PRICING UNDER FAIRNESS CONCERNS

Erik Eyster, Kristof Madarasz, Pascal Michaillat

Journal of the European Economic Association, 2021

Paper available at https://www.pascalmichaillat.org/8.html

CUSTOMERS & FIRMS CARE ABOUT FAIR PRICES

- evidence from marketing, psychology, sociology, economics
- but pricing models never invoke fairness

⇝ pricing models do not have realistic microfoundations

  - particularly problematic as these models are used for policy
  - example: Calvo pricing & monetary policy

- exception: theory by Rotemberg [2005]

  - but somewhat difficult to analyze & port to other models

THIS PAPER: TRACTABLE THEORY OF FAIR PRICING

- firms set prices to maximize profits given that
  - customers care about the fairness of markups
  - customers systematically misperceive markups
- in monopoly model:
  - price rigidity (incomplete passthrough of costs into prices)
- in New Keynesian model:
  - short-run & long-run nonneutrality of monetary policy

EVIDENCE THAT FAIRNESS MATTERS

FIRMS ATTRIBUTE PRICE RIGIDITY TO FAIRNESS

- 12,000 firms in the US, Canada, Europe, Japan say that they "tacitly agree to stabilize prices, perhaps out of fairness to customers"
  - Blinder et al [1998], Fabiani et al [2005], etc.
- median rank of macro theories of price rigidity:
  - nominal contracts: 3/11
  - menu costs: 9/11
  - informational frictions: 11/11

HIGHER PRICE DUE TO HIGHER MARKUP IS UNFAIR

- Kahneman, Knetsch, Thaler [1986]: “A hardware store has been selling snow shovels for $15. The morning after a large snowstorm, the store raises the price to $20.”
  - acceptable: 18%
  - unfair: 82%

BUT HIGHER PRICE WITH SAME MARKUP IS FAIR

- Kahneman, Knetsch, Thaler [1986]: “Due to a transportation mixup, the wholesale price of lettuce has increased. A grocer has bought lettuce at a price that is 30 cents per head higher than normal. The grocer raises the price of lettuce to customers by 30 cents per head.”
  - acceptable: 79%
  - unfair: 21%

FIRMS UNDERSTAND NORMS OF FAIRNESS

- Blinder et al [1998] surveyed 300 firms in the US
- 64% of firms: “customers do not tolerate price increases after increases in demand”
- 71% of firms: “customers do tolerate price increases after increases in cost”

EVEN GOD CARES ABOUT MARKUPS

- Talmudic law: maximum markup allowable in trade = 20%
- legal texts also regulate markups:
  - price of bread in France, 1700 – 1970
  - public utilities in the US
  - anti-price-gouging legislation in most US states

MONEY ILLUSION SUGGESTS MISINFERENCE

- Shafir, Diamond, Tversky [1997]: “Imagine that within a six-month period all salaries and all prices went up by 25%. You now earn and spend 25% more than before. Six months ago, you were planning to buy a leather armchair whose price during the 6-month period went up from $400 to $500. Would you be more or less likely to buy the armchair now?”
  - as or more likely: 62%
  - less likely: 38%

MONOPOLY MODEL

WITH FAIRNESS CONCERNS

CUSTOMERS

- given price of consumption P, wealth W, and fairness function F
- choose money balances B and consumption Y
- to maximize quasilinear utility

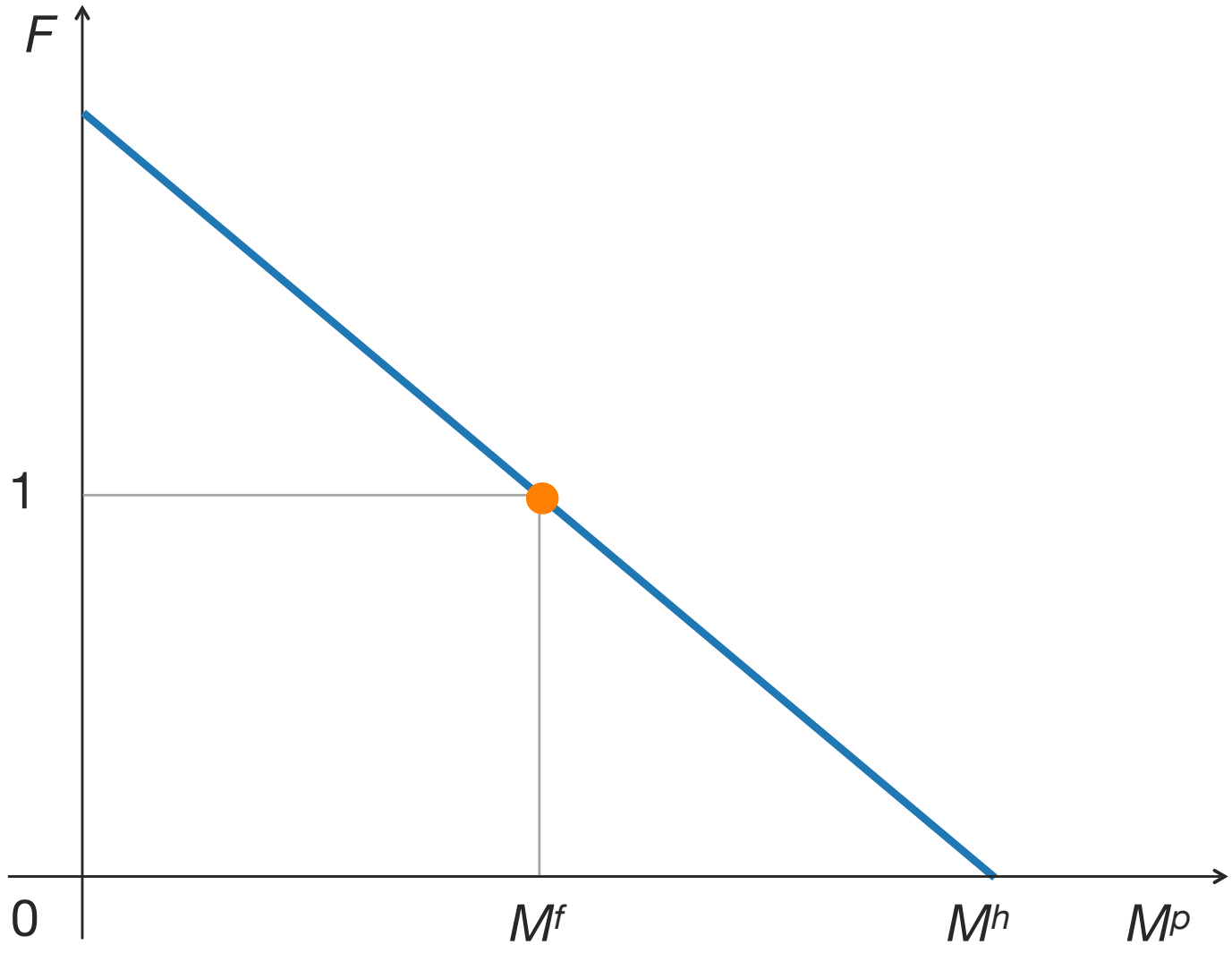
$$\frac{\epsilon}{\epsilon - 1} (F \cdot Y)^{(\epsilon-1)/\epsilon} + B$$

- subject to budget constraint $B + P \cdot Y = W$
- different from social-preference approach to fairness
  - Rabin [1993] $\rightsquigarrow$ Rotemberg [2005]

