Monetary Communication and Credibility in a Multi-Sector Economy

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Disclaimer

The views expressed in this paper are solely those of the authors, and no responsibility for them should be attributed to the Bank of Canada, the Banque de France or the Eurosystem.

ECB on Sectoral Heterogeneity

- *"The transmission of monetary policy [...] remains heterogeneous across different types of banks, firms and households, across different sectors and across countries."*

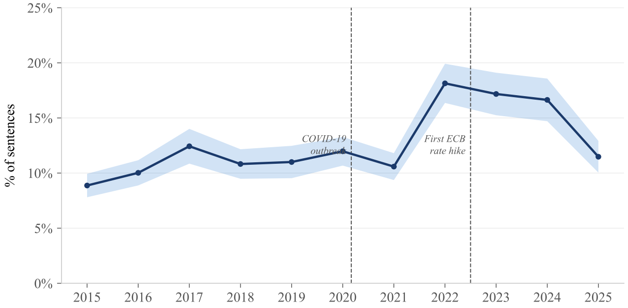
  Lane (Suerf, 2025)

- *"The most important [challenge] is services inflation [...] services inflation has been much stickier than expected."*

  Schnabel (Bloomberg, 2025)

⇒ ECB's mandate geared toward "price stability in the euro area as a whole" — yet sectoral narratives moved to the foreground around the inflation surge.

Sectoral language in ECB communication



⇒ Sectoral and heterogeneity framing in ECB monetary-policy communications rose sharply around the 2021–23 inflation surge.

Dictionary-based, sentence-level salience measure on 1,650 ECB monetary-policy documents, 2015–2025.

This Project

A Barro–Gordon theory of monetary communication in a multi-sector economy

1. **Commitment** - Optimal Disclosure Rule

   Optimal communication has a *full vs. partial disclosure* structure, pinned down by elasticities and sectoral price rigidities.

2. **Deviation** - Credibility of the Rule

   Full disclosure is *not time-consistent*: incentives to misreport sectoral dispersion to contain within-sector price dispersion.

3. **Discretion with Reputational Dynamics**

   Reputation sustains strategic communication, with short-run stabilization gains at the expense of long-run stabilization.

Literature

1. **Monetary stabilization with sectoral shocks**
   - Woodford (2003), Aoki (2001), Benigno (2004)
   - Afrouzi and Bhattarai (2023), Guerrieri, Lorenzoni, Straub, and Werning (2021), La'O and Tahbaz-Salehi (2022), Rubbo (2023)
2. **Central bank communication**
   - Social value of public information: Morris and Shin (2002)
   - Transparency, e.g., Ou, Zhang, and Zhang (2022)
   - Bayesian Persuasion, e.g., Tamura (2016,2018), Gati (2022), Herbert (2022)
3. **Credibility and reputation**

   Barro and Gordon (1983), Kreps and Wilson (1982), Backus and Driffill (1985), Benabou and Laroque (1992), Amador and Phelan (2021), Bocola, Dovis, Jørgensen, Kirpalani (2025)

$\Rightarrow$ Time-inconsistency of information disclosure and effective economic stabilization in a multi sector economy

Plan of the talk

1. **Economic Environment** GoTo
2. **Commitment** - Optimal Disclosure Rule GoTo
3. **Deviation** - Credibility of the Rule GoTo
4. **Discretion with Reputational Dynamics** GoTo

1. Environment

- Model and price sytem
- Log-linearized competitive equilibrium
- Timing: asymmetric information and price rigidities
- Monetary Policy as an information control problem

1. Model (static)

Households

$$U(C, L) = \log C - L$$

s.t. $PC = WL + \Pi + T$

Two Sectors Production (size $n_1 = n_2$)

- Consumption good is CES of sectoral goods $j \in \{1, 2\}$ elast $\eta \geq 1$
- Sectoral good j is CES of differentiated goods $i \in (0, \frac{1}{2})$ elast $\theta \geq \eta$
- Differentiated good: $Y_{ij} = A_j L_{ij}$ Price setters

