors with more frequent price adjustments display lower attention to macroeconomic conditions.

Our findings convey a broader message: an optimal policy derived from a stylized model *might* be misleading if there are omitted frictions that correlate with existing frictions. This critique also applies to our model. Specifically, in our model, the OPI policy induces firms in sectors with flexible prices to acquire limited information. Within our framework, such an allocation is optimal since the central bank stabilizes the actions of these partially informed firms (with a large $\omega$). However, in reality, firms' information choices may interact with other sources of distortion, which can introduce additional costs associated with information. Exploring this possibility could be a promising avenue for future research.

## References


Afrouzi, H. and C. Yang (2021). Dynamic rational inattention and the phillips curve. *Available at SSRN 3770462*. 1

Alvarez, F., F. Lippi, and A. Oskolkov (2022). The macroeconomics of sticky prices with generalized hazard functions. *The Quarterly Journal of Economics 137*(2), 989–1038. 1

Anand, R., E. S. Prasad, and B. Zhang (2015). What Measure of Inflation should a Developing Country Central Bank Target? *Journal of Monetary Economics 74*(C), 102–116. 1

Andrade, P., R. K. Crump, S. Eusepi, and E. Moench (2016). Fundamental Disagreement. *Journal of Monetary Economics 83*, 106–128. 1

Angeletos, G.-M., L. Iovino, and J. La'o (2016). Real Rigidity, Nominal Rigidity, and the Social Value of Information. *American Economic Review 106*(1), 200–227. 1

Aoki, K. (2001, August). Optimal Monetary Policy Responses to Relative-price Changes. *Journal of Monetary Economics 48*(1), 55–80. 1, 1, 4.1

Basu, S. and P. D. Leo (2016, March). Should Central Banks Target Investment Prices? Boston College Working Papers in Economics 910. 1

Benigno, P. (2004, July). Optimal Monetary Policy in a Currency Area. *Journal of International Economics 63*(2), 293–320. 1, 1, 4.1, 4.1

Broer, T., A. Kohlhas, K. Mitman, and K. Schlafmann (2022). Expectation and wealth heterogeneity in the macroeconomy. 2

Carvalho, C. (2006). Heterogeneity in price stickiness and the real effects of monetary shocks. *Frontiers in Macroeconomics 2*(1). 1

Carvalho, C., N. A. Dam, and J. W. Lee (2020). The cross-sectional distribution of price stickiness implied by aggregate data. *Review of Economics and Statistics 102*(1), 162–179. 1

Carvalho, C. and F. Schwartzman (2015). Selection and monetary non-neutrality in time-dependent pricing models. *Journal of Monetary Economics 76*, 141–156. 1

Coibion, O. and Y. Gorodnichenko (2012). What Can Survey Forecasts Tell Us about Information Rigidities? *Journal of Political Economy 120*(1), 116–159. 1, 2, 4.1, 3, 4, 5, 6, 7, 12, 13, 14, 15

Coibion, O. and Y. Gorodnichenko (2015). Information Rigidity and the Expectations Formation Process: A Simple Framework and New Facts. *American Economic Review 105*(8), 2644–78. 1, 4.4, 10, 11

Edmond, C., V. Midrigan, and D. Y. Xu (2018). How costly are markups? 4.1, 6

Ellison, M. and A. Macaulay (2021). A rational inattention unemployment trap. *Journal of Economic Dynamics and Control 131*, 104226. 2

Flynn, J. P. and K. Sastry (2022). Attention cycles. *Available at SSRN 3592107*. 1, 5

Gaballo, G. (2016). Rational inattention to news: The perils of forward guidance. *American Economic Journal: Macroeconomics 8*(1), 42–97. 2

Galí, J. (2015). *Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications*. Princeton University Press. 2.2, 4.1

Gautier, E. and H. L. Bihan (2018). Shocks vs menu costs: Patterns of price rigidity in an estimated multi-sector menu-cost model. *The Review of Economics and Statistics*, 1–45. 1

Gorodnichenko, Y. and M. Weber (2016, January). Are Sticky Prices Costly? Evidence from the Stock Market. *American Economic Review 106*(1), 165–199. 1

Hellwig, C. and L. Veldkamp (2009). Knowing what others know: Coordination motives in information acquisition. *The Review of Economic Studies 76*(1), 223–251. 5

Hobijn, B. and F. Nechio (2019). Sticker Shocks: Using VAT Changes to Estimate Upper-Level Elasticities of Substitution. *Journal of the European Economic Association 17*(3), 799–833. 4.1

Höynck, C., M. Li, and D. Zhang (2022). The markup elasticity of monetary non-neutrality. *Available at SSRN 4283059*. 1

Huang, K. X. and Z. Liu (2005, November). Inflation Targeting: What Inflation Rate to Target? *Journal of Monetary Economics 52*(8), 1435–1462. 1

Ilut, C. and R. Valchev (2023). Economic agents as imperfect problem solvers. *The Quarterly Journal of Economics 138*(1), 313–362. 2

Li, M. and H.-M. Wu (2016). Optimal Monetary Policy with Asymmetric Shocks and Rational Inattention. *mimeo*. 1, C.1

Loughran, T. and B. McDonald (2011). When is a liability not a liability? textual analysis, dictionaries, and 10-ks. *Journal of Finance 66*(1), 35–65. 5

Luo, Y. (2008). Consumption dynamics under information processing constraints. *Review of Economic dynamics 11*(2), 366–385. 2

Luo, Y., J. Nie, G. Wang, and E. R. Young (2017). Rational inattention and the dynamics of consumption and wealth in general equilibrium. *Journal of Economic Theory 172*, 55–87. 2

Luo, Y., J. Nie, and P. Yin (2022). Attention allocation and heterogeneous consumption responses. *Working Paper*. 2

Maćkowiak, B., F. Matějka, and M. Wiederholt (2023). Rational inattention: A review. *Journal of Economic Literature 61*(1), 226–273. 2

Mackowiak, B., E. Moench, and M. Wiederholt (2009). Sectoral Price Data and Models of Price Setting. *Journal of Monetary Economics 56*(S), 78–99. 2.1

Mackowiak, B. and M. Wiederholt (2009). Optimal Sticky Prices under Rational Inattention. *American Economic Review 99*(3), 769–803. 1, 1, 2.1, 2.1, 5, 4.4, 10, 11, B.2

Maćkowiak, B. and M. Wiederholt (2015). Business cycle dynamics under rational inattention. *The Review of Economic Studies 82*(4), 1502–1532. 2

Mankiw, N. G. and R. Reis (2002). Sticky information versus sticky prices: A proposal to replace the new keynesian phillips curve. *The Quarterly Journal of Economics 117*(4), 1295–1328. 1, 4.1

Mankiw, N. G. and R. Reis (2003, September). What Measure of Inflation Should a Central Bank Target? *Journal of the European Economic Association 1*(5), 1058–1086. 1, 1, 4.1

Matějka, F. (2016). Rationally inattentive seller: Sales and discrete pricing. *The Review of Economic Studies 83*(3), 1125–1155. 2

Matějka, F. and A. McKay (2012). Simple market equilibria with rationally inattentive consumers. *American Economic Review 102*(3), 24–29. 2

Miao, J., J. Wu, and E. R. Young (2022). Multivariate rational inattention. *Econometrica 90*(2), 907–945. 2

Mondria, J. (2010). Portfolio choice, attention allocation, and price comovement. *Journal of Economic Theory 145*(5), 1837–1864. 2, C.1

Nakamura, E. and J. Steinsson (2008). Five facts about prices: A reevaluation of menu cost models. *The Quarterly Journal of Economics 123*(4), 1415–1464. 1, 1

Nimark, K. (2008). Dynamic Pricing and Imperfect Common Knowledge. *Journal of monetary Economics 55*(2), 365–382. 1

Ou, S., D. Zhang, and R. Zhang (2021). Information frictions, monetary policy, and the paradox of price flexibility. *Journal of Monetary Economics 120*, 70–82. 1, 1

Paciello, L. and M. Wiederholt (2014). Exogenous Information, Endogenous Information, and Optimal Monetary Policy. *Review of Economic Studies 81*(1), 356–388. 1, 2.2, 3, 2, 5, 10, 11, 12, 13, 14, 15

Pasten, E. and R. Schoenle (2016). Rational inattention, multi-product firms and the neutrality of money. *Journal of Monetary Economics 80*, 1–16. 2

Pasten, E., R. Schoenle, and M. Weber (2020). The propagation of monetary policy shocks in a heterogeneous production economy. *Journal of Monetary Economics 116*, 1–22. 1, 1, 5

Rubbo, E. (2022). Networks, phillips curves, and monetary policy. *manuscript, Harvard University*. 1

SEC (2011, January). Investor Bulletin: How to Read a 10-K. Technical report, Securities and Exchange Commission Office of Investor Education and Advocacy. 5

Sims, C. A. (2003). Implications of Rational Inattention. *Journal of monetary Economics 50*(3), 665–690. 1, 2

Song, W. and S. Stern (2022, January). Firm Inattention and the Efficacy of Monetary Policy: A Text-Based Approach. Staff Working Papers 22-3, Bank of Canada. 1, 5