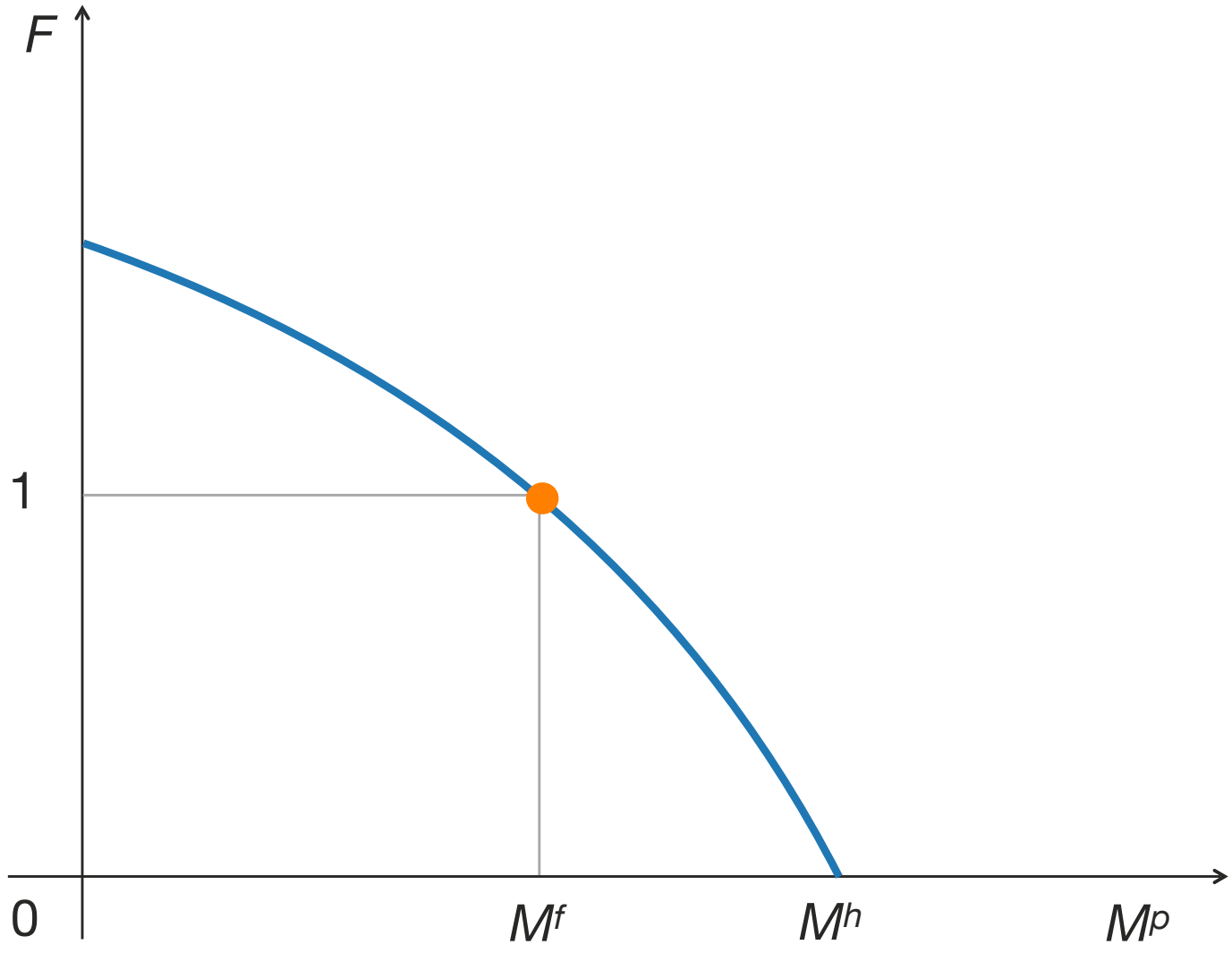
FAIRNESS FUNCTION F

- argument: perceived markup $M^p = P/C^p$
  - P: observed price
  - C^p: perception of hidden marginal cost
- positive: $F(M^p) > 0$
- decreasing: $F'(M^p) < 0$
  - higher markups are less fair
- linear or concave: $F''(M^p) \leq 0$
  - stronger response to increases in price than decreases

EXAMPLES OF FAIRNESS FUNCTION



EXAMPLES OF FAIRNESS FUNCTION



PERCEIVED MARGINAL COST

$$C^p(P) = (C^b)^\gamma \cdot \left[\frac{P}{\epsilon/(\epsilon-1)}\right]^{1-\gamma}$$

- C^b: prior belief about monopoly's marginal cost
- $P/[\epsilon/(\epsilon-1)]$: marginal cost with rational customers
- $\gamma \in (0, 1]$: amount of misinference
  - $\gamma = 0$: rational inference
  - $0 < \gamma < 1$: some inference, but less than rational
  - $\gamma = 1$: no inference

PERCEIVED MARKUP

$$M^p(P) = \frac{P}{C^p(P)} = \left(\frac{\epsilon}{\epsilon - 1}\right)^{1-\gamma} \left(\frac{P}{C^b}\right)^{\gamma}$$

- misinference ($\gamma > 0$): M^p increasing in P
  - when a price rises due to a cost increase, customers partially misattribute the higher price to a higher markup
- rational inference ($\gamma = 0$): constant M^p
  - when a price rises due to a cost increase, customers realize that the profit-maximizing markup is constant

DEMAND CURVE

$$Y^d(P) = P^{-\epsilon} \cdot F(M^p(P))^{\epsilon-1}$$

- $P^{-\epsilon}$: traditional effect of price on demand
  - price $\rightsquigarrow$ customers' budget sets $\rightsquigarrow$ demand
- $F(M^p(P))^{\epsilon-1}$: effect of price on demand through fairness
  - price $\rightsquigarrow$ perceived markup $\rightsquigarrow$ perceived fairness $\rightsquigarrow$ marginal utility of consumption $\rightsquigarrow$ demand

MONOPOLY

- given marginal cost of production C
  - unobservable to customers
- chooses output Y and price P
- to maximize profits $Y \cdot (P - C)$
- subject to customers' demand $Y = Y^d(P)$

PROFIT-MAXIMIZING PRICE

- profit-maximizing price:

$$P = M \cdot C$$

- M: profit-maximizing markup

$$M = \frac{E}{E - 1}$$

- E: (positive) elasticity of demand wrt price

$$E = -\frac{P}{Y^d} \cdot \frac{dY^d}{dP}$$

PRICE ELASTICITY OF DEMAND

- $Y^d(P) = P^{-\epsilon} \cdot F(M^p(P))^{\epsilon-1}$
- price elasticity of perceived markup $= \gamma$
- $\phi(M^p) =$ (positive) elasticity of fairness function wrt markup
- then we obtain:

$$E(P) = \epsilon + (\epsilon - 1) \cdot \gamma \cdot \phi(M^p(P))$$

- fairness operates through term $(\epsilon - 1) \cdot \gamma \cdot \phi(M^p(P))$ in price elasticity of demand

ELASTICITY OF FAIRNESS FUNCTION WRT MARKUP

$$\phi(M^p) = -\frac{M^p}{F(M^p)} \cdot \frac{dF}{dM^p}$$

- $\phi > 0$
  - because $F > 0$
  - and $F' < 0$
- ϕ increasing in M^p
  - because F is decreasing in M^p
  - and $-F'$ is weakly increasing in M^p (concavity of F)

NO FAIRNESS CONCERNS ⇝ FLEXIBLE PRICES

$$E(P) = \epsilon + (\epsilon - 1) \cdot \gamma \cdot \underbrace{\phi(M^p(P))}_{=0}$$

- standard price elasticity of demand: $E = \epsilon$
- standard markup: $M = \epsilon/(\epsilon - 1)$
- passthrough of marginal costs into prices = 100%
  - because markup is constant

RATIONAL INFERENCE $\rightsquigarrow$ FLEXIBLE PRICES

$$E(P) = \epsilon + (\epsilon - 1) \cdot \underbrace{\gamma}_{=0} \cdot \phi(M^p(P))$$

- standard price elasticity of demand: $E = \epsilon$
- standard markup: $M = \epsilon/(\epsilon - 1)$
- marginal-cost passthrough $= 100\%$
  - because markup is constant

FAIRNESS & MISINFERENCE ⇝ MORE COMPETITION

$$E(P) = \epsilon + (\epsilon - 1) \cdot \underset{>0}{\gamma} \cdot \underset{>0}{\phi}(M^p(P))$$

- price elasticity of demand is higher: $E > \epsilon$
- markup is lower:

$$M = \frac{E}{E-1} < \frac{\epsilon}{\epsilon - 1}$$

FAIRNESS & MISINFERENCE ⇝ PRICE RIGIDITY

- equilibrium markup is a fixed point:

$$M = \frac{E(M \cdot C)}{E(M \cdot C) - 1}$$

- equilibrium markup satisfies

$$M = 1 + \frac{1}{\epsilon - 1} \cdot \frac{1}{1 + \gamma \cdot \phi(M^p(M \cdot C))}$$

⇝ marginal-cost passthrough $< 100\%$

  – because markup ↓ when marginal cost ↑

EVIDENCE OF INCOMPLETE PASSTHROUGH

- labor-cost shocks in Sweden: passthrough = 30%
  - Carlsson, Skans [2012]
- reduction in import tariff in India: passthrough = 30%–40%
  - De Loecker et al [2016]
- marginal-cost shocks in Mexico: passthrough = 20%–40%
  - Caselli, Chatterjee, Woodland [2017]
- energy-price shocks in the US: passthrough = 50%–70%
  - Ganapati, Shapiro, Walker [2020]

NEW KEYNESIAN MODEL

WITH FAIRNESS CONCERNS

FAIRNESS CONCERNS

- fairness-adjusted consumption of good i by household j:

$$Z_{ij} = F_i(M_i^p(P_i)) \cdot Y_{ij}$$

- fairness-adjusted consumption by household j is aggregated:

$$Z_j = \left[\int_0^1 Z_{ij}^{(\epsilon-1)/\epsilon} di \right]^{\epsilon/(\epsilon-1)}$$

- consumption index Z_j enters utility

$$\mathbb{E}_0 \left(\sum \delta^t \left[\ln\left(Z_j\right) - \frac{N_j(t)^{1+\eta}}{1+\eta} \right] \right)$$

MISINFERENCE

- endogenize parameter C^b using past belief
- perceived marginal cost of good i in period t:

$$C_i^p(t) = \left[C_i^p(t-1)\right]^{\gamma} \cdot \left[\frac{P_i(t)}{\epsilon/(\epsilon-1)}\right]^{1-\gamma}$$

- $\gamma \in (0, 1]$: misinference

SHORT-RUN MONETARY NONNEUTRALITY

- 3 equilibrium variables: $\widehat{m^p}(t)$, $\widehat{n}(t)$, and $\widehat{\pi}(t)$
- belief dynamics: $\widehat{m^p}(t) = \gamma \cdot \left[\widehat{\pi}(t) + \widehat{m^p}(t-1)\right]$
- IS equation:

$$\alpha \widehat{n}(t) + \psi \widehat{\pi}(t) = \alpha \, \mathbb{E}_t\big(\widehat{n}(t+1)\big) + \mathbb{E}_t(\widehat{\pi}(t+1)) - s(t)$$

- short-run Phillips curve

$$(1 - \delta\gamma)\widehat{m^p}(t) - \lambda_1 \widehat{n}(t) = \delta\gamma \, \mathbb{E}_t(\widehat{\pi}(t+1)) - \lambda_2 \, \mathbb{E}_t\big(\widehat{n}(t+1)\big)$$