Monetary Policy

$$Q = PY$$

1. Price system

- <u>Consumption good and sectoral bundles</u> $\theta \geq \eta$

$$P = \left[\frac{1}{2}P_1^{1-\eta} + \frac{1}{2}P_2^{1-\eta}\right]^{\frac{1}{1-\eta}} \qquad P_j = \left[\left(\frac{1}{2}\right)^{-1}\int_0^{\frac{1}{2}} P_{ij}^{1-\theta} di\right]^{\frac{1}{1-\theta}}$$

- <u>Differentiated good i in sector j</u>, set price P_{ij}

$$P_{ij}\mathbb{E}_{ij}\left\{\left(\frac{1}{P_j}\right)^{-\theta}\left(\frac{P_j}{P}\right)^{-\eta}\right\} = \mathcal{M}(1-\tau)\mathbb{E}_{ij}\left\{\left(\frac{1}{P_j}\right)^{-\theta-1}\left(\frac{P_j}{P}\right)^{-\eta-1}\frac{Y}{A_j}\right\}$$

where $1-\tau$ offsets firms' mark up $\mathcal{M} = \frac{\theta}{\theta-1}$.

1. Log-linearized comp eqm

Price setting

$$\hat{p}_{ij} = \mathbb{E}_{ij}(\hat{q} - \hat{a}_j)$$

Natural level of output and relative price

$$\hat{y}^n = \frac{\hat{a}_1 + \hat{a}_2}{2} \qquad \hat{p}^n_R = \hat{a}_1 - \hat{a}_2$$

Welfare

$$U \approx -\frac{1}{2}\left[(\hat{y} - \hat{y}^n)^2 + \frac{\eta}{4}(\hat{p}_R - \hat{p}^n_R)^2 + \frac{\theta}{2}\sum_{j\in\{1,2\}} \mathrm{var}^j_i \hat{p}_{ij}\right] + \mathrm{t.i.p.}$$

1. Timing

Nature, **P**rivate **F**irms, and a **M**onetary **A**uthority:

- All **PF** in sector $j \in \{1, 2\}$ *preset* prices $\hat{p}_j^p = 0$, given prior μ.
- **N** draws $\hat{v}^n = (\hat{y}^n, \hat{p}_R^n)$, only observable to **MA**.*
- **MA** sends a message m associated to $\hat{v}^n = (\hat{y}^n, \hat{p}_R^n)$, and sets policy instrument $\hat{q}$.
- A share $1 - \alpha_j$ of **PF** in sector $j \in \{1, 2\}$ *resets* prices $\hat{p}_j^r$, given posterior beliefs $\tilde{\mu} = \mu | m, \hat{q}$.
- Production, aggregation and output $\hat{y}$ are realized.

NB: (i) rigidity α_j (ii) information, communication m and beliefs $\tilde{\mu}$

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*Generalizes to a noisy signal $s = \hat{v}^n + \varepsilon$ observed by **MA**

An information control problem

1. Express **prices and welfare** as a function of **beliefs** $\tilde{\mu}$ **and policy** $\hat{q}$, e.g.

$$\hat{p}_j^r = \hat{q} - \mathbb{E}_{\tilde{\mu}} \hat{y}^n \pm \frac{1}{2} \mathbb{E}_{\tilde{\mu}} \hat{p}_R^n$$

2. Set **policy** $\hat{q}$ **optimally** as a function of **posterior beliefs** $\tilde{\mu}$

$$\hat{q}(\tilde{\mu}) = \text{argmax}\ \mathbb{E}_{\tilde{\mu}} U(\hat{v}^n, \hat{q}, \mathbb{E}_{\tilde{\mu}} \hat{v}^n)$$

(benevolent, time consistent, without loss of generality*)

$\Rightarrow$ Study the **optimal control of information**, i.e., posterior beliefs $\tilde{\mu}$