Stevens, L. (2020). Coarse pricing policies. *The Review of Economic Studies 87*(1), 420–453. 2

Turen, J. (2023). State-dependent attention and pricing decisions. *American Economic Journal: Macroeconomics 15*(2), 161–189. 2

Tutino, A. (2013). Rationally inattentive consumption choices. *Review of Economic Dynamics 16*(3), 421–439. 2

Van Nieuwerburgh, S. and L. Veldkamp (2010). Information acquisition and under-diversification. *The Review of Economic Studies 77*(2), 779–805. 2

Veldkamp, L. L. (2023). *Information choice in macroeconomics and finance*. Princeton University Press. 2

Woodford, M. (2011a). *Interest and prices: Foundations of a theory of monetary policy*. princeton university press. 2.1

Woodford, M. (2011b). *Interest and prices: Foundations of a theory of monetary policy*. princeton university press. 2.2, 4.1

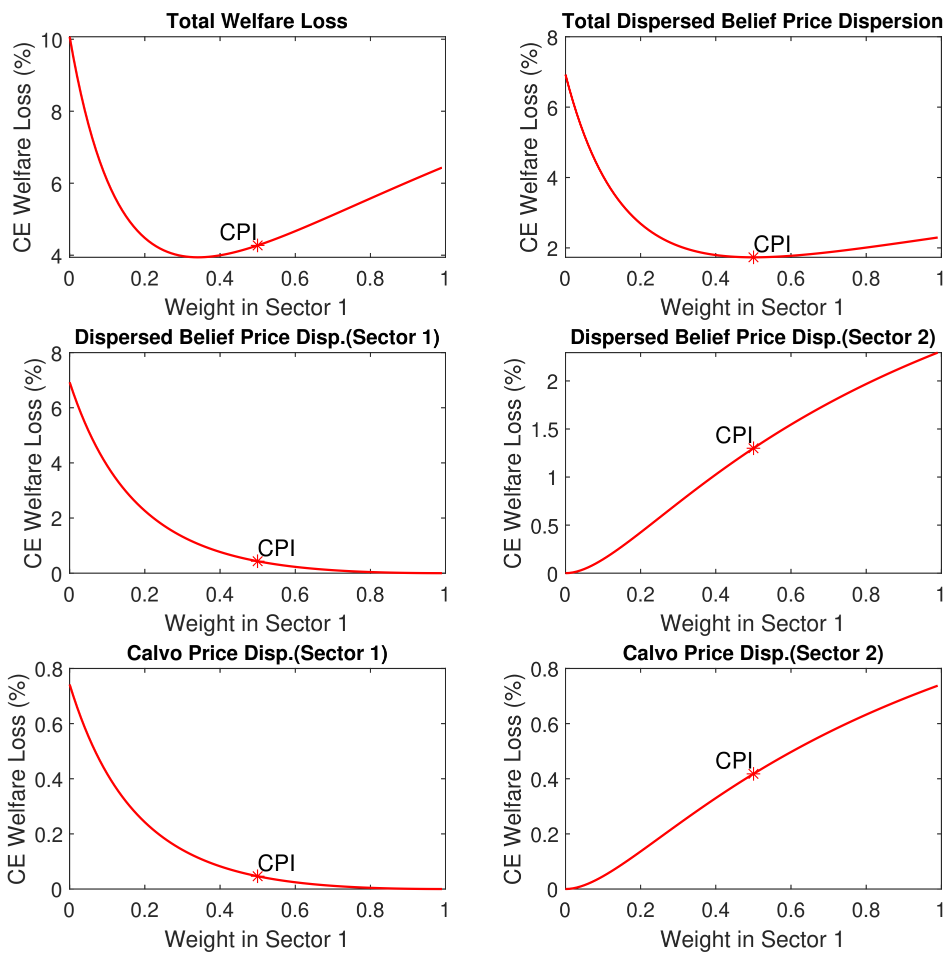
Yang, C. (2022). Rational inattention, menu costs, and multi-product firms: Micro evidence and aggregate implications. *Journal of Monetary Economics 128*, 105–123. 1

Yin, P. (2021). Optimal attention and heterogeneous precautionary saving behavior. *Journal of Economic Dynamics and Control 131*, 104230. 2

Zorn, P. (2020). Investment under rational inattention: Evidence from us sectoral data. 2

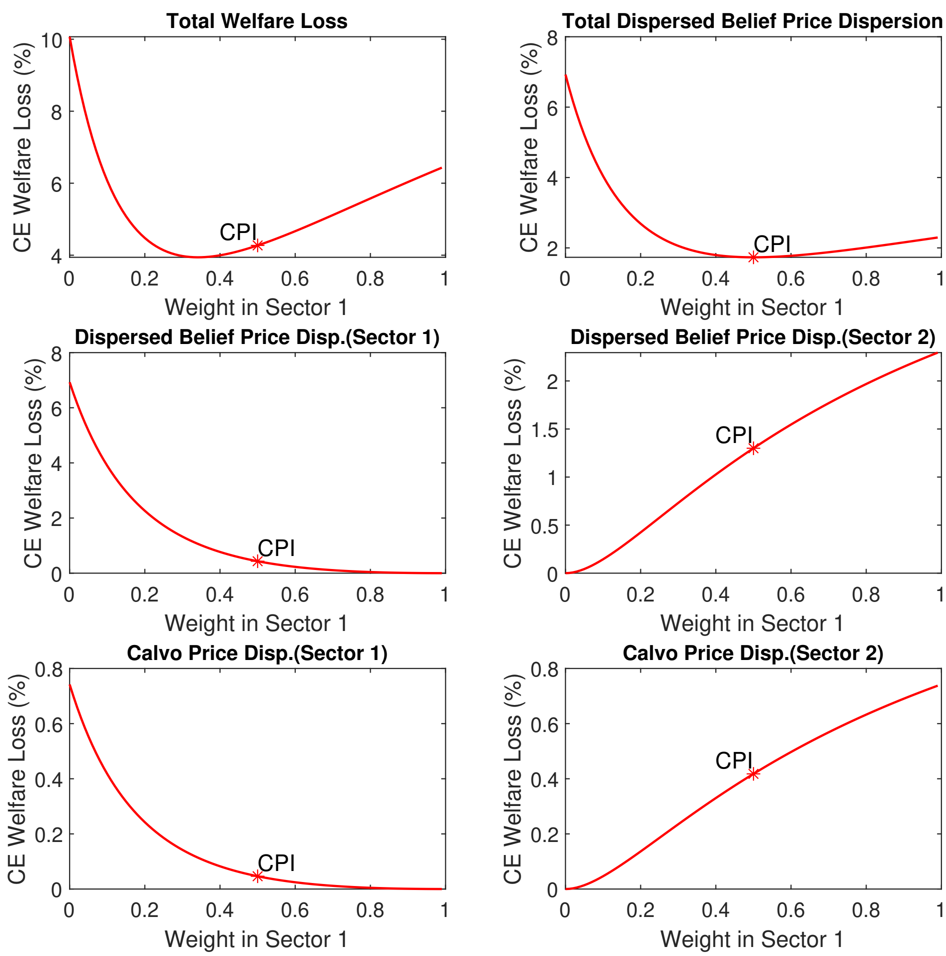
# A Figures and Tables

**Figure 8:** Understanding the Trade-offs when Information is Perfect



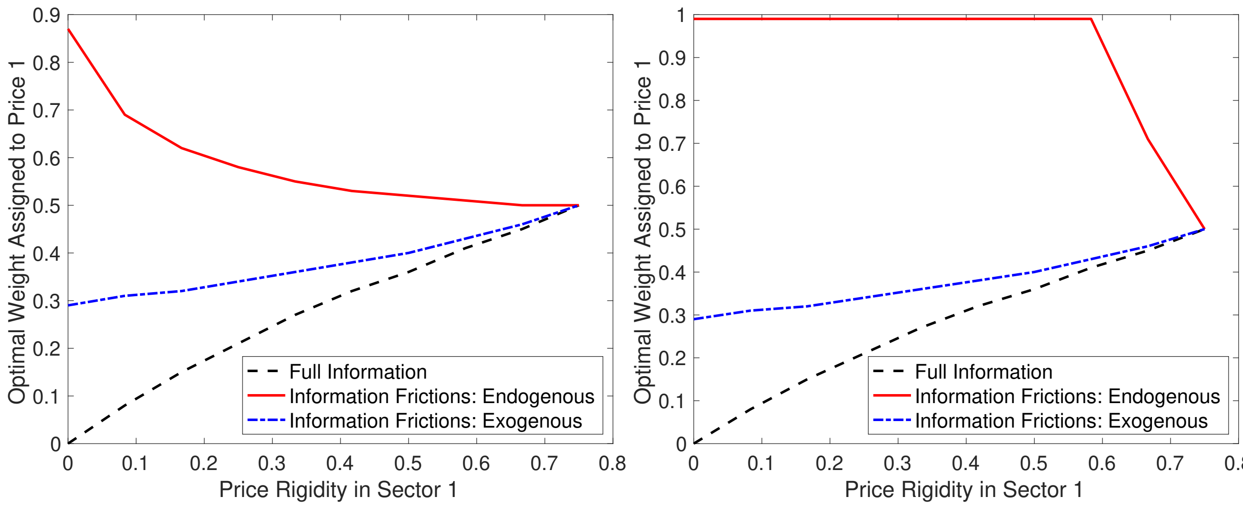

Note: This figure plots the total welfare loss and its sub-components related to price dispersions as a function of $\omega$ in the baseline model with full information. Sector 1 is calibrated to be the relatively more flexible sector with $\theta_1 = 0.25$ and $\theta_2 = 0.75$. The remaining parameters are calibrated as follows: $\epsilon = 11$, $\eta = 1$, $\sigma_u^2 = 0.02$, $n_1 = n_2 = 0.5$.

