

The Future in Today's Prices: Evidence from a Survey of US Firms

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Inflation: Drivers and Dynamics Conference 2026
Cleveland, Sep 24, 2026

The views stated herein are those of the authors and are not necessarily those of the Federal Reserve Bank of Boston, the Board of Governors of the Federal Reserve System or Danmarks Nationalbank.

Introduction

- ▶ Core feature of macro models: forward-looking price setting
 - ▶ Expectations enter the aggregate Phillips curve based on firm pricing rules
 - ▶ Prototypical firm pricing rule:

$$\Delta p_i = \alpha + \beta \underbrace{\Delta C_i}_{\text{current costs}} + \gamma \underbrace{\Delta C_i^e}_{\text{expected costs}} + \varepsilon_i$$

- ▶ Identifying $\{\beta, \gamma\}$ is empirically challenging due to endogeneity and measurement issues:
 - ▶ Omitted markup shocks, simultaneity / common shocks
 - ▶ Data on matched firm-level prices, costs, and cost expectations are rare

This Paper

Identify $\{\beta, \gamma\}$ from survey data and cross-firm variation in exposure to 2025 trade-policy shock

- ▶ New survey: US SMBs report realized and expected cost changes and their trade-policy components *at the moment of price adjustment*.
- ▶ IV strategy: Variation in firm-level exposure of cost changes to trade policy to instrument for ΔC_i , and ΔC_i^e .
- ▶ Theory: Generalized-hazard pricing framework maps pricing frictions into pass-through across horizons to motivate empirical specification; estimates shed light on model choice.

Our Results

Both realized and expected cost shocks matter in firms' price setting:

- ▶ Pass-through of realized cost changes: $\hat{\beta} \approx 0.7$
- ▶ Pass-through of expected cost changes: $\hat{\gamma} \approx 0.4$

Pass-through estimates are heterogeneous across firms:

- ▶ Expected-cost pass-through is concentrated among sticky-price, high-uncertainty, service, and high-labor-share firms.

Policy implications:

- ▶ Inflationary impact of 1% (expected) cost shock: 0.95pp. (0.60pp.) higher annualized first-quarter inflation; under high uncertainty, 0.35pp. (1.12 pp.) – role for expectations and uncertainty management towards *firms* to reduce anticipatory inflation.

Main takeaway:

Pricing frictions explain why expectations matter, but uncertainty and sector-specific processes also play a role in defining forward-looking behavior.

⇒ Evidence in support of endogenous pricing models, or models with imperfect information.

Literature

- ▶ **Expected inflation and pricing.** Aggregate Phillips curve; firm-survey evidence.
Galí-Gertler 99, Mavroeidis et al. 14, Coibion et al. 18, 20, Andrade et al. 22, Abberger et al. 24
- ▶ **Pass-through of cost shocks.** Exchange rates, taxes, tariffs.
Gopinath et al. 10, Amiti et al. 19, Fajgelbaum et al. 20, Cavallo et al. 21, 25
- ▶ **Pass-through of expected cost shocks.**
Meyer-Sheng 25, Ghassibe et al. 25 Natural experiments and firm-survey data.
- ▶ **Generalized-hazard pricing.** Frictions and reset-price kernels.
Alvarez-Lippi-Oskolkov 22, Werning 22

Our contribution: firm-level measurement of realized *and* expected cost changes at the price-adjustment moment, with trade-policy IV identifying both pass-through channels. Results point to models beyond simple linear-quadratic setting.

Data

Survey of small and medium businesses (SMBs) – firms with < 500 employees.