- nonneutrality arises from Phillips curve
- evidence: Christiano, Eichenbaum, Evans [1999]; Ramey [2016]

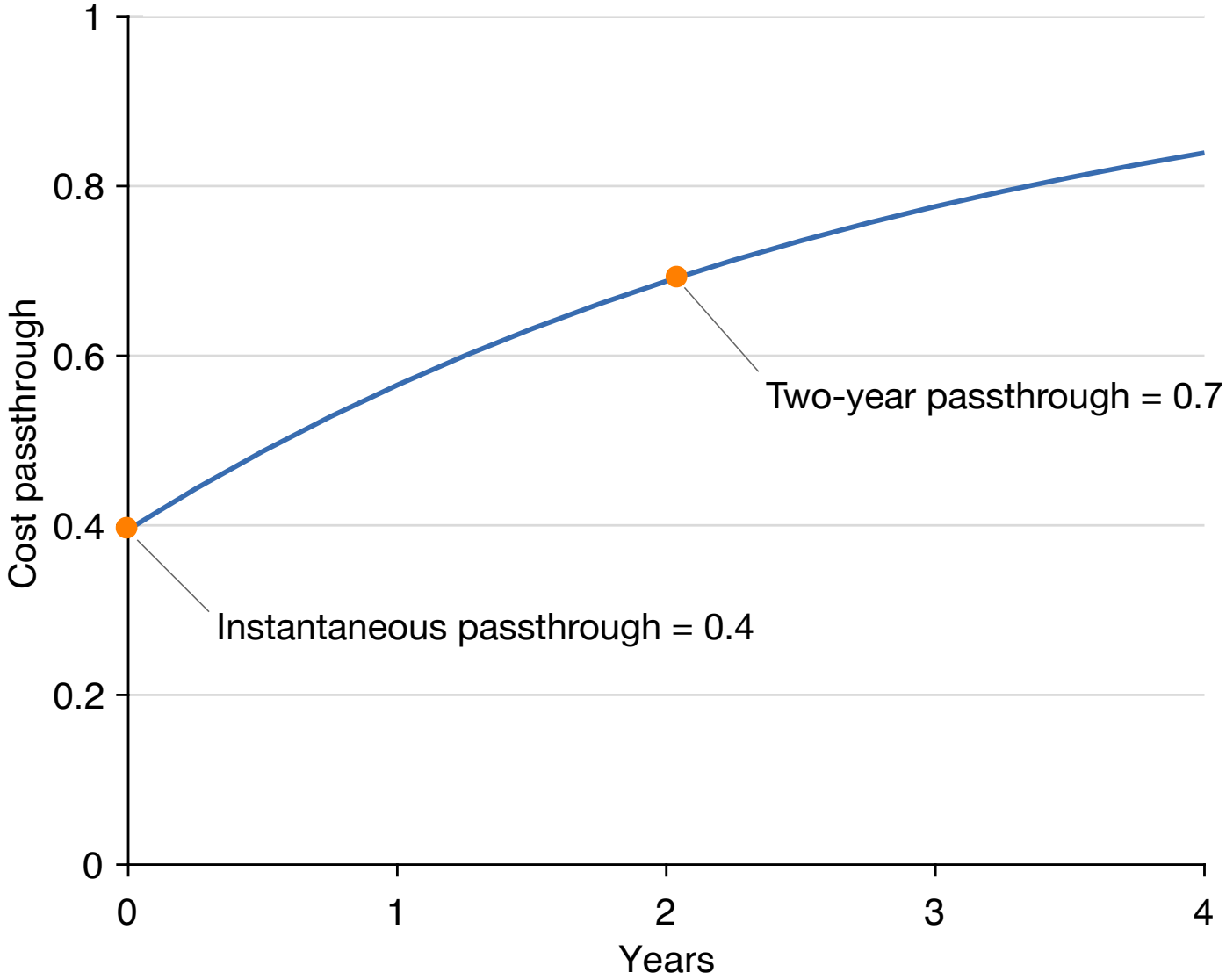
HYBRID SHORT-RUN PHILLIPS CURVE

- Phillips curve is forward-looking + backward-looking

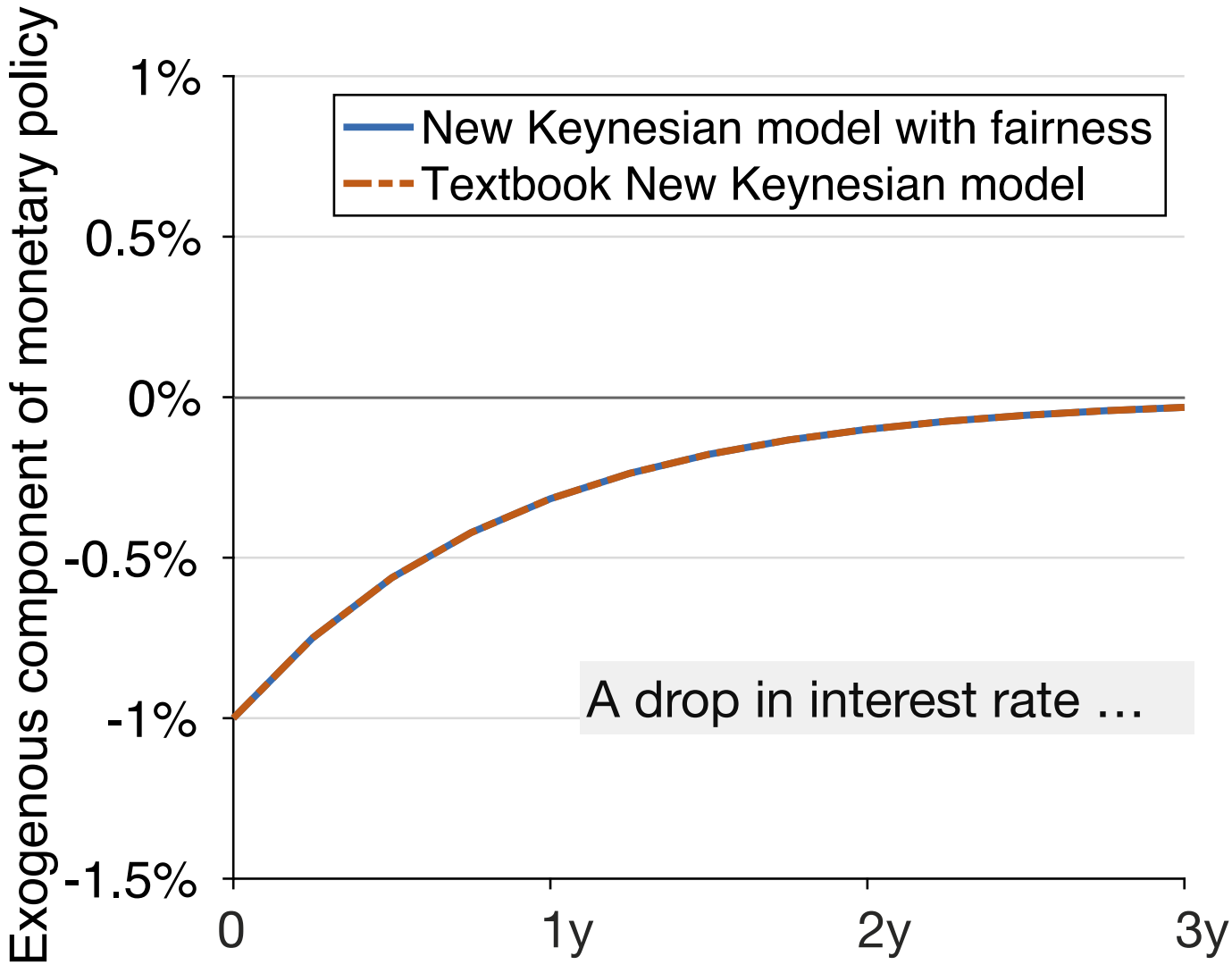
$$(1-\delta\gamma)\sum_{s=0}^{+\infty}\gamma^{s+1}\widehat{\pi}(t-s)-\lambda_1\widehat{n}(t)=\delta\gamma\,\mathbb{E}_t(\widehat{\pi}(t+1))-\lambda_2\,\mathbb{E}_t\big(\widehat{n}(t+1)\big)$$

- hybrid short-run Phillips curve is more realistic
  - inflation dynamics are more persistent
- evidence: Mavroeidis, Plagborg-Moller, Stock [2014]