2. Commitment – Optimal Disclosure Rule

A Bayesian Persuasion Problem

Prior to observing shocks, the **MA** commits to a mapping φ: $\hat{v}^n \to m$

$$\max_{\varphi} \mathbb{E}\left[U(\hat{v}^n, \hat{q}, \mathbb{E}_{\tilde{\mu}}\hat{v}^n)\right]$$

subject to:

- instrument $\hat{q}$ set optimally given posterior beliefs

$$\hat{q} = \hat{q}(\mathbb{E}_{\tilde{\mu}}\hat{v}^n)$$

- firms update beliefs rationally upon receiving m (Bayes)

$$\mathbb{E}_{\tilde{\mu}}\hat{v}^n = \mathbb{E}(\hat{v}^n \mid m)$$

2. Optimal Disclosure Rule

Proposition 1

$\exists\ \Gamma \in \mathbb{R}$ — function of (η, θ) and (α_1, α_2) — such that the optimal disclosure rule satisfies:

- **Full disclosure** if $\Gamma \geq 0$:

$$m = \hat{v}^n$$

- **Partial disclosure** if $\Gamma < 0$: (dispersion $\hat{p}_R^n$ withheld)

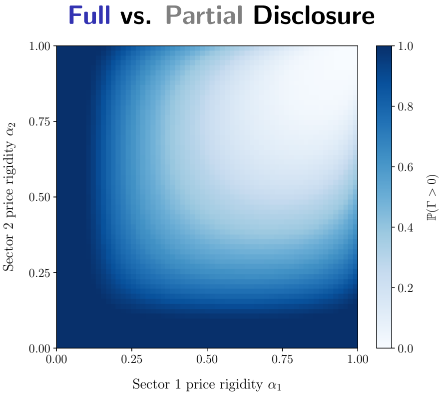
$$m = \hat{y}^n$$

- If symmetric price rigidigity, $\alpha_1 = \alpha_2 \equiv \alpha$:

$$\Gamma \geq 0 \;\Leftrightarrow\; \frac{\theta}{\eta} \leq \frac{1+\alpha}{\alpha}$$

$\Rightarrow$ *Trade-off:* sector relative price η vs. within sectors price disp. θ Γ

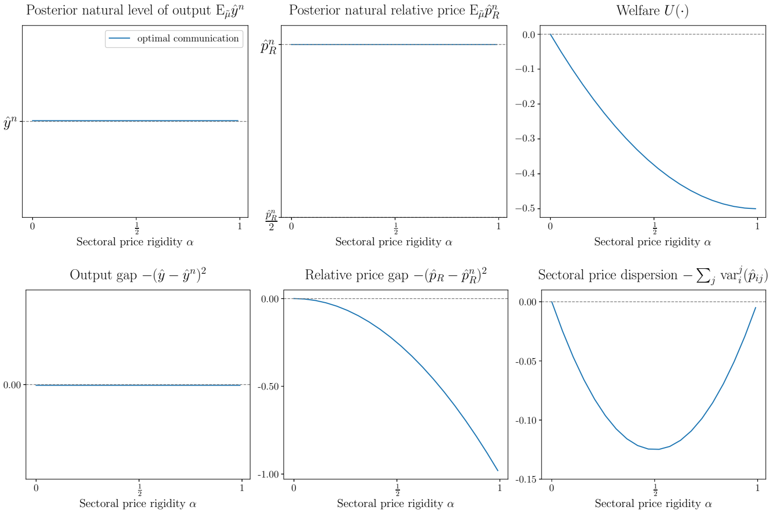
2. Disclosure and Sectoral Price Rigidities



$\mathbb{P}(\Gamma \geq 0)$ over $(\alpha_1, \alpha_2) \in (0,1)^2$, with $\eta \sim U[1,3]$, $\theta \sim U[6,8]$, $n_1 = n_2 = 1/2$.