- ▶ Morning Consult online survey since 2022, recent waves in collaboration with Boston Fed
- ▶ $N \approx 600$ firm owners and relevant decision makers per quarterly wave

Representative sample of SMBs in the US:

- ▶ Sample weights to fit Census 2023 Annual Business Survey distribution by Census region, industry groups, firm size *for firms with ≤ 500 employees*.
- ▶ Median firm: 2 to 5 employees, \$100k to \$499k revenue per year, 7-9 years in business

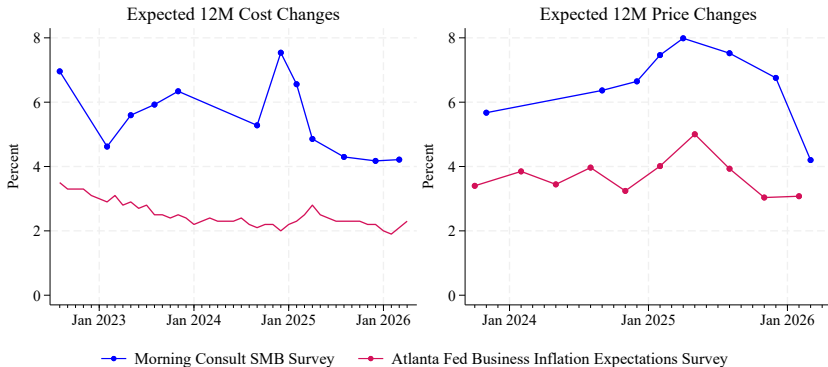
Owner Characteristics

Firm Characteristics

Comparison to Existing Surveys

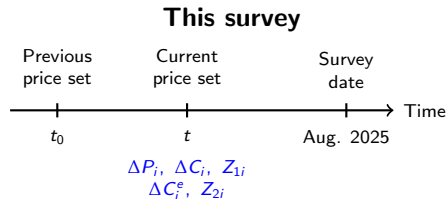
- ▶ Movements in expected cost and price changes align with the Atlanta Fed's BIE survey.
- ▶ Level difference is consistent with BIE panelists having longer survey tenure compared to the MC repeated cross-section respondents (Kim and Binder 2023).

Comparison of Expected Cost and Price Changes with the BIE



Survey Timing and Variables: Key Measurement Innovation

2025:Q3 research module: Special questions **eliciting variables as of the most recent price adjustment rather than the survey date** to map directly into theory-implied regressions



Measures price & cost **changes between price adjustments**
and expectations **at the adjustment date.**

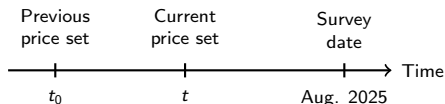
- ▶ ΔP_i : Price change (%) at most recent adjustment date
- ▶ ΔC_i : Cost change between the two most recent price adjustments
- ▶ ΔC_i^e : Expected 12-month ahead cost change at most recent price-adjustment date
- ▶ Instruments Z_{i1}, Z_{i2} : realized (expected) cost change *due* to trade policy

Questions

Survey Timing and Variables: Key Measurement Innovation

2025:Q3 research module: Special questions **eliciting variables as of the most recent price adjustment rather than the survey date** to map directly into theory-implied regressions

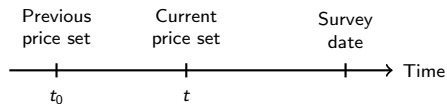
This survey



$$\Delta P_i, \Delta C_i, Z_{1i}$$
$$\Delta C_i^e, Z_{2i}$$

Measures price & cost **changes between price adjustments** and expectations **at the adjustment date**.

Typical surveys



$$\Delta C_i^e, \Delta P_i, \Delta C_i$$

Measures **fixed-horizon changes** and expectations **at the survey date**.

- ▶ ΔP_i : Price change (%) at most recent adjustment date
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- ▶ ΔC_i^e : Expected 12-month ahead cost change at most recent price-adjustment date
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Questions

Model: The Reset-Price Kernel

General linear-quadratic firm pricing problem:

$$p_t^* = \arg \min_p \mathbb{E}_t \left[\sum_{k=0}^{\tau-1} \beta^k (p - p_{t+k}^+) ^2 \right].$$

- ▶ p_t^* : optimal reset price
- ▶ p_{t+k}^+ : frictionless target price at time $t+k$, assume equal to mc_{t+k}
- ▶ τ : random time until next reset

FOC: optimal reset price is a discounted, survival-weighted average of expected target prices

$$p_t^* = \sum_{k \geq 0} \underbrace{\frac{\beta^k S_k}{\sum_{k \geq 0} \beta^k S_k}}_{w_k} \mathbb{E}_t p_{t+k}^+, \quad \text{where } S_j \equiv \Pr_t(\tau > j).$$

- ▶ Survival function summarizes reset process (Alvarez et al. 2022; Werning 2022). Illustration
- ▶ Nests models where price resets are exogenous (Calvo, Taylor) or endogenous (menu cost).