**Figure 9:** Understanding the Trade-offs when Information is Exogenous




Note: This figure plots the total welfare loss and its sub-components related to price dispersions as a function of $\omega$ in the baseline model with exogenous information friction (Kalman gain is set to 0.3). Sector 1 is calibrated to be the relatively more flexible sector with $\theta_1 = 0.25$ and $\theta_2 = 0.75$. The remaining parameters are calibrated as follows: $\epsilon = 11$, $\eta = 1$, $\sigma_u^2 = 0.02$, $n_1 = n_2 = 0.5$.

**Figure 10:** Optimal Weight under the Alternative Calibration of $\lambda$

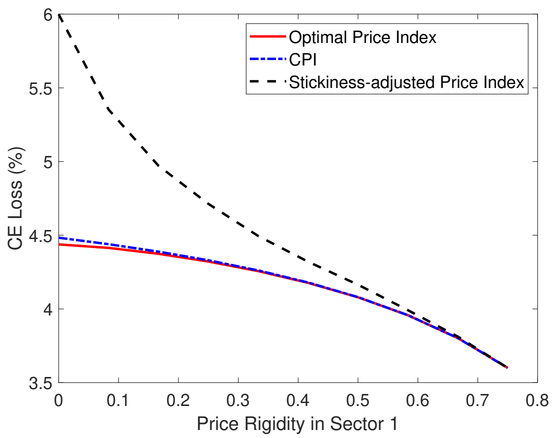



**(a)** Exponential Cost Function

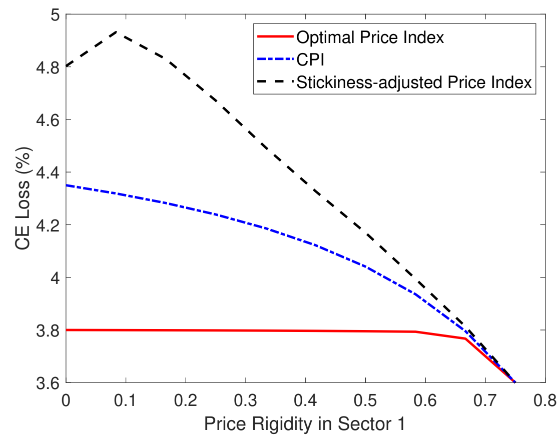
**(b)** Linear Cost Function

Note: This figure plots the optimal price index summarized by $\omega$ as a function of price rigidity in sector 1 ($\theta_1$) in three alternative models: endogenous information frictions (red line), exogenous information frictions (dotted blue line), and full information (dashed black line). The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Mackowiak and Wiederholt (2009) and Coibion and Gorodnichenko (2015)'s empirical estimate of the Kalman gain (0.4). For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

**Figure 11:** Policy Evaluations under the Alternative Calibration of $\lambda$



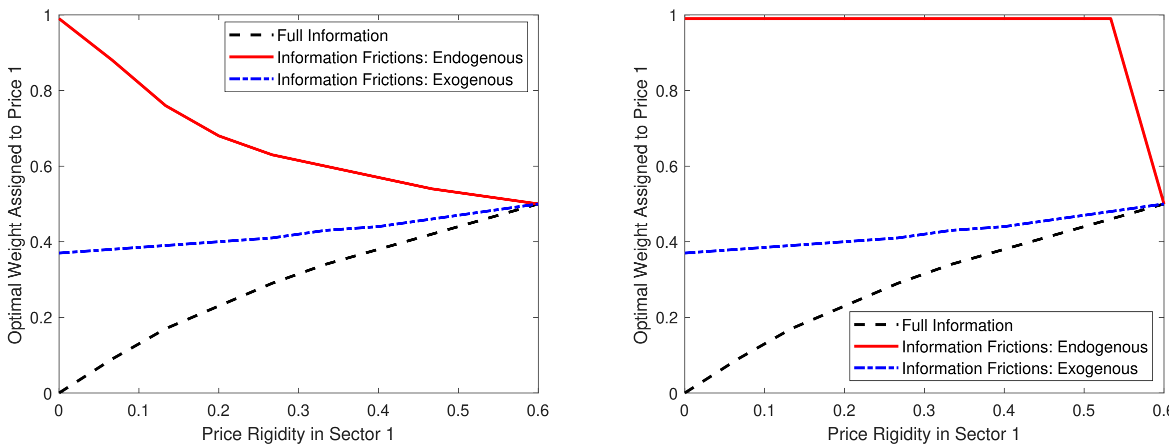

**(a)** Exponential Cost Function.




**(b)** Linear Cost Function

Note: The figure shows the total social welfare loss as a function of price rigidity in sector 1 in the baseline model with rational inattention under three alternative monetary policy rules: the stabilization of the optimal price index (red line), CPI (dotted blue line), and the stickiness-adjusted price index (dashed black line), respectively. The model calibration is as follows: $\theta_2 = 0.75, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Mackowiak and Wiederholt (2009) and Coibion and Gorodnichenko (2015)'s empirical estimate of the Kalman gain (0.4). For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

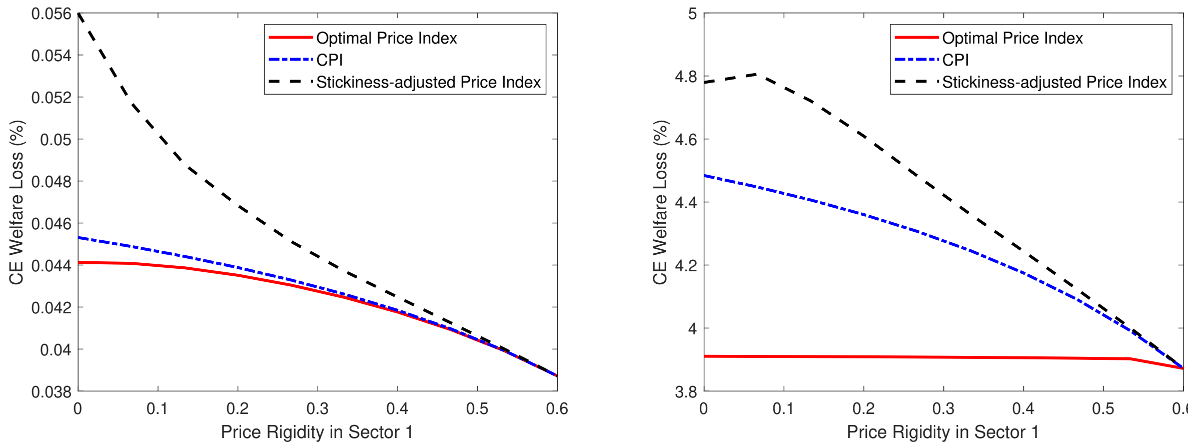
**Figure 12:** Optimal Weight under the Alternative Calibration of $\theta_2$




**(a)** Alternative Cost Function. **(b)** Linear Cost Function

Note: This figure plots the optimal price index summarized by $\omega$ as a function of price rigidity in sector 1 ($\theta_1$) in three alternative models: endogenous information frictions (red line), exogenous information frictions (dotted blue line), and full information (dashed black line). The calibration of the model is as follows: $\theta_2 = 0.6, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

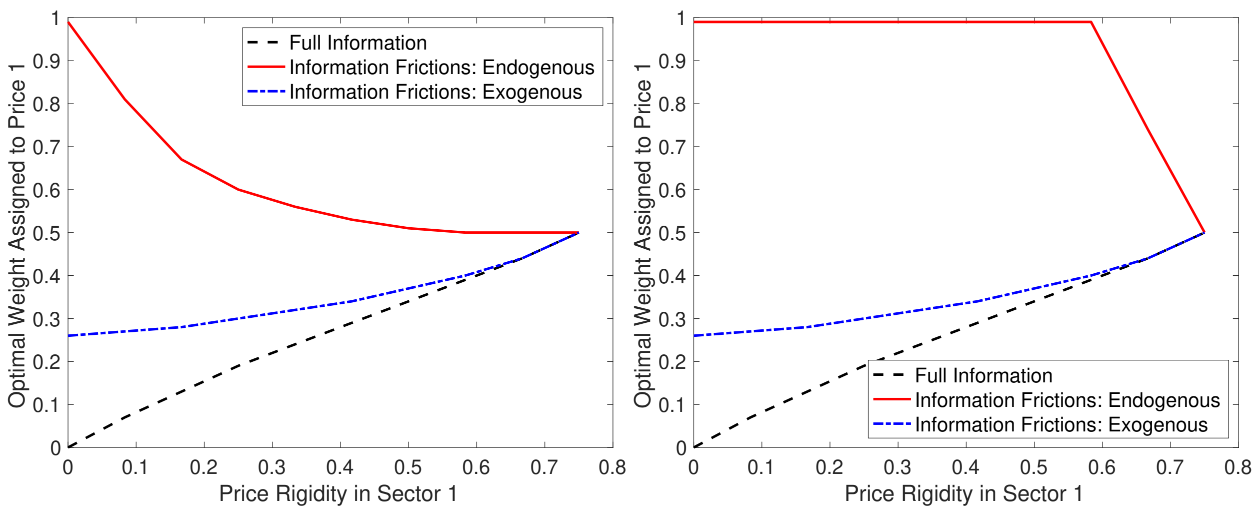
**Figure 13:** Policy Evaluations under the Alternative Calibration of $\theta_2$