$\Rightarrow$ Low rigidities favor full disclosure
$\Rightarrow$ Sectoral asymmetry favors full disclosure (flexible sector absorbs the relative-price correction while the rigid sector contains the dispersion cost)

2. Full-Disclosure ($\Gamma \geq 0$, $\alpha_1 = \alpha_2$)



2. Partial-Disclosure ($\Gamma < 0$, $n_1 = n_2 = 1/2$)

$m = \hat{y}^n$: aggregate disclosed, dispersion withheld

- Firms' posterior on dispersion is zero $\Rightarrow$ **reset prices coincide with preset prices** within each sector
- No welfare loss from *within-sector* price dispersion
- Cost: *cross-sector misallocation* reflects the full natural relative-price gap $\hat{p}^n_R$

$\Rightarrow$ Trade-off resolved in favor of withholding dispersion:
θ (dispersion cost) dominates η (alignment gains)

2. Application: Euro-Area Inflation Surge

Did the regime switch from partial to full disclosure around the inflation surge?

Probability of the full-disclosure regime, $\mathbb{P}(\Gamma \geq 0)$						
	Quarterly interpretation			Annual interpretation		
Product sample	Pre	Surge	Δ	Pre	Surge	Δ
Harmonized, incl. sales	0.120	0.185	+0.07	0.901	1.000	+0.10
Harmonized, excl. sales	0.040	0.078	+0.04	0.544	0.783	+0.24
Country-specific, incl. sales	0.106	0.167	+0.06	0.861	1.000	+0.14
Country-specific, excl. sales	0.040	0.081	+0.04	0.545	0.805	+0.26

Frequency of price adjustments adapted from monthly frequency of price changes reported in Gautier et al. (2025); $\eta \sim U[1,3]$, $\theta \sim U[6,8]$.

$\Rightarrow$ The inflation surge raised $\mathbb{P}(\Gamma \geq 0)$, structural rationale for the contemporaneous shift in ECB communication toward sectoral framing.

3. Credibility – Sequential Incentives

One-shot deviation problem

- **PF** expect **MA** to follow the commitment rule φ and read messages accordingly.
- After observing $\hat{v}^n$, does the **MA** prefer to deviate?

$$\max_{m} \mathbb{E}\left[U(\hat{v}^n, \hat{q}, \mathbb{E}_{\tilde{\mu}}\hat{v}^n) \;\middle|\; \hat{v}^n\right]$$

subject to:

- instrument $\hat{q} = \hat{q}(\mathbb{E}_{\tilde{\mu}}\hat{v}^n)$
- rule-consistent reading by **PF**: (perfect control of beliefs)

$$\mathbb{E}_{\tilde{\mu}}\hat{v}^n = m$$

3. Credibility of the Optimal Disclosure Rule

Proposition 2

(i) **One-sector economy** $(\eta = \theta)$: full disclosure is **credible**.

(ii) **Multi-sector economy** $(\eta < \theta)$:

- If $\Gamma \geq 0$, full disclosure is **time-inconsistent**. **MA** deviates to

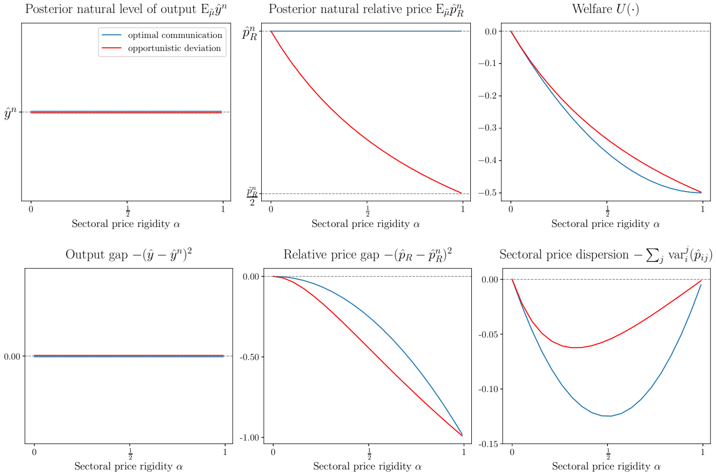
$$m = \begin{pmatrix} 1 & \kappa_1 \\ 0 & \kappa_2 \end{pmatrix} \begin{pmatrix} \hat{y}^n \\ \hat{p}_R^n \end{pmatrix} = \kappa \, \hat{v}^n$$

At $\alpha_1 = \alpha_2 \equiv \alpha$: $\kappa_1 = 0$ and $\kappa_2 = \dfrac{\eta}{\eta(1-\alpha) + \theta\alpha} < 1$.