Link to Estimating Equation and Survey Questions

With constant markups, FOC implies:

$$\underbrace{\Delta p_t}_{\text{Change in price}} = \underbrace{\Delta mc_{t,t_0}}_{\text{Realized cost change since } t_0} + \underbrace{\mathbb{E}_t \left[\sum_{j \geq 1} w_j \Delta mc_{t,t+j} \right] - \mathbb{E}_{t_0} \left[\sum_{j \geq 1} w_j \Delta mc_{t_0,t_0+j} \right]}_{\text{Revision of expected future cost changes}}$$

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- ▶ Two additional conditions to map reset price equation into main specification:
 - I: **Flat cost path** 12m expectations are a measure of a weighted expected cost change path.
 - ▶ Satisfied if cost expectations are flat starting in t . Illustration
 - II: **No anticipation** Expectations formed at the previous price change are orthogonal to current realized and expected cost changes. Illustration

Link to Estimating Equation and Survey Questions

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- ▶ Two additional conditions to map reset price equation into main specification:
 - I: **Flat cost path** 12m expectations are a measure of a weighted expected cost change path.
 - ▶ Satisfied if cost expectations are flat starting in t . [Illustration](#)
 - II: **No anticipation** Expectations formed at the previous price change are orthogonal to current realized and expected cost changes. [Illustration](#)
- ▶ This yields the main estimating equation:

$$\Delta p_t = \alpha + \beta \Delta C_t + \gamma \Delta C_t^e + \epsilon_t, \quad \text{with } \beta = 1, \quad \gamma = 1 - w_0.$$

But shocks that move both costs and prices (e.g., markups) still bias OLS estimates so we need instruments.

Identification: Trade-Policy Instruments

Instrument current and expected costs with their trade-policy-induced components:

$$Z_{1i} \equiv \Delta(C_i \mid \text{trade policy}), \quad Z_{2i} \equiv \Delta(C_i^e \mid \text{trade policy}).$$

Relevance. Z_{1i} and Z_{2i} strongly predict ΔC_i and ΔC_i^e in the first stage (KP F-stat: 26)

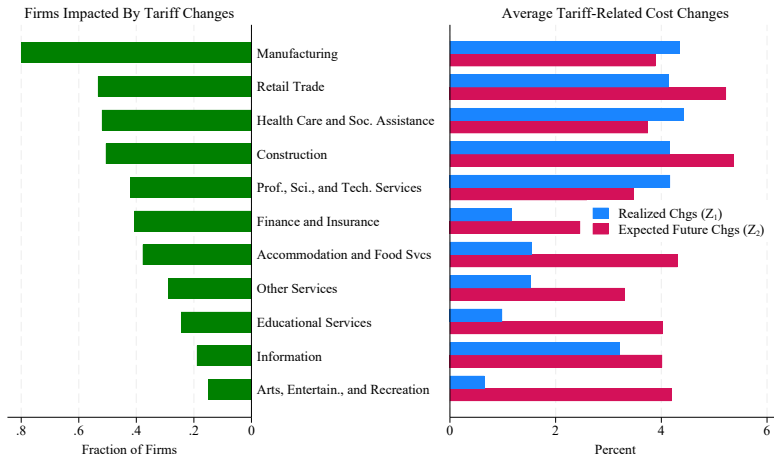
Exclusion. Trade-policy exposure affects prices through realized and expected costs:

$$\mathbb{E}[Z_{1i}\epsilon_i] = 0, \quad \mathbb{E}[Z_{2i}\epsilon_i] = 0.$$

Joint IV identifies (β, γ) from policy-driven variation in realized and expected cost changes

1. **Flat cost path:** Tariffs do generally jump and stay flat. Tariff paths
2. **No anticipation:** 2025 tariffs were not forecastable at t_0 (timing, magnitude, cross-sectional incidence). $\Rightarrow Z_{1i}, Z_{2i}$ orthogonal to firms' prior information sets
3. **Shocks simultaneously affecting prices and costs:** to first order, tariffs affect firms' cost; if negative markup correlation, likely downward bias.