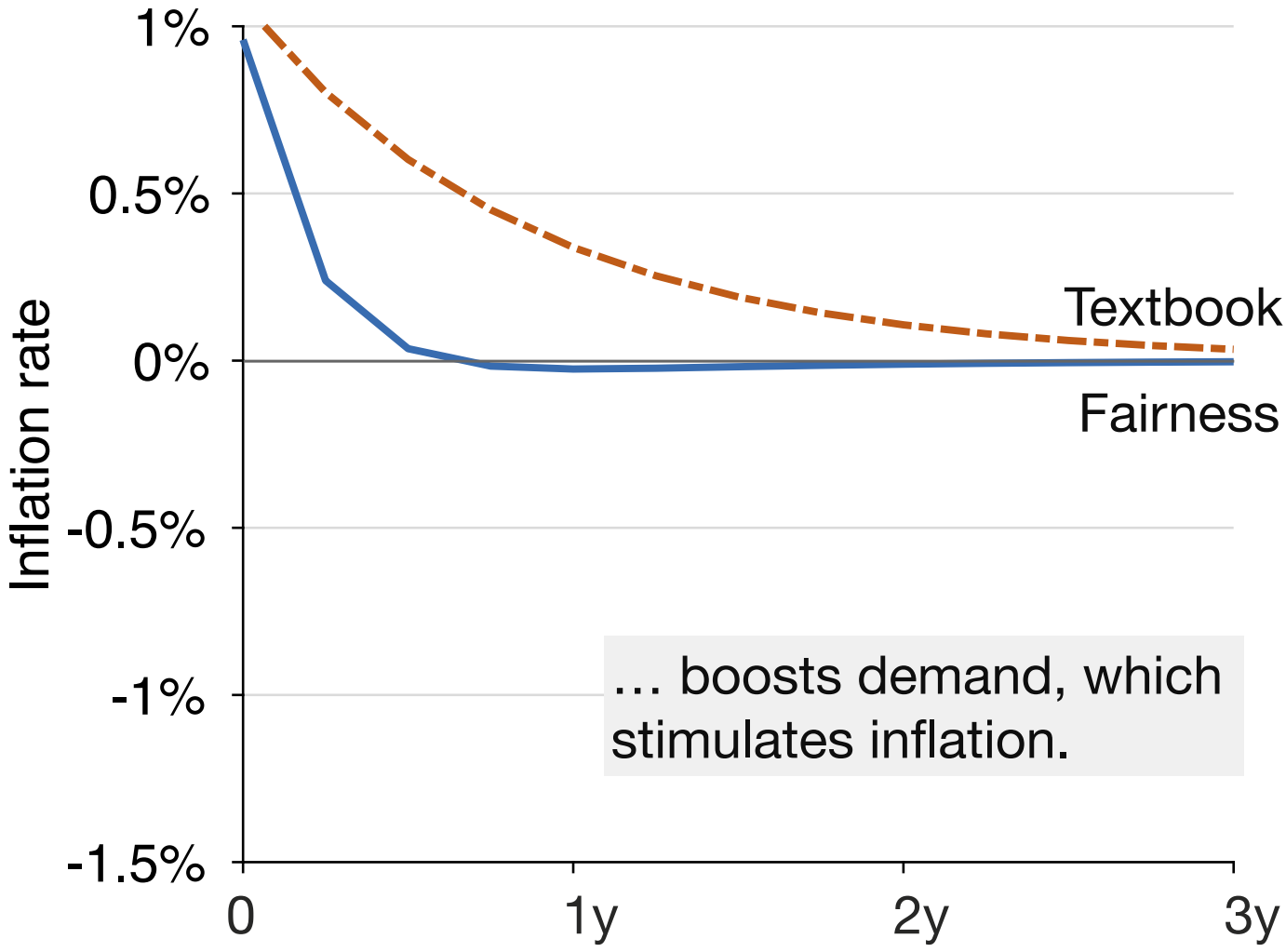
CALIBRATION FROM PASSTHROUGH EVIDENCE



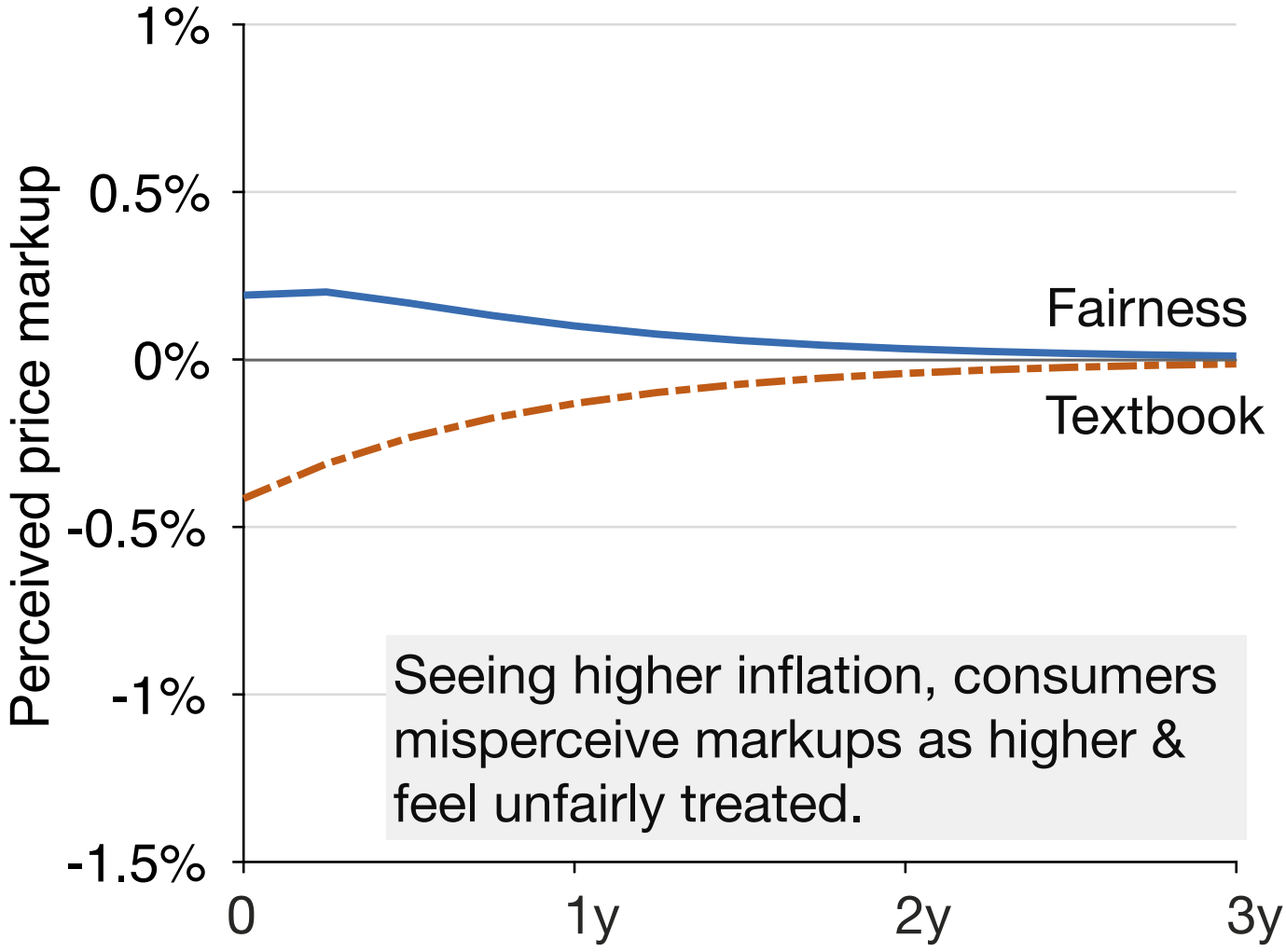
LOOSENING OF MONETARY POLICY



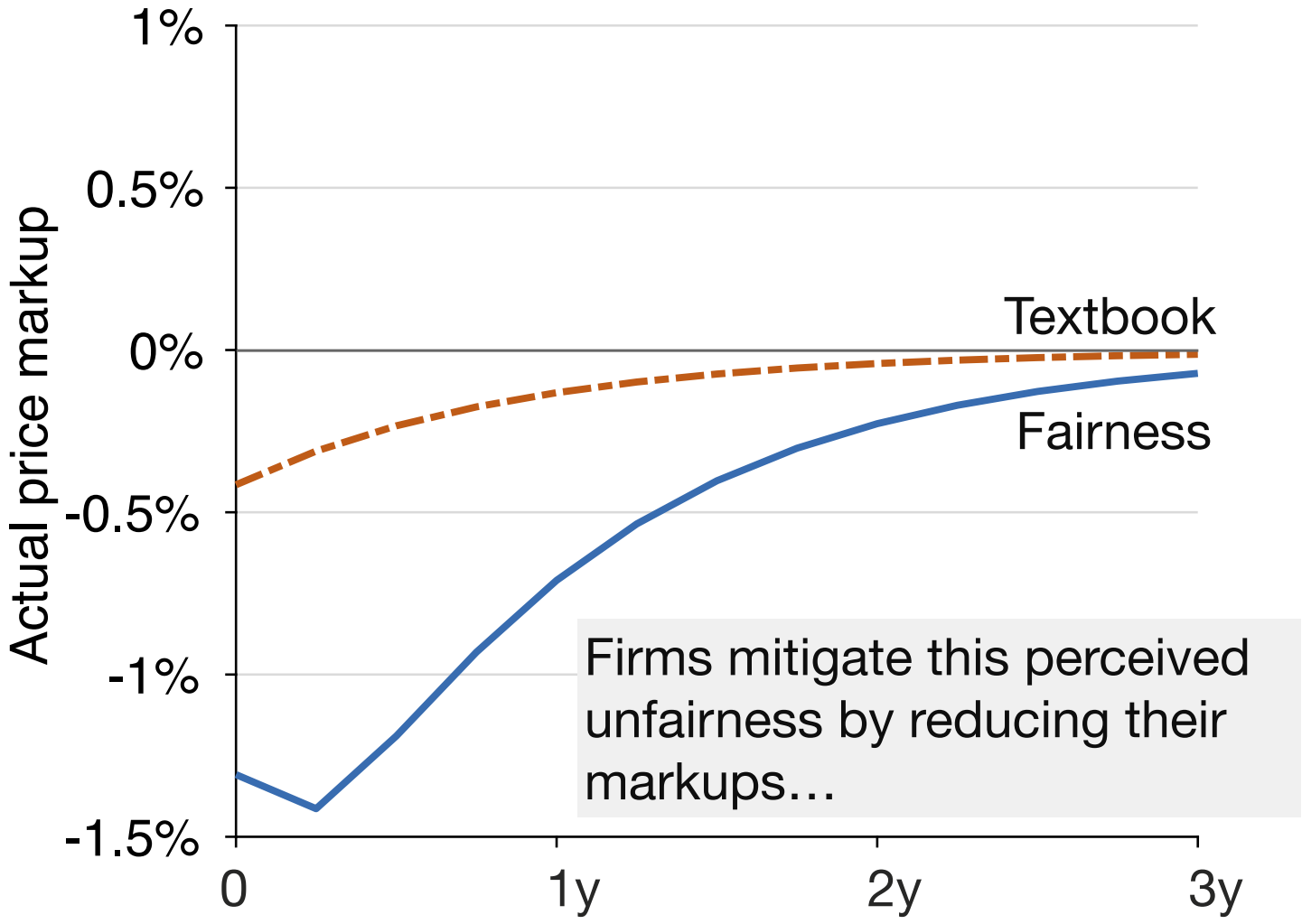
LOOSENING OF MONETARY POLICY



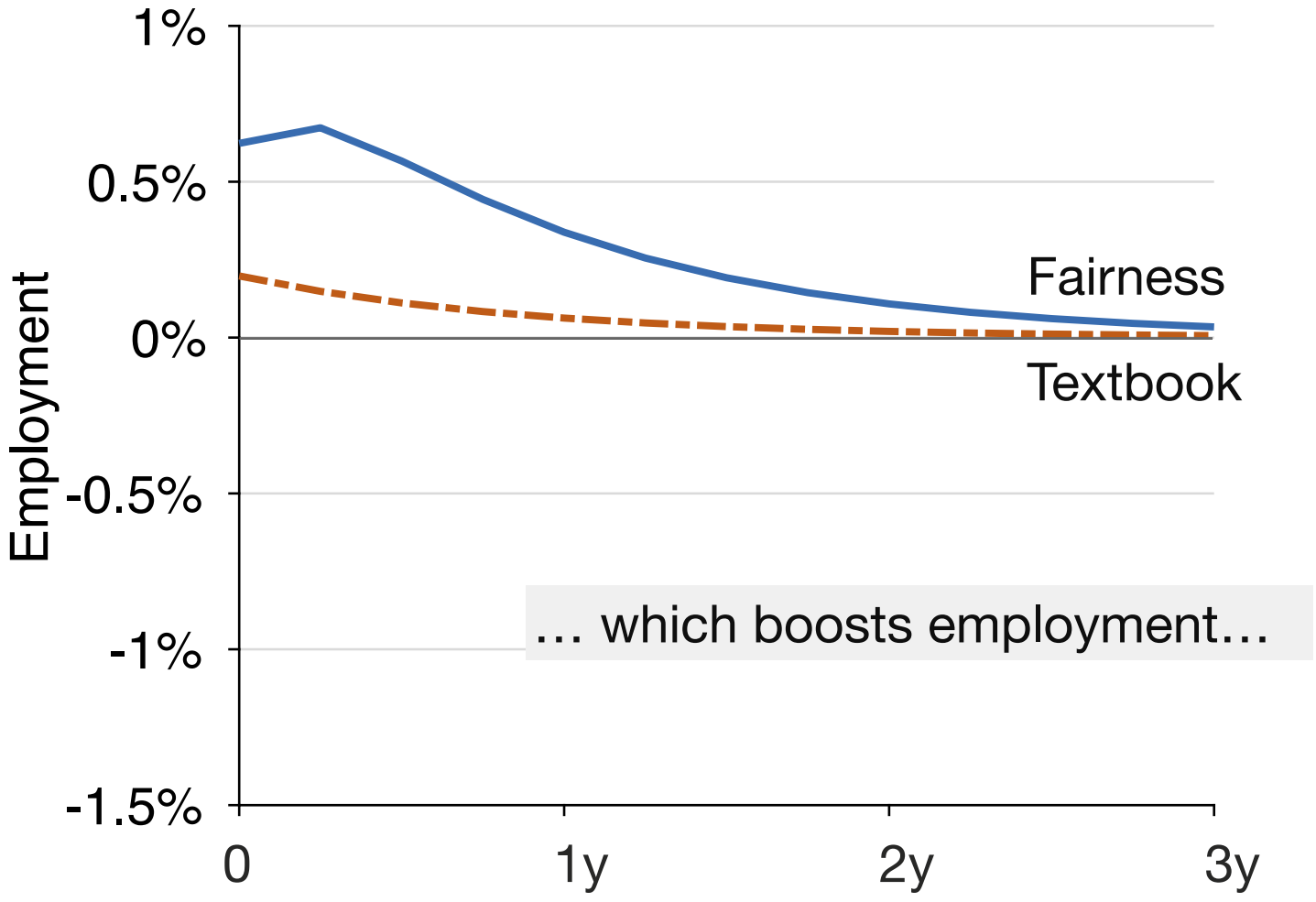
LOOSENING OF MONETARY POLICY



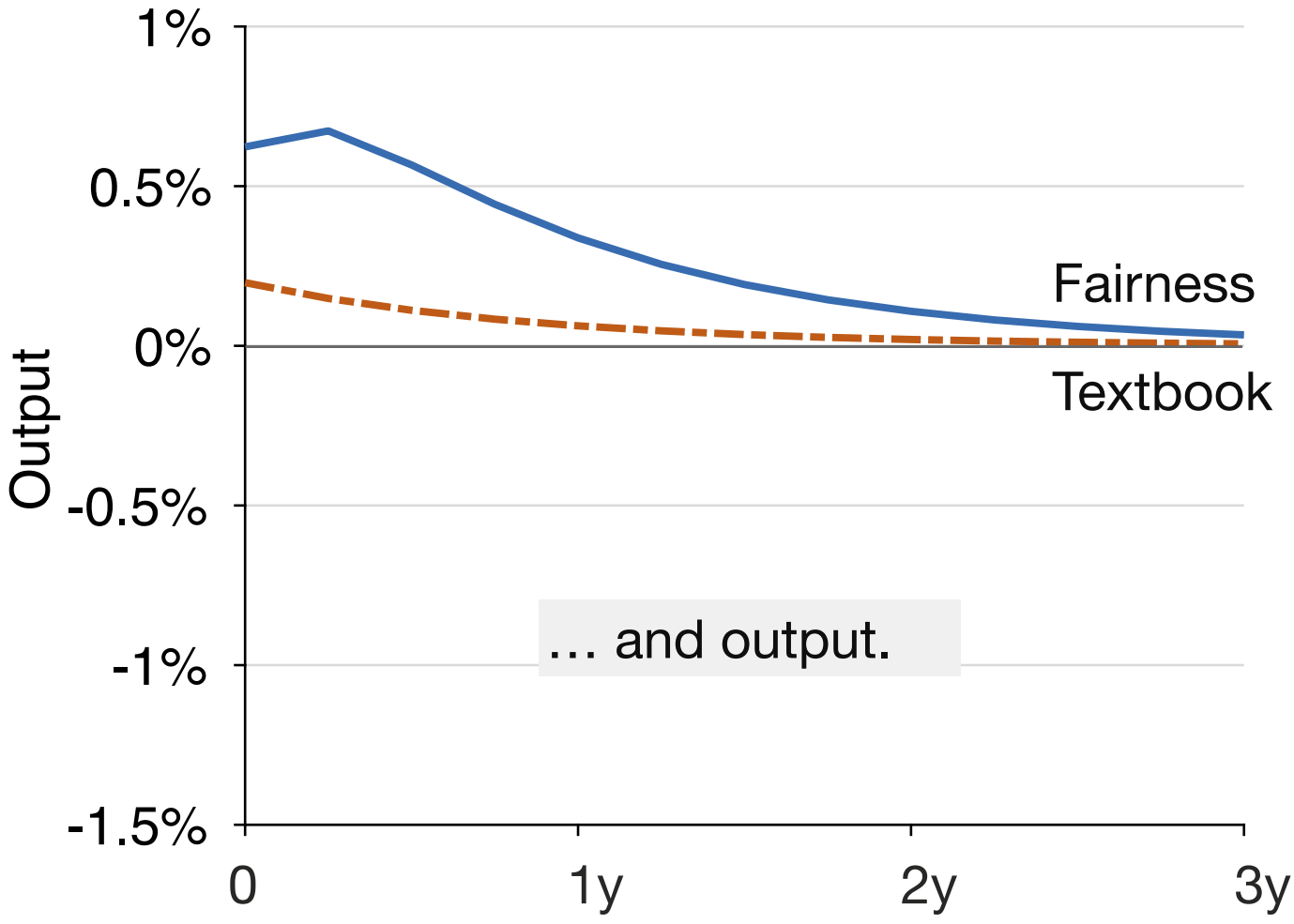