**(a)** Exponential Cost Function    **(b)** Linear Cost Function

Note: The figure shows the total social welfare loss as a function of price rigidity in sector 1 in the baseline model with rational inattention under three alternative monetary policy rules: the stabilization of the optimal price index (red line), CPI (dotted blue line), and the stickiness-adjusted price index (dashed black line), respectively. The model calibration is as follows: $\theta_2 = 0.6, \epsilon = 11, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

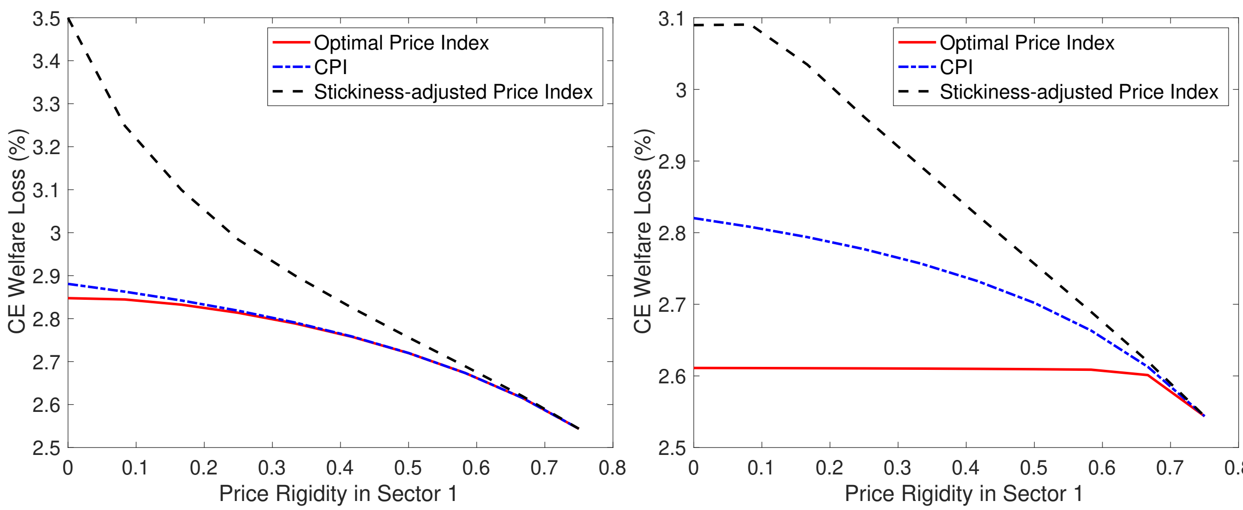
**Figure 14:** Optimal Weight under the Alternative Calibration of $\epsilon$




**(a)** Exponential Cost Function **(b)** Linear Cost Function

Note: This figure plots the optimal price index summarized by $\omega$ as a function of price rigidity in sector 1 ($\theta_1$) in three alternative models: endogenous information frictions (red line), exogenous information frictions (dotted blue line), and full information (dashed black line). The calibration of the model is as follows: $\theta_2 = 0.75, \epsilon = 6, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

**Figure 15:** Policy Evaluations under the Alternative Calibration of $\epsilon$




**(a)** Exponential Cost Function    **(b)** Linear Cost Function

Note: The figure shows the total social welfare loss as a function of price rigidity in sector 1 in the baseline model with rational inattention under three alternative monetary policy rules: the stabilization of the optimal price index (red line), CPI (dotted blue line), and the stickiness-adjusted price index (dashed black line), respectively. The model calibration is as follows: $\theta_2 = 0.75, \epsilon = 6, \eta = 1, \sigma_u^2 = 0.02, n_1 = n_2 = 0.5$. Moreover, the parameter that determines the attention cost ($\lambda$) is calibrated to align $K^s$ with Coibion and Gorodnichenko (2012)'s empirical estimate of the Kalman gain (0.3). Specifically, $\lambda$ equals 0.049 (0.097) in the model with an exponential (linear) information cost function. For the model with exogenous information, $\sigma_{e,k}$ is calibrated to match the targeted Kalman gain. Panel (a) and (b) present the results under the assumption of an exponential cost function as in Paciello and Wiederholt (2014) and a linear information cost function, respectively.

**Table 2:** Macroeconomics Topics and Keywords

| **Topic** | **Keywords** |
|---|---|
| General | economic conditions |
| Output | GDP , economic growth, macroeconomic condition, construction spending, national activity, recession |
| Employment | national activity, JOLTS , labor market, jobless claims, jobs report, non farm payroll, adp employment report, employment cost index |
| Consumption | consumer confidence, consumer credit, consumer sentiment, durable goods, personal income, retail sales |
| Investment | business inventories, manufacturing survey, factory orders, business outlook survey, manufacturing index, industrial production, business optimism, wholesale trade |
| FOMC | FOMC , monetary policy, quantitative easing |
| Housing | home sales, home prices, housing starts, housing market |
| Inflation | price index, price level, consumer price index, CPI , PMI , PPI , disinflationary, hyperinflation, inflation, inflationary, hyperinflationary, disinflation |
| Oil | oil prices, oil supply, oil demand |

**Table 3:** Regression Results: Robustness Check

| | (1) | (2) | (3) |
|---|---|---|---|
| $\hat{\beta}$ | -40.05*** | -32.72*** | -30.83*** |
| | (7.31) | (6.38) | (6.80) |
| Topic FE | NO | YES | NO |
| Sector * Topic FE | NO | NO | YES |
| Observations | 2583 | 2583 | 2583 |
| Adjusted R-squared | 0.011 | 0.251 | 0.297 |

Note: This table report the estimated $\hat{\beta}$ from $100 \times log(\hat{k}_{k,j}) = \alpha + \beta \times FPA_k + FE + u_{k,j}$ , where FPA indicates the frequency of price adjustment. $\hat{k}_{k,j}$ measures the amount of information. In the fixed effects, Sector FE refers to the 2-digit NAICS sector, and Topic to the group of keywords used to measure attention. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

# B Model Appendix

## B.1 Optimal price setting

Firm $i$ in sector $k$ maximizes its expected profit:

$$E\left(\pi_{ki}|I_{ki}\right) = E\left(P_{ki}Y_{ki}/P - (1-\tau)W_k L_{ki}/P|I_{ki}\right)$$

Moreover, from the household's utility maximization problem, we derive:

$$\frac{1}{C}\frac{W_k}{P} - 1 = 0 \quad \Rightarrow W_k = PC \tag{B.1}$$

Thus, the profit function is given by:

$$\pi_{ki} = P_{ki}Y_{ki}/P - Ye^{-a_k}Y_{ki} \tag{B.2}$$

Given optimal consumption solution $C_{k,i} = \left(\frac{P_{k,i}}{P_k}\right)^{-\epsilon}\frac{1}{n_k}C_k$ and $C_k = \left(\frac{P_k}{P}\right)^{-\eta} n_k C$, The profit function can be expressed as:

$$\pi_{ki} = \left(\frac{P_{ki}}{P}\right)^{1-\epsilon}\left(\frac{P_k}{P}\right)^{\epsilon-\eta} Y - e^{-a_k}\left(\frac{P_{ki}}{P}\right)^{-\epsilon}\left(\frac{P_k}{P}\right)^{\epsilon-\eta} Y^2 \tag{B.3}$$

We rewrite $Y = \bar{Y}e^y$, $P = \bar{P}e^p$, $P_k = \bar{P}e^{p_k}$, $P_{ki} = \bar{P}e^{p_{ki}}$, where a small letter denotes the log-deviation of the variable from its value at the non-stochastic solution (when $a_k = 0$). Thus, the above profit function can be expressed as:

$$\pi_{ki} = e^{(1-\epsilon)p_{ki}}e^{(\epsilon-\eta)p_k}e^{(\eta-1)p}\overline{Y}e^y - e^{-a_k}e^{-\epsilon p_{ki}}e^{(\epsilon-\eta)p_k}e^{\eta p}\overline{Y}^2 e^{2y} \tag{B.4}$$