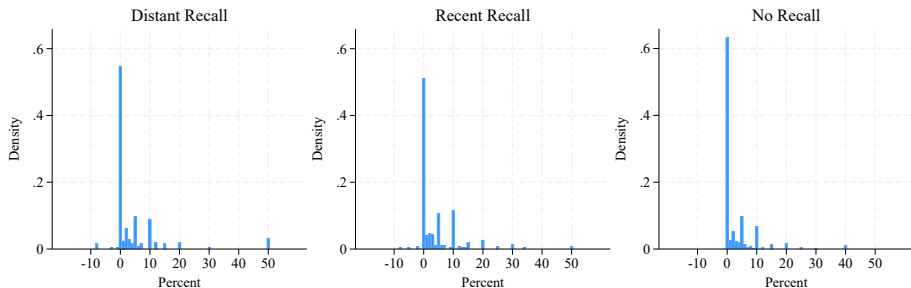
Instrument: Tariff Exposure of SMBs



- ▶ About 1/3 of SMBs in our survey import; exposure by industry is broadly consistent with literature (Barbiero and Stein 2025)
- ▶ Costs of service sector firms are affected indirectly and through expectations.

Further Identification Challenge: Limited Memory

- Distributions of price, cost and expected cost changes do not differ systematically across times of last price changes and current period (no recall).



(a) Actual Cost Change between Last Two Price Changes

(b) Actual Cost Change since Last Price Change

- Other indicators of limited memory also similar across degrees of recall: inattentive straight-lining, round-numbering, etc.
- None of this would explain systematic cross-firm heterogeneity in pricing behavior.

Main Results

How do firms adjust prices to current and expected cost changes?

	OLS	IV	IV First Stages	
	Δp_i	Δp_i	ΔC_i	ΔC_i^e
Cost change ΔC_i	0.60*** (0.05)	0.68*** (0.14)		
Exp. cost change ΔC_i^e	0.25***	0.43*** (0.15)		
Trade-related cost change Z_{1i}			0.59*** (0.09)	0.02 (0.07)
Exp. trade-related cost change Z_{2i}			-0.08 (0.10)	0.59*** (0.09)
Constant	4.16*** (0.60)	3.06*** (1.08)	2.56*** (0.89)	3.15*** (0.52)
N	537	539	539	539
R^2	0.37	0.33	0.15	0.27
SW F-stat			55.53	53.46
KP F-stat		25.61		

Estimates from jackknife regression. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

- Both matter: $\sim 70\%$ pass-through of *realized* cost changes; $> 40\%$ of *expected* cost changes passed on

Heterogeneity

Sample splits to highlight the role of...

- ▶ Price rigidity
- ▶ Goods vs service sectors
- ▶ Labor share
- ▶ Uncertainty

Also cross-validate expectations pass-through result following Werning (2022) sufficient statistic approach.

Price Rigidity: Only firms with more rigid prices are forward looking

Two groups based on average price duration: Duration distribution

- ▶ ≤ 6 months (avg: 3.5): Full pass-through of realized costs, no role of expectations
- ▶ > 6 months (avg: 15.8+): Large significant role of expectations

	≤ 6 months	≥ 7 months
	Δp_i	Δp_i
Cost change ΔC_i	1.02*** (0.21)	0.34* (0.21)
Exp. cost change ΔC_i^e	0.25 (0.21)	0.50** (0.20)
Constant	2.53* (1.39)	4.32*** (1.46)
N	278	259
R^2	0.26	0.47
SW F-stat ΔC_i	26.12	31.12
SW F-stat ΔC_i^e	24.73	34.71
KP F-stat	12.46	14.67
P-val: Equal γ	0.38	

Estimates from jackknife regression. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Sector: Services firms are more forward looking, primarily driven by high labor cost shares