LOOSENING OF MONETARY POLICY



LOOSENING OF MONETARY POLICY



LOOSENING OF MONETARY POLICY



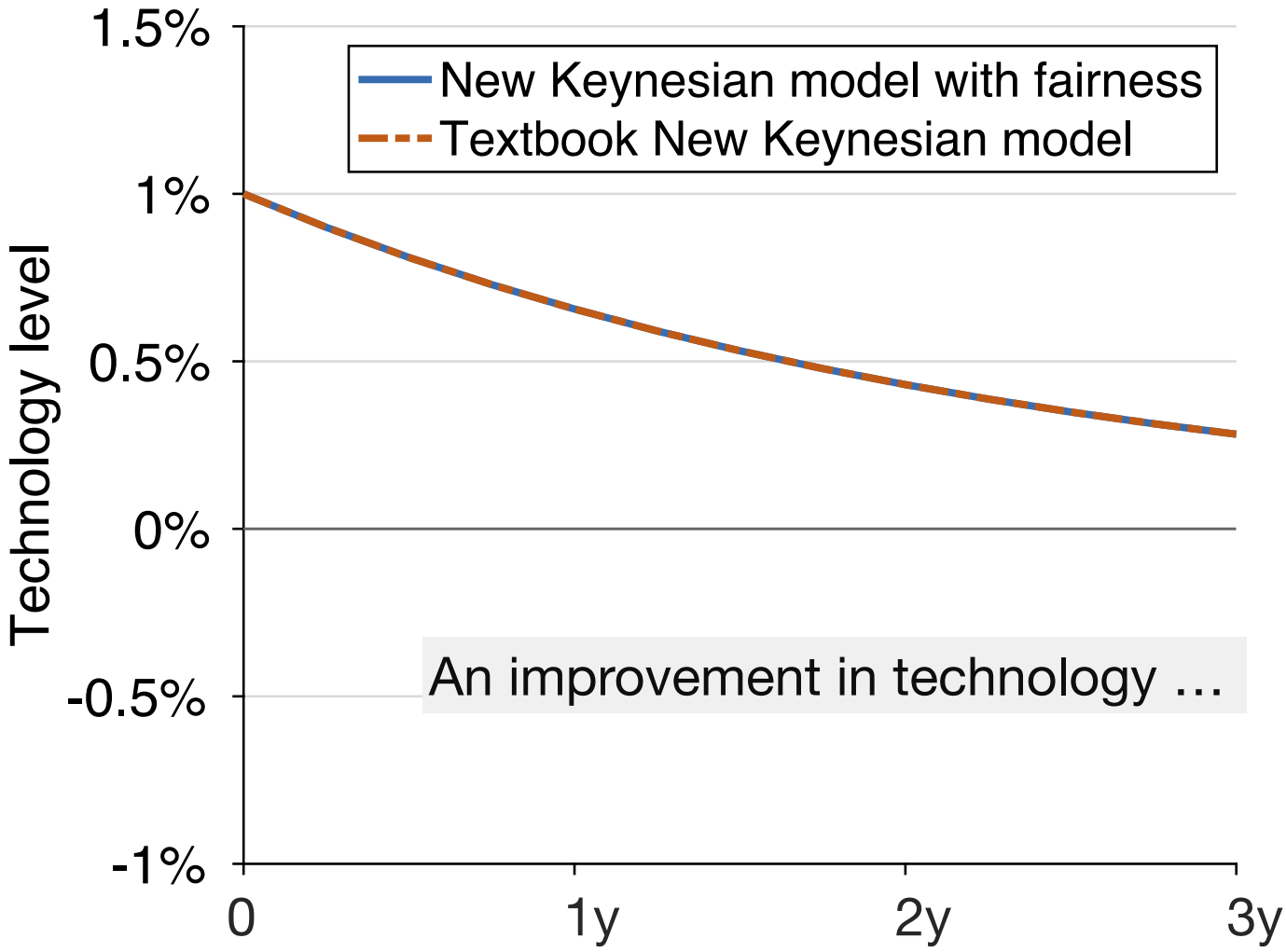
EXPLANATION FOR ANGER AT INFLATION

- Shiller [1997] surveyed 120 people in the US
- 85% said that “when they go to the store and see that prices are higher, they sometimes feel a little angry at someone”