- If $\Gamma < 0$, partial disclosure $m = \hat{y}^n$ is **credible**.

$\Rightarrow$ Barro–Gordon time-inconsistency in **information disclosure** in a **muli-sector economy**

3. Rule vs. Deviation $\Gamma \geq 0$



$\Rightarrow$ Deviation attenuates dispersion ($\kappa_2 < 1$): lower within-sector dispersion cost, larger relative-price gap cost.

4. Discretion with Reputational Dynamics

Monetary Authorities, Strategies and Reputation $\Gamma > 0$

Two types of **MA** $\delta \in \{C, S\}$, observe $s = \hat{v}^n + \varepsilon$

- a *committed* **MA** $(\delta = C)$ always reports $\bar{v}^n = \mathbb{E}(\hat{v}^n|s)$ truthfully
- a *strategic* **MA** $(\delta = S)$
  - either truthful report: $m = \bar{v}^n$ w.p. p
  - or opportunistic report: $m = \kappa\bar{v}^n$ w.p. $1 - p$

$\Rightarrow$ $p(\cdot)$ **is the communication policy**

MA type is unobservable, ...

...but **PF** hold belief ξ that **MA** is $\delta = C$

$\Rightarrow$ ξ **is the reputation of MA**

4. Dynamic Game: Timing

- **PF** hold belief $P(\delta = C) = \xi$ and *preset* prices $\hat{p}_j^p = 0$ given μ
- **N** draws $\hat{v}^n = (\hat{y}^n, \hat{p}_R^n)$
- **MA** observes noisy signal $s = \hat{v}^n + \varepsilon$, infers $\bar{v}^n = \mathbb{E}(\hat{v}^n|s)$, then sends m and sets $\hat{q}(\tilde{\mu})$
- A share $1 - \alpha_j$ of **PF** in sector $j \in (1, 2)$ *resets* prices $\hat{p}_j^r$, given posterior beliefs $\tilde{\mu} = \mu|m, \xi$
- Output $\hat{y}$ and prices are realized, **PF** observe $\hat{v}^n$ and update **MA** type

$$(\xi, m, \hat{v}^n) \rightarrow \bar{\xi}$$

- Overnight stochastic rotation of **MA**

$$\xi' = (1 - \lambda)\bar{\xi} + \lambda\rho$$

where λ is persistence and ρ long run average of $\delta = C$

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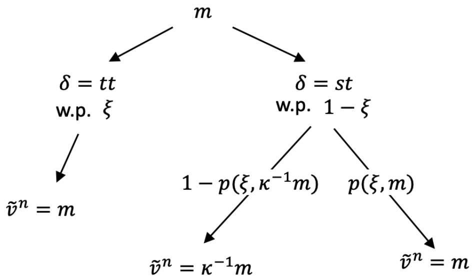
4. Bayesian Interpretation of m

Bayesian interpretation of message

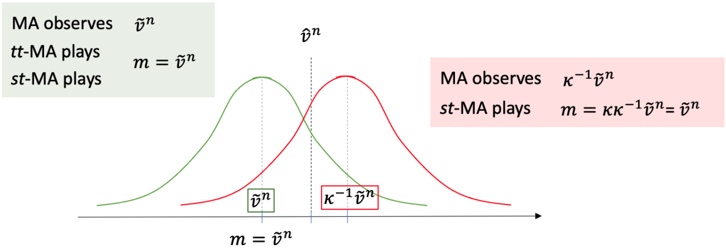


$$\mathbb{E}_{\tilde{\mu}} \hat{v}^n = \frac{m \cdot f_{tr}(m)\left[\xi + (1-\xi)p(\xi, m)\right] + \kappa^{-1} m \cdot f_{op}(m)(1-\xi)\left[1 - p(\xi, \kappa^{-1}m)\right]}{f_{tr}(m)\left[\xi + (1-\xi)p(\xi, m)\right] + f_{op}(m)(1-\xi)\left[1 - p(\xi, \kappa^{-1}m)\right]}$$