To approximate the equation, we need the following first and second-order derivatives:

$$\frac{\partial v_{ki}}{\partial p_{ki}} = (1-\epsilon)\, e^{(1-\epsilon)p_{ki}} e^{(\epsilon-\eta)p_k} e^{(\eta-1)p} \overline{Y} e^{y} + \epsilon e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.5}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki}^2} = (1-\epsilon)^2\, e^{(1-\epsilon)p_{ki}} e^{(\epsilon-\eta)p_k} e^{(\eta-1)p} \overline{Y} e^{y} - \epsilon^2 e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.6}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial p_k} = (1-\epsilon)\,(\epsilon-\eta)\, e^{(1-\epsilon)p_{ki}} e^{(\epsilon-\eta)p_k} e^{(\eta-1)p} \overline{Y} e^{y} + \epsilon\,(\epsilon-\eta)\, e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.7}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial p} = \eta\,(1-\epsilon)\, e^{(1-\epsilon)p_{ki}} e^{(\epsilon-\eta)p_k} e^{(\eta-1)p} \overline{Y} e^{y} + (1+\eta)\epsilon e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.8}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial a_k} = -\epsilon e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.9}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial y} = (1-\epsilon)\, e^{(1-\epsilon)p_{ki}} e^{(\epsilon-\eta)p_k} e^{(\eta-1)p} \overline{Y} e^{y} + 2\epsilon e^{-a_k} e^{-\epsilon p_{ki}} e^{(\epsilon-\eta)p_k} e^{\eta p} \overline{Y}^2 e^{2y} (1-\tau) \tag{B.10}$$

Next we evaluate above derivatives at the non-stochastic solution, i.e. $p_{ki} = 0, p_k = 0, a_k = 0, y = 0$. The employment subsidy $\tau$ is chosen to elminate the inefficiency resulting from the presence of market power of monopolistic competititve firms, i.e. $1 - \tau = \frac{\epsilon - 1}{\epsilon}$, implying that $\overline{Y} = 1$. The evaluated derivatives are as follows:

$$\frac{\partial v_{ki}}{\partial p_{ki}}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = 0, \tag{B.11}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki}^2}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = -(\epsilon - 1), \tag{B.12}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial p_k}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = 0, \tag{B.13}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial p}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = \epsilon - 1 \tag{B.14}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial a_k}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = -(\epsilon - 1) \tag{B.15}$$

$$\frac{\partial^2 v_{ki}}{\partial p_{ki} \partial y}(p_{ki} = 0, p_k = 0, p = 0, y = 0, a_k = 0) = \epsilon - 1 \tag{B.16}$$

Using these results above and together with Equation (B.4), we take second order approximation to the profit function and obtain

$$v_{ki} \approx -\frac{\epsilon-1}{2} p_{ki}^2 + (\epsilon-1) p_{ki} p - (\epsilon-1) p_{ki} a_k + (\epsilon-1) p_{ki} y + t.i.p.s \tag{B.17}$$

where $t.i.p.s$ are terms independent of $p_{ki}$. Finally, profit-maximizing price $p_{ki}^{\diamond}$ set by firm $i$ in sector $k$ implied by the first order condition $\frac{\partial v_{ki}}{\partial p_{ki}} = 0$ is

$$p_{ki}^{\diamond} = p + y - a_k \tag{B.18}$$

## B.2 Objective function for attention choice: profit loss

From the inner optimization problem in Equation (2.2), the price set by firm $i$ in sector $k$ is $p_{ki}^* = E[p_{ki}^{\diamond} | I_{ki}]$, where $p_{ki}^{\diamond}$ denotes the profit-maximizing price (details can be found above in B.1). Then, we follow Mackowiak and Wiederholt (2009) and define the loss in profits resulting from a suboptimal price set by the inattentive decision-maker as

$$\begin{aligned}
&\hat{v}_{ki}(p_{ki}^{\diamond}, p, y, a) - \hat{v}_{ki}(p_{ki}^*, p, y, a) \qquad\qquad (B.19)\\
&= \frac{1-\epsilon}{2} \left(p_{ki}^{\diamond}\right)^2 + (\epsilon-1) p_{ki}^{\diamond} p - (\epsilon-1) p_{ki}^{\diamond} a_k + (\epsilon-1) p_{ki}^{\diamond} y \\
&- \frac{1-\epsilon}{2} \left(p_{ki}^*\right)^2 - (\epsilon-1) p_{ki}^* p + (\epsilon-1) p_{ki}^* a_k - (\epsilon-1) p_{ki}^* y \\
&= \frac{1-\epsilon}{2} \left[\left(p_{ki}^{\diamond}\right)^2 - \left(p_{ki}^*\right)^2\right] + (\epsilon-1)(p + y - a_k) \left(p_{ki}^{\diamond} - p_{ki}^*\right), \\
&= \frac{\epsilon-1}{2} \left(p_{ki}^{\diamond} - p_{ki}^*\right)^2 \qquad\qquad (B.20)
\end{aligned}$$

where the first equality follows from Equation (B.17) and the second equality follows from Equation (B.18).

### B.3 Policy functions

We employ the method of undetermined coefficients to determine the policy functions. We guess and verify these function forms as follows:

$$\begin{aligned} p_{1i}^* &= \phi_1 s_{1i} \\ p_1^* &= \phi_1 u \\ p_{2i}^* &= -\phi_2 s_{2i} \\ p_2^* &= -\phi_2 u \\ x &= \phi_x u. \end{aligned}$$

Given our guesses, the following equations must hold:

$$\phi_1 s_{1i} = E\left[\frac{1}{2}(1-\theta_1)\phi_1 u - \frac{1}{2}(1-\theta_2)\phi_2 u + \phi_x u + u | s_{1i}\right] \tag{B.21}$$

$$-\phi_2 s_{2i} = E\left[\frac{1}{2}(1-\theta_1)\phi_1 u - \frac{1}{2}(1-\theta_2)\phi_2 u + \phi_x u - u | s_{2i}\right], \tag{B.22}$$

Thus, we have:

$$\phi_1 = \frac{1}{2}(1-\theta_1)\phi_1 K_1 - \frac{1}{2}(1-\theta_2)\phi_2 K_1 + \phi_x K_1 + K_1 \tag{B.23}$$

$$-\phi_2 = \frac{1}{2}(1-\theta_1)\phi_1 K_2 - \frac{1}{2}(1-\theta_2)\phi_2 K_2 + \phi_x K_2 - K_2, \tag{B.24}$$

where $K_1$ and $K_2$ are Kalman gains in sector 1 and 2 respectively. We assume the central bank uses a price stabilization monetary policy:

$$\frac{1}{2}(1-\theta_1)\omega\phi_1 u - \frac{1}{2}(1-\theta_2)(1-\omega)\phi_2 u = 0, \tag{B.25}$$

From this equation, we obtain:

$$\phi_1 = \frac{(1-\theta_2)(1-\omega)}{(1-\theta_1)\omega}\phi_2 \tag{B.26}$$

Plugging equation (B.26) into (B.23) and (B.24), we get

$$\frac{(1-\theta_2)(1-\omega)}{(1-\theta_1)\omega}\phi_2 = \frac{1}{2}(1-\theta_1)\frac{(1-\theta_2)(1-\omega)}{(1-\theta_1)\omega}\phi_2 K_1 - \frac{1}{2}(1-\theta_2)\phi_2 K_1 + \phi_x K_1 + K_1, \tag{B.27}$$

$$-\phi_2 = \frac{1}{2}(1-\theta_1)\frac{(1-\theta_2)(1-\omega)}{(1-\theta_1)\omega}\phi_2 K_2 - \frac{1}{2}(1-\theta_2)\phi_2 K_2 + \phi_x K_2 + K_2 \tag{B.28}$$

Combining these two equations above, we can derive

$$\phi_1 = \frac{2(1-\theta_2)(1-\omega)K_1K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}, \tag{B.29}$$

$$\phi_2 = \frac{2(1-\theta_1)\omega K_1K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}. \tag{B.30}$$

Plugging the two results into either equation (B.27) or equation (B.28), we obtain

$$\phi_x = \frac{(1-\theta_2)(1-\omega)K_2 - (1-\theta_1)\omega K_1}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1} - \frac{(1-\theta_1)(1-\theta_2)(1-\omega) - (1-\theta_1)(1-\theta_2)\omega}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}K_1K_2 \tag{B.31}$$

Substituting the values of $\phi_1$, $\phi_2$, and $\phi_x$ into the profit-maximizing price of firm $i$ in sector 1, we have

$$p_{1i}^{\diamond} = \frac{2(1-\theta_2)(1-\omega)K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}u, \tag{B.32}$$

and

$$p_{1i}^{*} = \frac{2(1-\theta_2)(1-\omega)K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}K_1 s_{1i}, \tag{B.33}$$

This equation (B.33) verifies our initial guesses. Furthermore, we define $\varphi_1$ and $\varphi_2$ as

$$\varphi_1 = \frac{\phi_1}{K_1} = \frac{2(1-\theta_2)(1-\omega)K_2}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}, \tag{B.34}$$

$$\varphi_2 = \frac{\phi_2}{K_2} = \frac{2(1-\theta_1)\omega K_1}{(1-\theta_2)(1-\omega)K_2 + (1-\theta_1)\omega K_1}. \tag{B.35}$$

Note that $\varphi_1 + \varphi_2 = 2$.