- someone: “greedy store owners and businesses”

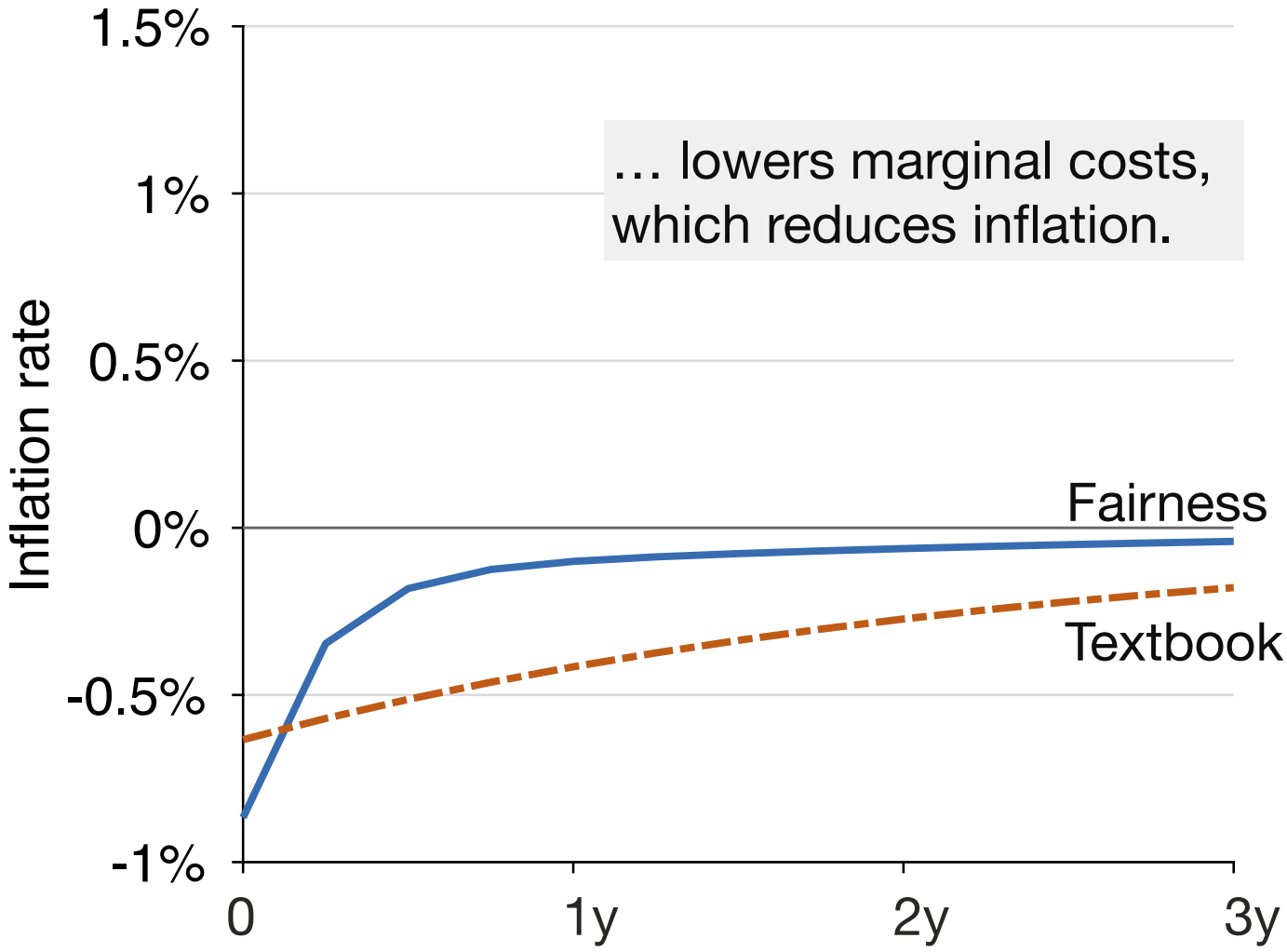
EXPLANATION FOR OPINIONS ABOUT PRICE MOVEMENTS IN JAPAN (BOJ SURVEY, 2001–2017)

perceived price change	favorable	neutral	unfavorable
prices have gone up ($N = 68,491$)	2.5%	13.0%	83.7%
prices have gone down ($N = 18,257$)	43.0%	34.2%	21.9%