4. Law of Motion of Reputation

Law of motion of reputation

Given reputation ξ, message m and observed $\hat{v}^n$, $P(\delta = C|\xi, m, \hat{v}^n)$?



$$\bar{\xi} = \frac{f_m(\hat{v}^n) f_{tr}(m) \cdot \xi}{f_m(\hat{v}^n) f_{tr}(m) \left[\xi + (1-\xi) p(\xi, m)\right] + f_{\frac{m}{\kappa}}(\hat{v}^n) f_{op}(m)(1-\xi)\left(1 - p(\xi, \kappa^{-1} m)\right)}$$

4. Bellman Problem of the Strategic MA

Strategic Monetary Authority

$$V_S(\xi, \bar{v}^n) = \max_{p \in [0,1]} \mathbb{E}_{m, \hat{v}^n} \Big\{ U\left(\hat{v}^n, \hat{q}, \mathbb{E}_{\tilde{\mu}} \hat{v}^n | m\right) + \beta \mathbf{V}_S\big(\xi'\big) \Big\}$$

subject to

$\hat{q} = \hat{q}(\tilde{\mu})$	instrument policy
$\mathbb{E}_{\tilde{\mu}} \hat{v}^n = \mathbb{E}(\hat{v}^n \| \xi, m)$	interpretation of m
$\xi' = \xi'(\xi, m, \hat{v}^n)$	law of motion of reputation

and continuation benevolent utility

$$\mathbf{V}_S(\xi) = (1 - \lambda\rho) \cdot \mathbb{E}_{\bar{v}^n} V_S(\xi, \bar{v}^n) + \lambda\rho \cdot \mathbb{E}_{\bar{v}^n} V_C(\xi, \bar{v}^n)$$

$\Rightarrow$ **Discretionary communication** vs. **reputation**

4. Static Benchmark (1)

Strategic **MA** only

Proposition. Let $\xi = \rho = 0$, then given $\bar{v}^n$

- **MA** systematic misreporting $m = \kappa \bar{v}^n$

$$p(\bar{v}^n) = 0, \ \forall \bar{v}^n$$

- and **PF** Bayesian interpretation

$$\mathbb{E}_{\tilde{\mu}} \hat{v}^n | m = \kappa^{-1} m = \bar{v}^n$$

$\Rightarrow$ **symmetric information** without strategic gain in equilibrium!