# C Proofs of Propositions

## C.1 Proof of Proposition 1

The proof closely follows Mondria (2010) and Li and Wu (2016). Let the signals structure of agents have the following general form

$$\boldsymbol{s}_{ki}^{*} = \boldsymbol{M}_{k}^{*}\boldsymbol{a} + \boldsymbol{e}_{ki}^{*} \tag{C.1}$$

where $\boldsymbol{a} = (a_1, a_2)'$ is the vector of sectoral shocks with variance-covariance matrix $\boldsymbol{\Sigma}_{aa}$, $\boldsymbol{s}_{ki}^{*} = (s_{ki,1}, s_{ki,2})'$ is the vector of signals and $\boldsymbol{M}_{k}^{*}$ is $2 \times 2$ matrix as the weights of these shocks. The vector of observational errors $\boldsymbol{e}_{ki}^{*} = \left(e_{1,ki}^{*}, e_{2,ki}^{*}\right)'$ is a 2-dimensional Gaussian vector. The variance-covariance matrix of $\boldsymbol{e}_{ki}^{*}$ is $\Sigma_{e,k}^{*}$.

In the following steps, we will show that given the general signal strcuture (C.1), the agents will optimally choose the sginal strcture as the form:

$$s_{ki} = u + \epsilon_{ki} \tag{C.2}$$

**Step 1** We first take a linear tranformation of the signal structure (C.1) so that the variance-covariance matrix of the error term of the new signal is dianal. Since the vairance-covariance matrix $\Sigma_{e,k}^{*}$ is symmetric and positive semi-definite, we can always find a orthonal matrix $B_k$ such that

$$\Sigma_{e,k}^{*} = B_k \Lambda_k B_k' \tag{C.3}$$

where $\Lambda_k$ is a diagnal matrix and $B_k' = B_k^{-1}$. Firstly, we transform the signal linearly as follows:

$$\tilde{\boldsymbol{s}}_{ki}^{*} = B_k^{-1}\boldsymbol{s}_{ki}^{*} \tag{C.4}$$

$$= B_k^{-1}\boldsymbol{M}_{k}^{*}\boldsymbol{a} + B_k^{-1}\boldsymbol{e}_{ki}^{*} \tag{C.5}$$

The variance-covariance matrix of $B_k^{-1}\boldsymbol{e}_{ki}^{*}$ is a diagnal matrix $\Lambda_k$.

Then, we constrcut a new signal $\boldsymbol{s}_{ki}$ of the following form:

$$\boldsymbol{s}_{ki} = \boldsymbol{M}_{k}\boldsymbol{a} + \boldsymbol{e}_{ki}$$

where $\boldsymbol{M}_k = DB_k^{-1}\boldsymbol{M}_k^{*}$, $\boldsymbol{e}_{ki} = DB_k^{-1}\boldsymbol{e}_{ki}^{*}$. $\boldsymbol{D}$ is a diagonal non-singular matrix. We can select $D$ such that the weighting matrix $\boldsymbol{M}_k$ is normalized to be $\boldsymbol{M}_k = \begin{bmatrix} 1 & m_{k,1} \\ 1 & m_{k,2} \end{bmatrix}$. The variance-covariance matrix of $\boldsymbol{e}_{ki}$ is $\Sigma_{e,k}$.

Moreover, it is important to note that the linear transform does not alter the mutual information. In other words, the new signal $\tilde{\boldsymbol{s}}^*_{ki}$ satifies the information capacity constraint and leads to the same equilibrium.

**Step 2** In the second step, we proceed to show that firms choose to observe only one signal. We first describe the information capacity of firms.

The information constraint for firms in sector $k$ follows

$$\frac{det\left(\boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' + \Sigma_{e,k}\right)}{det\left(\Sigma_{e,k}\right)} \quad \leq \quad 2^{2\kappa_k}, \tag{C.6}$$

where $det$ denotes the determinant of a matrix. It follows that

$$\frac{\sigma_{a1}^2 + m_{k,1}^2 \sigma_{a2}^2}{\sigma_{k,e1}^2} + \frac{\sigma_{a1}^2 + m_{k,2}^2 \sigma_{a2}^2}{\sigma_{k,e2}^2} + \frac{\left(m_{k,1} - m_{k,2}\right)^2 \sigma_{a1}^2 \sigma_{a2}^2}{\sigma_{k,e1}^2 \sigma_{k,e2}^2} \quad \leq \quad 2^{2\kappa_k}. \tag{C.7}$$

where $\sigma_{k,e1}^2$ and $\sigma_{k,e2}^2$ are items in $\Sigma_{e,k}$, and $\sigma_{a1}^2$ and $\sigma_{a2}^2$ are items in $\boldsymbol{\Sigma}_{aa}$. The information constraint is binding in the equilibrium can be rewritten compactly in terms of $\sigma_{e1,k}^2$ and $\sigma_{e2,k}^2$ as $y_{k,1}\sigma_{k,e1}^{-2} + y_{k,2}\sigma_{k,e2}^{-2} + y_{k,3}\sigma_{k,e1}^{-2}\sigma_{k,e2}^{-2} = y_{k,4}$ where $y_{k,1}, y_{k,2}, y_{k,3}$ and $y_{k,4}$ are positive real numbers.

Next, we describe the optimization problem of firms. Given the information capacity $\kappa_k$, firm $i$ in sector $k$ minimize the profit loss function $E\left((p^*_{ki} - p^\diamond_{ki})^2 \mid \boldsymbol{s}_{ki}\right)$ subject to the information constraint (C.6).

Let's assume in equilibrium $p^\diamond_{ki} = \boldsymbol{\Phi}_{p^\diamond_k} \boldsymbol{a}$, where $\boldsymbol{\Phi}_{p^\diamond_k} = \left(\phi_{p^\diamond_k,1}, \phi_{p^\diamond_k,2}\right)$. This can be easily verified later. [10] Use the information constraint (C.6) and conjectured equilibrium for $p^\diamond_{ki}$ , the profit loss function is:

$$\begin{aligned}
& E\left((p^*_{ki} - p^\diamond_{ki})^2 \mid \boldsymbol{s}_{ki}\right) \\
= \quad & Var\left(p^\diamond_{ki} \mid \boldsymbol{s}_{ki}\right) \\
= \quad & \boldsymbol{\Phi}_{p^\diamond_k} \boldsymbol{\Sigma}_{aa} \boldsymbol{\Phi}'_{p^\diamond_k} - \boldsymbol{\Phi}_{p^\diamond_k} \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' \left(\boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' + \Sigma_{k,e}\right)^{-1} \boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{\Phi}'_{p^\diamond_k} \\
= \quad & \boldsymbol{\Phi}_{p^\diamond_k} \boldsymbol{\Sigma}_{aa} \boldsymbol{\Phi}'_{p^\diamond_k} - \boldsymbol{\Phi}_{p^\diamond_k} \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' \frac{Tr\left(\boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' + \Sigma_{k,e}\right)\mathbf{1} - \left(\boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{M}_k' + \Sigma_{k,e}\right)}{2^{2\kappa_k} det\left(\Sigma_{k,e}\right)} \boldsymbol{M}_k \boldsymbol{\Sigma}_{aa} \boldsymbol{\Phi}'_{p^\diamond_k} \\
= \quad & x_{k,0} + x_{k,1}\sigma_{k,e1}^{-2} + x_{k,2}\sigma_{k,e2}^{-2} + x_3 \sigma_{k,e1}^{-2}\sigma_{k,e2}^{-2}
\end{aligned}$$

[10] We will show that $p^\diamond_{ki}$ actually is function of $u$, which is $0.5\left(a_2 - a_1\right)$, later

where the first equality uses the pricing equation $p^*_{ki} = E\left(p^\diamond_{ki} \mid \mathbf{s}_{ki}\right)$, the second equality uses the equilibrium solution, the third equality uses equation (C.6) and operation of inverse matrix, and the fourth equality is obtained with some algebra. *Tr* means the trace of a matrix and **1** is $2 \times 2$ identity matrix. Coefficients $x_{k,0}$, $x_{k,1}$, , $x_{k,2}$ and $x_{k,3}$ are all positive real numbers:

$$
\begin{aligned}
x_{k,0} &= \phi^2_{1,p^\diamond_k}\sigma^2_{a1} + \phi^2_{2,p^\diamond_k}\sigma^2_{a2} \\
x_{k,1} &= 2^{-2\kappa_k}\left(\phi_{1,p^\diamond_k}\sigma^2_{a1} + m_{k,1}\phi_{2,p^\diamond_k}\sigma^2_{a2}\right)^2 \\
x_{k,2} &= 2^{-2\kappa_k}\left(\phi_{1,p^\diamond_k}\sigma^2_{a1} + m_{k,2}\phi_{2,p^\diamond_k}\sigma^2_{a2}\right)^2 \\
x_{k,3} &= 2^{-2\kappa_k}\left(m_{k,1} - m_{k,2}\right)^2\sigma^2_{a1}\sigma^2_{a2}\left(\phi^2_{1,p^\diamond_k}\sigma^2_{a2} + \phi^2_{2,p^\diamond_k}\sigma^2_{a2}\right).
\end{aligned}
$$