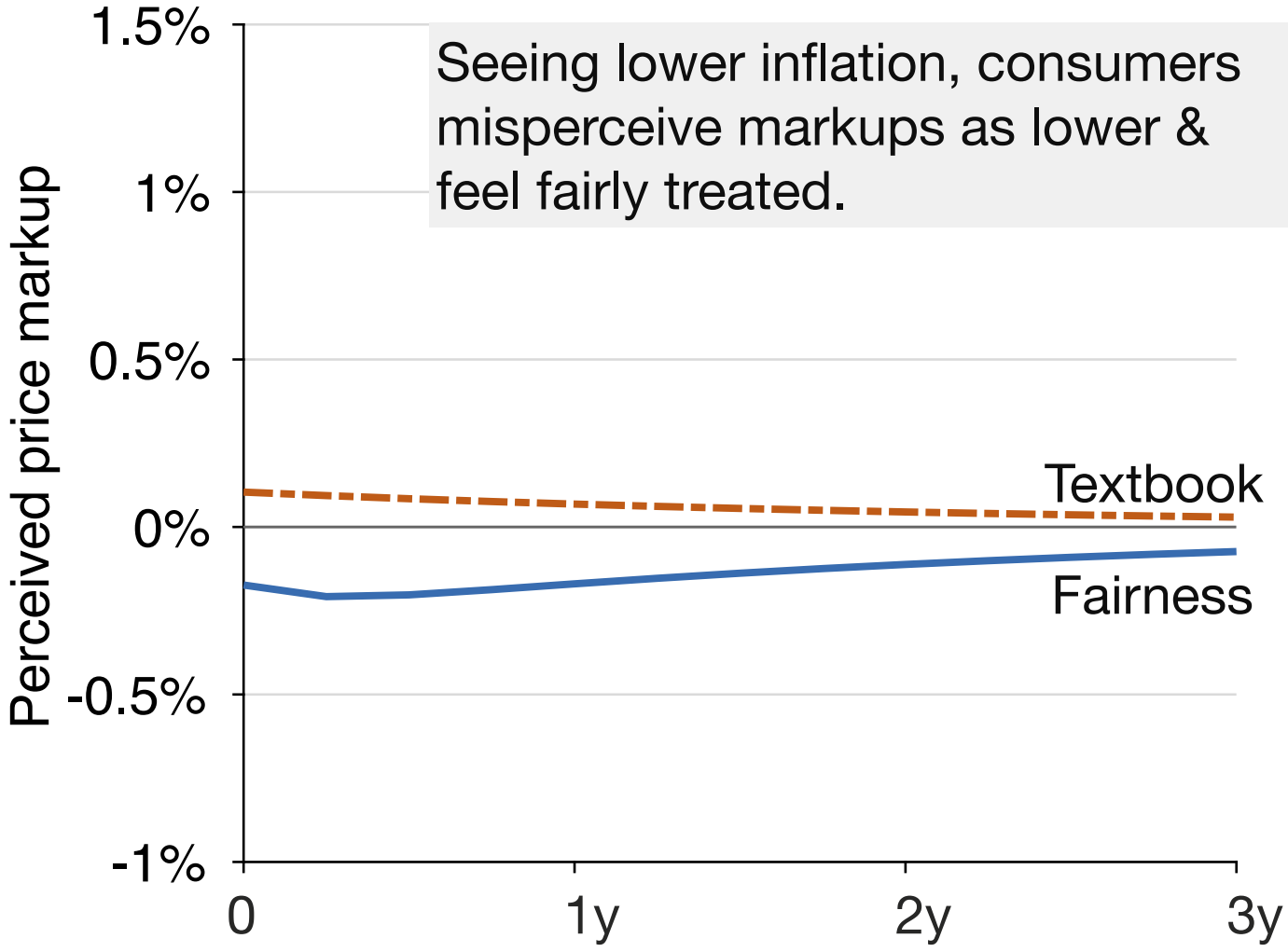
IMPROVEMENT IN TECHNOLOGY



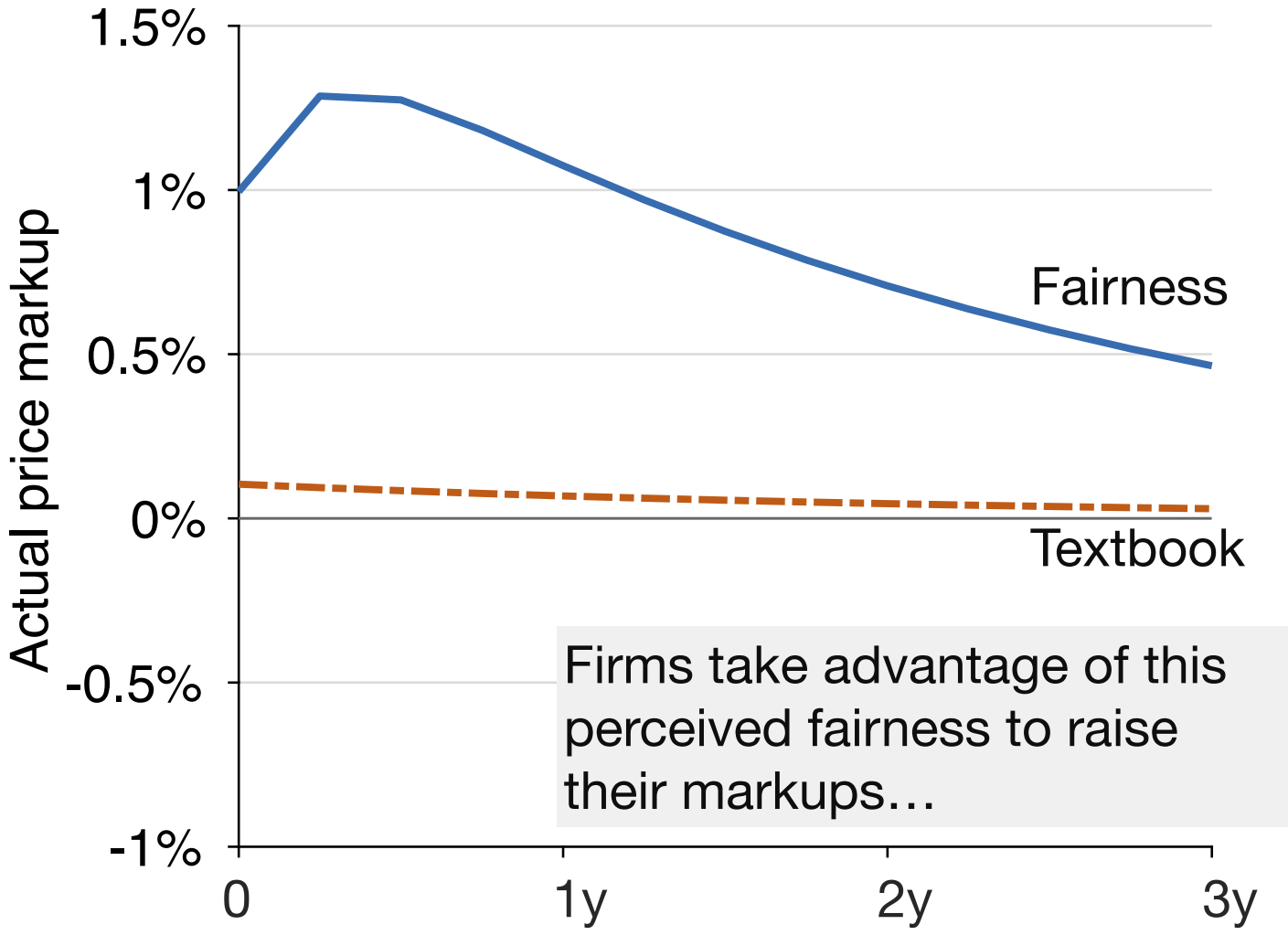
IMPROVEMENT IN TECHNOLOGY



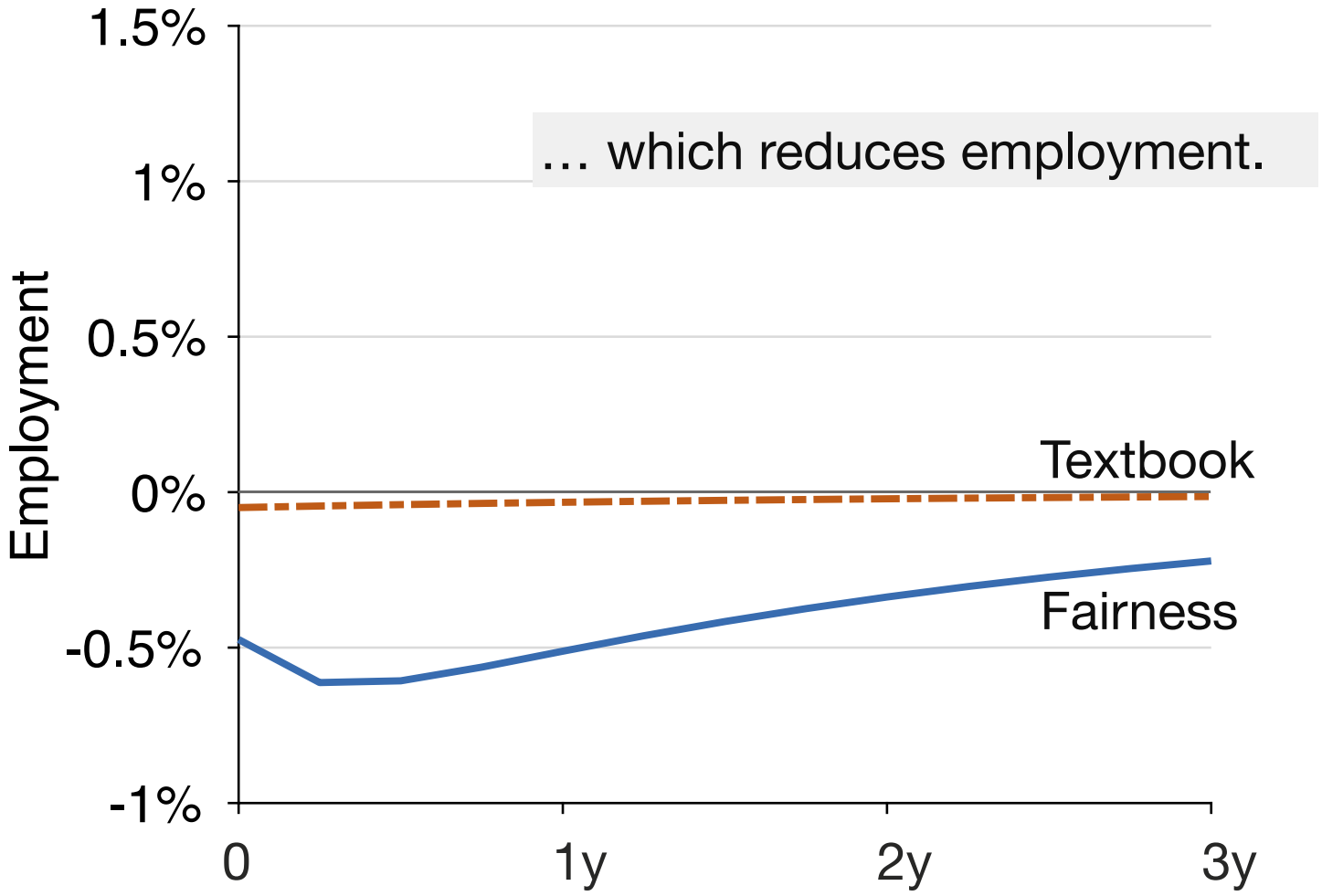
IMPROVEMENT IN TECHNOLOGY



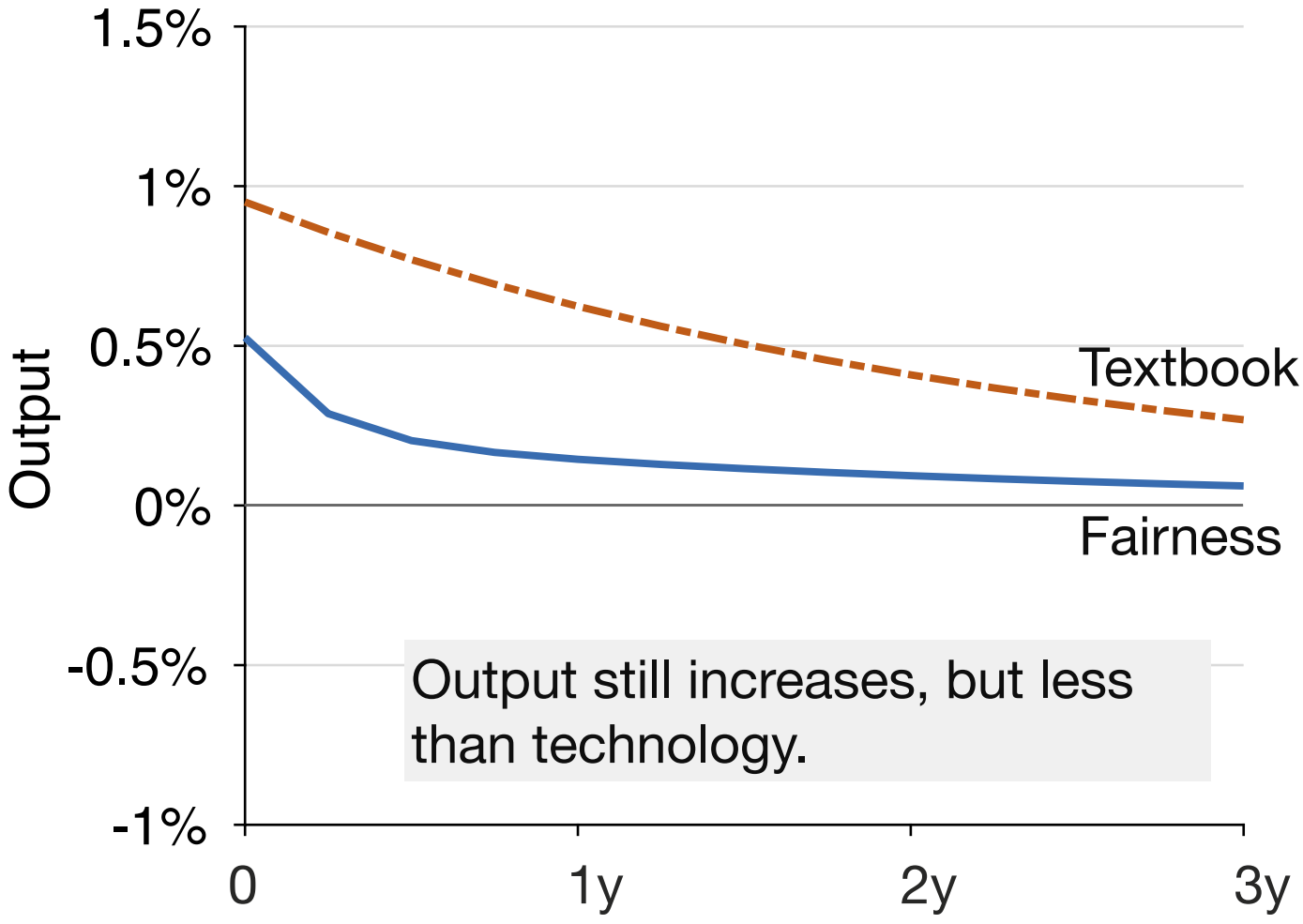
IMPROVEMENT IN TECHNOLOGY



IMPROVEMENT IN TECHNOLOGY



IMPROVEMENT IN TECHNOLOGY



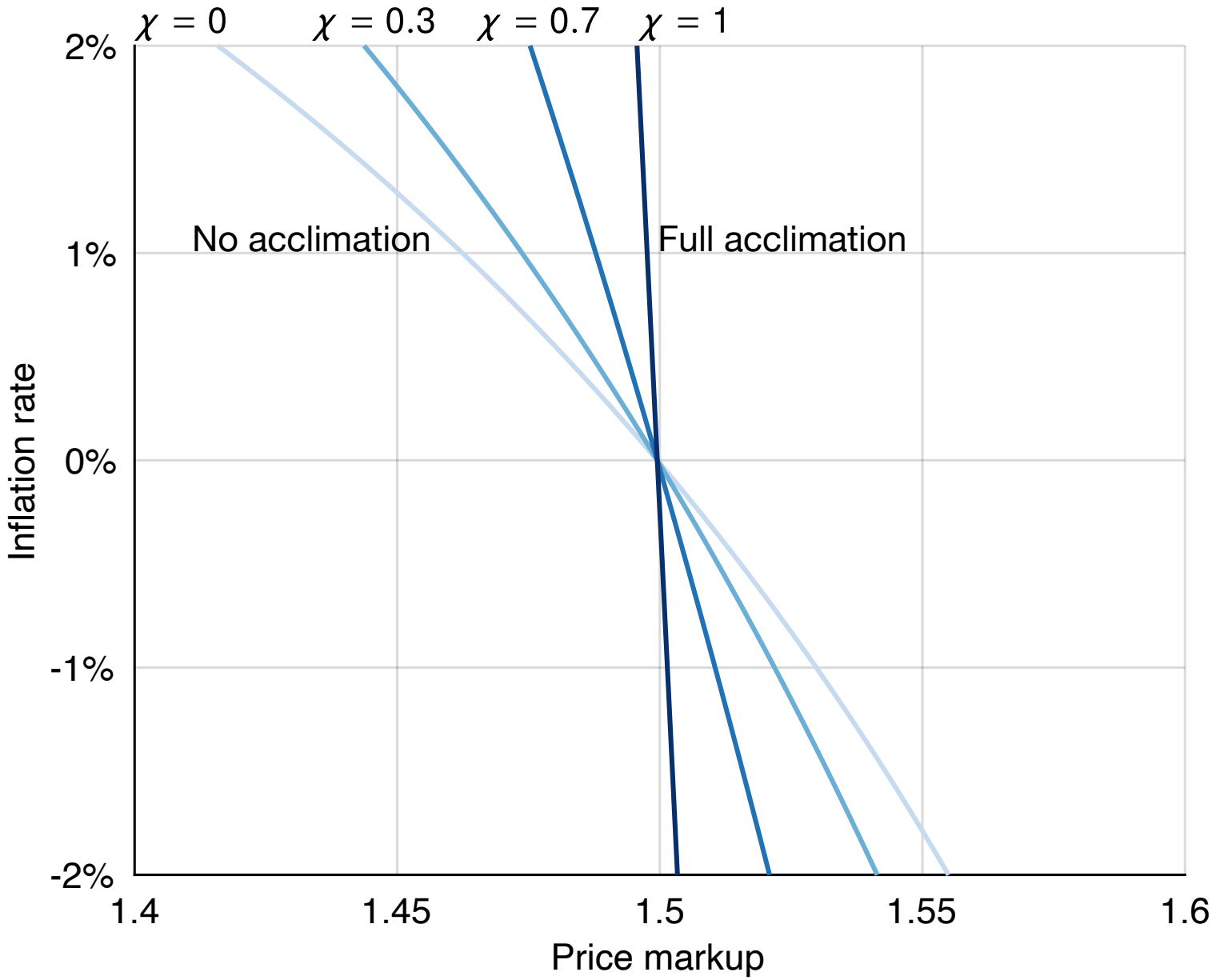
LONG-RUN MONETARY NONNEUTRALITY

- steady-state perceived markup:

$$\ln\left(\overline{M^p}\right) = \ln\left(\frac{\epsilon}{\epsilon - 1}\right) + \frac{\gamma}{1 - \gamma} \cdot \overline{\pi}$$

- higher inflation $\rightsquigarrow$ higher perceived markup $\rightsquigarrow$ lower fairness $\rightsquigarrow$ lower actual markup $\rightsquigarrow$ higher output
- evidence of long-run nonneutrality: King, Watson [1994, 1997]
- evidence on inflation & markups: Benabou [1992]; Banerjee, Russell [2005]
- nonneutrality modulated by acclimation to inflation: $\chi \in [0, 1]$

LONG-RUN PHILLIPS CURVE



LONG-RUN PHILLIPS CURVE