4. Static Benchmark (2)

Systematic turnover of **MA**

Proposition. Let $\lambda = 1$ and $\rho \in (0,1)$, then

- reputation is exogenous and constant across periods

$$P(\delta = C) = \xi = \rho$$

- a S-**MA** always misreport

$$\forall \bar{v}^n,\ \forall \xi,\ p(\xi, \bar{v}^n) = 0$$

- a S-**MA** achieves stabilization gains at the expense of C-**MA**

$$W_C(\rho) \leq W^{SI} \leq W_S(\rho)$$

- and at the expense of the long run stabilization of the economy

$$W(\rho) = \rho \cdot W_C(\rho) + (1-\rho) \cdot W_S(\rho) \leq W^{SI}$$

where the inequalities are strict if $0 < \rho < 1$

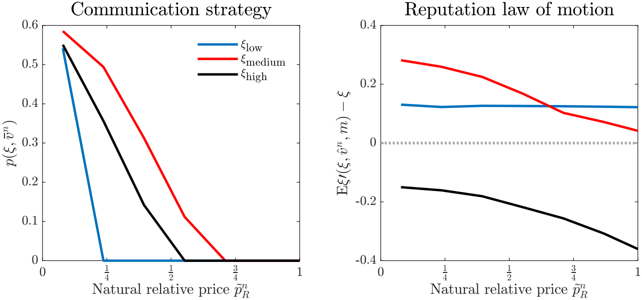
4. Numerical Calibration

Numerical Values

Parameter	Symbol	Value
Discount factor	β	0.96
Elasticity across sectors	η	4
Elasticity within sector	θ	8
Price rigidity 1	α_1	0.5
Price rigidity 2	α_2	0.5
Dispersion of technology shocks	σ_a	1
Competence of monetary authorities	σ_ε	1/5
Prevalence of committed type	ρ	0.5
Persistence of CB type	λ	0.2

4. Reputation and Propensity to Misreport

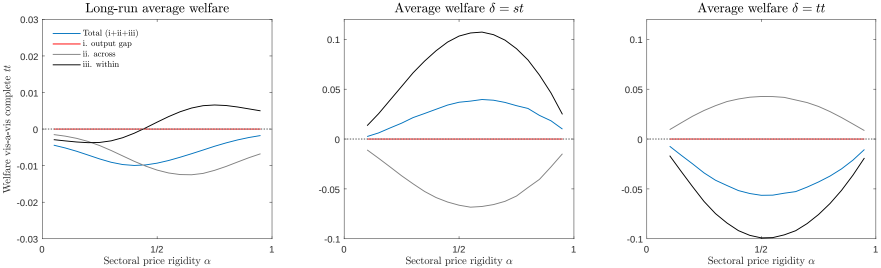
Reputation and propensity to misreport



Reputation as capital

- "Use it" at low and high ξ to (try to) stabilize the economy
- "Build it" at intermediate ξ and low shocks $\hat{p}_R^n$

Welfare implications



Relative to symmetric information

- Strategic **MA** achieves aggregate stabilization gains
- ... at the expense of committed **MA**
- ... and the long run stabilization of the economy

4. Sensitivity Analysis

	Average propensity to report truthfully			Average reputation			Average welfare $(.10^{-2})$		
	$\delta = C$	$\delta = S$	$\mathbb{E}(\delta)$	$\delta = C$	$\delta = S$	$\mathbb{E}(\delta)$	$\delta = C$	$\delta = S$	$\mathbb{E}(\delta)$
Baseline	1.00	0.112	0.556	0.72	0.23	0.48	-5.61	3.63	-0.99
Price rigidities									
$\alpha_1 = \alpha_2 = 0.25$	1.00	0.131	0.566	0.60	0.30	0.45	-3.35	1.65	-0.85
$\alpha_1 = \alpha_2 = 0.75$	1.00	0.103	0.552	0.77	0.20	0.49	-4.31	3.40	-0.46
$\alpha_1 = 0.25 < \alpha_2 = 0.75$	1.00	0.091	0.546	0.82	0.18	0.50	-11.49	11.40	-0.06
Elasticities									
$\eta = 3$; $\theta = 8$	1.00	0.103	0.551	0.78	0.20	0.49	-7.24	6.00	-0.62
$\eta = 5$; $\theta = 8$	1.00	0.126	0.563	0.63	0.28	0.45	-3.60	1.93	-0.83
Monetary Authorities									
competence $\sigma_\varepsilon = 1/3$	1.00	0.108	0.554	0.60	0.26	0.43	-6.23	2.90	-1.67
$\sigma_\varepsilon = 1/7$	1.00	0.125	0.563	0.77	0.21	0.49	-4.96	3.75	-0.61
prevalence $\rho = 0.4$	1.00	0.101	0.460	0.67	0.18	0.38	-7.16	3.16	-0.97
$\rho = 0.6$	1.00	0.124	0.649	0.77	0.28	0.57	-4.20	4.09	-0.88
persistence $\lambda = 0.1$	1.00	0.101	0.550	0.80	0.15	0.48	-4.05	2.53	-0.76
$\lambda = 0.3$	1.00	0.110	0.555	0.67	0.29	0.48	-6.40	4.38	-1.01