Therefore, firms' attention allocation problem can be reformulated as

$$
\begin{aligned}
&\min_{\sigma^2_{k,e1},\sigma^2_{k,e2}} x_{k,0} + x_{k,1}\sigma^{-2}_{k,e1} + x_{k,2}\sigma^{-2}_{k,e2} + x_{k,3}\sigma^{-2}_{k,e1}\sigma^{-2}_{k,e2} \\
&\text{s.t. } y_{k,4} = y_{k,1}\sigma^{-2}_{k,e1} + y_{k,2}\sigma^{-2}_{k,e2} + y_{k,3}\sigma^{-2}_{k,e1}\sigma^{-2}_{k,e2},
\end{aligned}
$$

Substituting constraints into the objective function, we obtain

$$
\min_{\sigma^{-2}_{k,e1}\in\left[0,\frac{y_{k,4}}{y_{k,1}}\right]} x_{k,0} + x_{k,1}\sigma^{-2}_{k,e1} + \left(x_{k,1} + x_{k,3}\sigma^{-2}_{k,e1}\right)\frac{y_{k,4} - y_{k,1}\sigma^{-2}_{k,e1}}{y_{k,2} + y_{k,3}\sigma^{-2}_{k,e1}}
$$

The second-order condition is

$$
\begin{aligned}
& 2\frac{(y_1y_2+y_3y_4)}{(y_2+y_3z_1)^3}\left(x_2y_3 - y_2x_3\right) \\
=\;& -2^{-2\kappa_k}\left(m_{k,1} - m_{k,2}\right)^2\sigma^4_{a1}\sigma^4_{a2}\left(\phi_{1,p^\diamond_k}m_{k,2} - \phi_{2,p^\diamond_k}\right)^2 \\
<\;& 0 .
\end{aligned}
$$

The objective function is strictly concave over a compact set $\left[0, \frac{y_{k,4}}{y_{k,1}}\right]$. There exists only corner solutions, which implies that firms choose to observe only one signal. The firms choose to observe either signal $s_{ki,1}$ (i.e. $\sigma^{-2}_{k,e,1} = y_{k,4}/y_{k,1}, \sigma^{-2}_{k,e,2} = 0$) or signal $s_{ki,2}$ (i.e. $\sigma^{-2}_{k,e,1} = 0, \sigma^{-2}_{k,e,2} = y_{k,4}/y_{k,2}$). Without the loss of the generality, we assume firms choose to observe:

$$\begin{aligned} s_{ki} &= a_1 + m_{k,1}a_2 + e_{ki} \\ &= \tilde{\boldsymbol{M}}_k \boldsymbol{a} + e_{ki} \end{aligned}$$

where $\tilde{\boldsymbol{M}}_k = (1, m_{k,1})$.

**Step 3**: In the third step, we chaterize the optimal information strcuture the firms choose to observe. Specifically, , we solve for the optimal weights $\tilde{\boldsymbol{M}}_k$ and variance $\sigma_e^2$ for firms in sector $k$ as follows

$$\begin{aligned} \min_{m_{k,1}, \sigma_e^2} \boldsymbol{\Phi}_{p_k^\diamond} \Sigma_{aa} \boldsymbol{\Phi}'_{p_k^\diamond} - \frac{\left(\boldsymbol{\Phi}_{p_k^\diamond} \Sigma_{aa} \tilde{\boldsymbol{M}}_k{}'\right)^2}{\tilde{\boldsymbol{M}}_k \Sigma_{aa} \tilde{\boldsymbol{M}}_k{}' + \sigma_e^2} \\ \text{s.t. } \frac{\tilde{\boldsymbol{M}}_k \Sigma_{aa} \tilde{\boldsymbol{M}}_k{}' + \sigma_e^2}{\sigma_e^2} = 2^{2\kappa_k} \end{aligned}$$

The solution is

$$\begin{aligned} m_{k,1} &= \frac{\phi_{p_k^\diamond,2}}{\phi_{p_k^\diamond,1}} \\ \sigma_e^2 &= \frac{1}{2^{2\kappa_k} - 1} \tilde{\boldsymbol{M}}_k \Sigma_{aa} \tilde{\boldsymbol{M}}_k{}'. \end{aligned}$$

Thus $\tilde{\boldsymbol{M}}_k = \left(1, \frac{\phi_{p_k^\diamond,2}}{\phi_{p_k^\diamond,1}}\right)$. Take linear transform of the signal, it turns out that the optimal signal for firms in sector k is a is a signal about $p_{ki}^\diamond = \left(\phi_{p_k^\diamond,1}, \phi_{p_k^\diamond,2}\right) \boldsymbol{a}$. With a little abuse of notation, it is

$$s_{ki} = p_{ki}^\diamond + e_{ki}.$$

**Step 4** In the last step, we show that $p_{ki}^\diamond$ is a linear function of $u_t$ and optimal signal for firms is to observe $u_t$. Given the information structure (C.8), and the systems of the equations

$$\begin{aligned} p^*_{ki} &= E\left(p^\diamond_{ki}|s_{ki}\right) \\ p^\diamond_{1i} &= p+x+u \\ p^\diamond_{2i} &= p+x-u \\ 0 &= \omega p_1+(1-\omega)p_2 \\ p_k &= (1-\theta_k)\int p^*_{ki}di, \end{aligned}$$

$p^\diamond_{ki}$ is linear function of $u$. Thus, by the linear transformation, the optimal signal is a signal about $u$ equivalently. With a little abuse of notation, it is

$$s_{ki} = u+e_{ki}.$$

## C.2 Proof of Proposition 2

*Proof.* In the analysis below, we focus on the case where the solution is interior. The optimal attention choice problem leads to the following equations:

$$K_1 = 1-\frac{1-K^s}{\varphi_1} \tag{C.8}$$

$$K_2 = 1-\frac{1-K^s}{\varphi_2}. \tag{C.9}$$

where $K^s = 1-(\frac{2\lambda}{(\epsilon-1)\sigma_u^2})^{\frac{1}{2}}$.

The price stabilization policy indicates that

$$\omega\left(1-\theta_1\right)\varphi_1 K_1-(1-\omega)\left(1-\theta_2\right)\varphi_2 K_2 = 0 \tag{C.10}$$

Note that

$$\varphi_1+\varphi_2 = 2 \tag{C.11}$$

From Equations (C.8), (C.9), (C.10), and (C.11), we can solve for $K_1$, $K_2$, $\varphi_1$, and $\varphi_2$:

$$K_1 = \frac{2(1-\omega)(1-\theta_2)K^s}{(1-\omega)(1-\theta_2)(1+K^s)+\omega(1-\theta_1)(1-K^s)} \tag{C.12}$$

$$K_2 = \frac{2\omega(1-\theta_1)K^s}{(1-\omega)(1-\theta_2)(1-K^s)+\omega(1-\theta_1)(1+K^s)} \tag{C.13}$$

$$\varphi_1 = \frac{(1-\omega)(1-\theta_2)(1+K^s)+\omega(1-\theta_1)(1-K^s)}{(1-\omega)(1-\theta_2)+\omega(1-\theta_1)} \tag{C.14}$$

$$\varphi_2 = \frac{(1-\omega)(1-\theta_2)(1-K^s)+\omega(1-\theta_1)(1+K^s)}{(1-\omega)(1-\theta_2)+\omega(1-\theta_1)} \tag{C.15}$$

It is straightforward to show that $\frac{\partial \varphi_k}{\partial \theta_k} > 0$, $\frac{\partial \kappa_k}{\partial \theta_k} > 0, k = 1,2$. Next, we derive the expressions for $\sigma_{e,k}$, where $k = 1,2$:

$$\begin{aligned}\sigma^2_{\epsilon,1} &= \left(\frac{1}{K_1} - 1\right)\sigma^2_u \\ &= \left(\frac{(1-\omega)(1-\theta_2)(1-K^s)+\omega(1-\theta_1)(1-K^s)}{2(1-\omega)(1-\theta_2)K^s}\right)\sigma^2_u \end{aligned} \tag{C.16}$$

$$\begin{aligned}\sigma^2_{e,2} &= \left(\frac{1}{K_2} - 1\right)\sigma^2_u \\ &= \frac{(1-K^s)\left[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)\right]}{2\omega(1-\theta_1)K^s}\sigma^2_u \end{aligned} \tag{C.17}$$

From equations C.16, C.17, it can be shown that $\frac{\partial \sigma^2_{e,k}}{\partial \theta_k} > 0$. Proof of proposition 1 is completed. □

## C.3 Proof of Proposition 3

*Proof.* Under exogenous information friction, the sum of dispersed information price dispersion is:

$$NS^{exo} = \frac{(1-\theta_2)[(1-\omega)^2(1-\theta_2)+\omega^2]}{[(1-\omega)(1-\theta_2)+\omega]^2}4K^2\sigma^2_e \tag{C.18}$$

The sum of calvo price dispersion is:

$$Calvo^{exo} = \frac{\theta_2(1-\theta_2)4\omega^2K^2\sigma^2_u}{[(1-\omega)(1-\theta_2)+\omega]^2} \tag{C.19}$$

The total price dispersion is proportional to:

$$L^{exo} = \frac{\sigma_e^2/\sigma_u^2[(1-\omega)^2(1-\theta_2)+\omega^2)+\theta_2\omega^2]+\theta_2\omega^2}{[(1-\omega)(1-\theta_2)+\omega]^2} \tag{C.20}$$

Take the derivative of $L^{exo}$ w.r.t.$\omega$, the first order condition $\frac{\partial L^{exo}}{\partial \omega} = 0$ yields the optimal weight:

$$\omega^* = \frac{1}{2+\frac{\sigma_u^2}{\sigma_e^2}\theta_2} \tag{C.21}$$

It is easy to show that $\omega^*$ is decreasing in $\theta_2$, and $\omega^* \leq 0.5$.