Conclusions

A Barro-Gordon theory of monetary communication

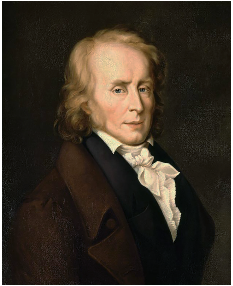
1. The optimal disclosure rule is **sharp**
   - always reveal the aggregate
   - reveal or pool *dispersion* according to $\Gamma \gtrless 0$
   - T.O.: alignment vs. dispersion cost and frequency of price changes
2. Generically **time-inconsistent** in a multi-sector economy:
   - ex post the **MA** shades dispersion
   - credibility à la Barro-Gordon
3. Reputation can **discipline** communication, but
   - short term welfare gains lead to long-run losses
   - long-run loss reflects *type uncertainty*
4. **Structural lens** on *ECB sectoral inflation narratives*
   - stronger asymmetries and higher price-adjustment frequency raise the value of dispersion disclosure

On a Supposed Right to Tell Lies from Benevolent Motives*

Immanuel Kant

"*categorical imperative*"

Benjamin Constant

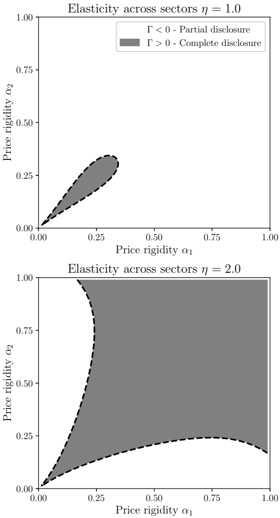


"*sure, but...*"

* *Uber ein vermeintes Recht aus Menschenliebe zu lugen* (1797)

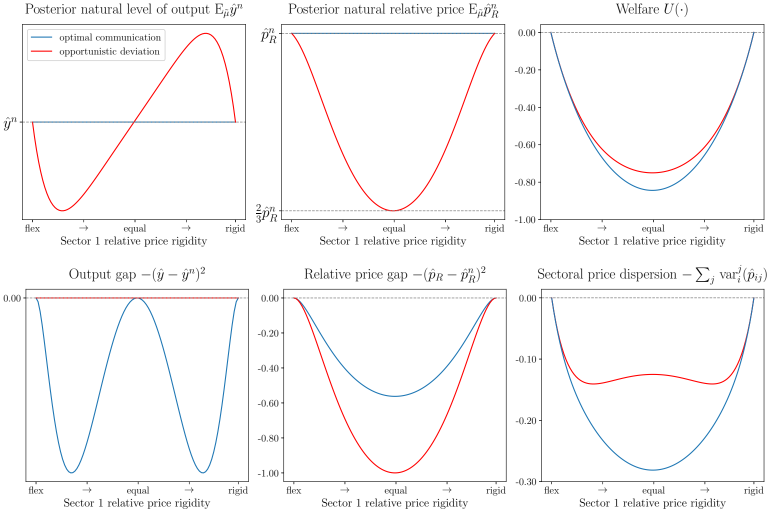
Appendix

Γ as a function of (η, θ) and (α_1, α_2)



Back

$\Gamma \geq 0$, $\alpha_1 \neq \alpha_2$: Commitment vs. Deviation



Note: $\hat{y}^n > 0$ and $\hat{p}^n_R > 0$.

Back

$\Gamma < 0$, $n_1 = n_2 = 1/2$: Rule is Credible

$m = \hat{y}^n$: aggregate only, dispersion withheld

- Commitment rule discloses aggregate, withholds dispersion
- Firms' posterior on dispersion is zero $\Rightarrow$ no within-sector dispersion to manage
- **MA** has no incentive to deviate at the realized signal

$\Rightarrow$ Partial-disclosure rule is **time-consistent**: credibility is also a multi-sector phenomenon.

Back