□

## C.4 Proof of Proposition 4

*Proof.* From section C.2, we have the following expressions for the case where the price is fully flexible in sector 1 under rational inattention, i.e., $\theta_1 = 0$.

The sum of Calvo price dispersion is

$$\frac{4\,(1-\theta_2)\,\theta_2\omega^2 K^{s2}}{[(1-\omega)\,(1-\theta_2)+\omega]^2}\sigma_u^2 \tag{C.22}$$

The sum of dispersed belief price dispersion is

$$\frac{2\,(1-\theta_2)\,K^s\,(1-K^s)}{(1-\omega)\,(1-\theta_2)+\omega}\sigma_u^2 \tag{C.23}$$

The total price dispersion is proportional to

$$L = \frac{2\theta_2\omega^2K^s + (1-K^s)\,((1-\omega)\,(1-\theta_2)+\omega)}{[(1-\omega)\,(1-\theta_2)+\omega]^2} \tag{C.24}$$

$$= \frac{2\theta_2\omega^2K^s + (1-K^s)\,(1-\theta_2+\omega\theta_2)}{[1-\theta_2+\omega\theta_2]^2} \tag{C.25}$$

Take derivative of L w.r.t $\omega$, we get

$$\frac{\partial L}{\partial \omega} = \frac{(4\theta_2\omega K^s+(1-K^s)\theta_2)[1-\theta_2+\omega\theta_2]^2-2\theta_2[1-\theta_2+\omega\theta_2]\left(2\theta_2\omega^2K^s+(1-K^s)(1-\theta_2+\omega\theta_2)\right)}{[1-\theta_2+\omega\theta_2]^4}$$
$$= \frac{\left[4\theta_2K^s(1-\theta_2)-(1-K^s)\theta_2^2\right]\omega-(1-K^s)\theta_2(1-\theta_2)}{[1-\theta_2+\omega\theta_2]^3}$$

Throughout the analysis below, we focus on the cases where $\theta_2 > 0$.

- Case 1: $\left[4\theta_2K^s\left(1-\theta_2\right)-\left(1-K^s\right)\theta_2^2\right] \leq 0 \iff K^s \leq \frac{\theta_2}{4-3\theta_2}$. In this case, $\frac{\partial L}{\partial \omega} \leq 0$. Therefore the welfare loss is decreasing in $\omega$. The economy reaches the minimum of welfare loss when $\omega^* = 1$.

- Case 2: $\left[4\theta_2K^s\left(1-\theta_2\right)-\left(1-K^s\right)\theta_2^2\right] > 0 \iff K^s > \frac{\theta_2}{4-3\theta_2}$. In this case, the optimal weight $\omega^* = min\{\frac{(1-K^s)(1-\theta_2)}{4K^s(1-\theta_2)-(1-K^s)\theta_2}, 1\}$. It is trivial to show that under the former condition, $\frac{\partial\omega^*}{\theta_2} \geq 0$.
  Next, we derive the condition for $\omega^* > \frac{1}{2}$, which implies that $(5K^s-1)\theta_2 > 2(3K^s-1)$. It follows that $K^s < \frac{2-\theta_2}{6-5\theta_2}$.

Combining case 1 and case 2, we conclude that $\frac{\partial\omega^*}{\theta_2} \geq 0$, and if $K^s < \frac{2-\theta_2}{6-5\theta_2}$, $\omega^* > 0.5$. This completes the proof. □

## C.5 Proof of Proposition 5

The dispersed belief components for sector 1 ($NS_1$) and sector 2 ($NS_2$) under rational inattention are given by:

$$NS_1 = \left(1-\theta_1\right)\left(K_1\varphi_1\right)^2\sigma_{e,1}^2 \tag{C.26}$$
$$NS_2 = \left(1-\theta_2\right)\left(K_2\varphi_2\right)^2\sigma_{e,2}^2 \tag{C.27}$$

Substituting the solutions for $\varphi_1$, $\varphi_2$, $K_1$, and $K_2$ from section C.2, we can simplify the expressions to:

$$NS_1 = \frac{2\left(1-\omega\right)\left(1-\theta_2\right)K^s\left(1-K^s\right)}{\left(1-\omega\right)\left(\frac{1-\theta_2}{1-\theta_1}\right)+\omega}\sigma_u^2 \tag{C.28}$$
$$NS_2 = \frac{2\omega\left(1-\theta_2\right)K^s\left(1-K^s\right)}{\left(1-\omega\right)\left(\frac{1-\theta_2}{1-\theta_1}\right)+\omega}\sigma_u^2 \tag{C.29}$$

Under exogenous information, when firms in both sectors share the same information set, the dispersed belief component for sector 1 ($NS_1^{exo}$) and sector 2 ($NS_2^{exo}$) is given by:

$$NS_1^{exo} = (1-\theta_1)\left[\frac{2(1-\omega)(1-\theta_2)K_{exo}}{(1-\omega)(1-\theta_2)+\omega(1-\theta_1)}\right]^2 \sigma_\epsilon^2 \tag{C.30}$$

$$NS_2^{exo} = (1-\theta_2)\left[\frac{2\omega(1-\theta_1)K_{exo}}{(1-\omega)(1-\theta_2)+\omega(1-\theta_1)}\right]^2 \sigma_\epsilon^2 \tag{C.31}$$

where $K_{exo}$ is the Kalman gain under exogenous information. It can be easy to show that under CPI targeting policy, i.e., $\omega = 0.5$, $\frac{\partial NS_1}{\partial \theta_1} < 0, \frac{\partial NS_1^{exo}}{\partial \theta_1} > 0$, for $\theta_1 \in (0,1)$and $\theta_2 \in (0,1)$. This completes the proof.

## C.6 Proof of Proposition 6

*Proof.* From section C.5, the sum of dispersed belief components for welfare loss $NS$ under rational inattention is:

$$NS = NS_1 + NS_2 = \frac{2(1-\theta_2)K^s(1-K^s)}{(1-\omega)\left(\frac{1-\theta_2}{1-\theta_1}\right)+\omega}\sigma_u^2 \tag{C.32}$$

It is straigtforward to show that if $\theta_1 < \theta_2$, $\frac{\partial NS}{\partial w} < 0$.

Under exogenous information, the sum of dispersed belief components for welfare loss $NS^{exo}$ is

$$NS^{exo} \propto \frac{(1-\theta_2)(1-\omega)^2+(1-\theta_1)\omega^2}{[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^2}$$

Taking the derivative of $NS$ with respect to $\omega$, we get:

$$\begin{aligned}
\frac{\partial NS^{exo}}{\partial \omega} &= \frac{[-2(1-\theta_2)(1-\omega)+2(1-\theta_1)\omega][(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^2}{[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^4} \\
&- \frac{2[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)][-(1-\theta_2)+(1-\theta_1)]\left[(1-\theta_2)(1-\omega)^2+(1-\theta_1)\omega^2\right]}{[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^4} \\
&= \frac{[-2(1-\theta_2)(1-\omega)+2(1-\theta_1)\omega][(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]}{[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^3} \\
&- \frac{2[-(1-\theta_2)+(1-\theta_1)]\left[(1-\theta_2)(1-\omega)^2+(1-\theta_1)\omega^2\right]}{[(1-\omega)(1-\theta_2)+\omega(1-\theta_1)]^3}
\end{aligned}$$

Evaluating $\frac{\partial NS^{exo}}{\partial \omega}$ at $\omega = 0.5$, we have:

$$\frac{\partial NS^{exo}}{\partial \omega} = 0.$$

Proof of proposition 5 is completed. □

## C.7 Proof of Proposition 7

*Proof.* From section C.2, we have the following expressions:

$$K_1 = \frac{2\,(1-\omega)\,(1-\theta_2)\,K^s}{(1-\omega)\,(1-\theta_2)\,(1+K^s)+\omega\,(1-\theta_1)\,(1-K^s)} \tag{C.33}$$

$$\varphi_1 = \frac{(1-\omega)\,(1-\theta_2)\,(1+K^s)+\omega\,(1-\theta_1)\,(1-K^s)}{(1-\omega)\,(1-\theta_2)+\omega\,(1-\theta_1)} \tag{C.34}$$

$$\sigma^2_{\epsilon,1} = \left(\frac{(1-\omega)\,(1-\theta_2)\,(1-K^s)+\omega\,(1-\theta_1)\,(1-K^s)}{2\,(1-\omega)\,(1-\theta_2)\,K^s}\right)\sigma^2_u \tag{C.35}$$

It is clear that $\frac{\partial \varphi_1}{\partial \omega} < 0$, $\frac{\partial K_1}{\partial \omega} < 0$, and $\frac{\partial \sigma_{\epsilon,1}}{\partial \omega} > 0$. Since $\kappa_1$ is increasing in $K$, we have $\frac{\partial \kappa_1}{\partial \omega} < 0$. This completes the proof of Proposition 6. □