	Sector		Labor Costs – All Firms		Labor Costs – Svc Firms	
	Goods	Services	Low	High	Low	High
	ΔP_i	ΔP_i	ΔP_i	ΔP_i	ΔP_i	ΔP_i
Cost change ΔC_i	0.73*** (0.21)	0.44*** (0.17)	0.92*** (0.26)	0.48** (0.23)	1.03** (0.42)	0.36 (0.38)
Exp. cost change ΔC_i^e	0.12 (0.27)	0.45*** (0.14)	0.08 (0.21)	0.43** (0.21)	0.01 (0.32)	0.64** (0.25)
Constant	5.12*** (1.52)	3.65*** (1.05)	4.45*** (1.66)	3.35*** (1.22)	4.48** (2.00)	2.59 (2.11)
N	110	427	247	255	183	214
R^2	0.31	0.32	0.27	0.47	0.25	0.44
SW F-stat ΔC_i	16.15	34.62	22.84	26.77	12.37	15.87
SW F-stat ΔC_i^e	7.60	53.61	28.88	25.66	19.52	18.51
KP F-stat	4.95	17.17	10.87	13.04	6.46	7.04
P-val: Equal γ	0.27		0.24		0.12	

Estimates from jackknife regression. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Uncertainty: More uncertain firms are those that are forward looking

- Using a measure of trade cost uncertainty based on responses for average, lowest, and highest possible expected cost changes due to trade policy. Uncertainty measure

	Trade Cost Uncertainty	
	Low	High
	ΔP_i	ΔP_i
Cost change ΔC_i	0.95*** (0.16)	0.25 (0.42)
Exp. cost change ΔC_i^e	-0.04 (0.18)	0.80** (0.31)
Constant	4.14*** (1.23)	2.98 (1.82)
N	327	205
R^2	0.29	0.12
SW F-stat ΔC_i	34.50	11.49
SW F-stat ΔC_i^e	21.43	21.73
KP F-stat	11.33	5.65
P-val: Equal γ	0.02	

Estimates from jackknife regression. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

- In line with models of endogenous timing of price adjustments.

A Theory-Based Validation Exercise

Werning (2022) provides a sufficient statistic for the pass-through of anticipated shocks:

$$\phi \equiv \frac{\text{average ongoing price spell duration}}{\text{average price spell duration}}$$

- Over population of firms: $\phi = 1$ (Calvo), $\phi = 0.5$ (Taylor), $\phi < 0.5$ (menu cost)

Create subgroups with low and high ϕ by splitting the sample on a firm-level proxy ϕ_i : Distribution

- **Low- ϕ group:** disproportionately drawn from *steep* survival functions — spells cluster near the mean (Taylor-like).
- **High- ϕ group:** disproportionately drawn from *flat* survival functions — substantial probability of very long spells (Calvo-like).

Model prediction: flat survival $\Rightarrow$ kernel weights long horizons more $\Rightarrow$ higher pass-through of expected costs

Higher ϕ group more forward looking, consistent with Werning (2022)

	Ongoing-Completed Duration Ratio	
	< .75	$\geq$.75
	ΔP_i	ΔP_i
Cost change ΔC_i	0.67** (0.34)	0.58*** (0.18)
Exp. cost change ΔC_i^e	-0.09 (0.32)	0.59*** (0.18)
Constant	5.94** (2.42)	3.36*** (1.10)
N	180	323
R^2	0.18	0.36
SW F-stat ΔC_i	18.90	25.27
SW F-stat ΔC_i^e	13.83	55.75
KP F-stat	7.97	12.59
P-val: Equal γ	0.06	

Estimates from jackknife regression. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Conclusion

Firms set prices both backward- and forward-looking.

- ▶ Pass-through to prices: $\hat{\beta} \approx 0.7$ on realized costs, $\hat{\gamma} \approx 0.4$ on expected future costs.
- ▶ Identification from differential firm-level trade-policy exposure in 2025.

Pass-through depends on the pricing environment.

- ▶ Frequent adjusters and goods firms price reactively; sticky-price firms, high-labor share and service firms price are forward-looking.
- ▶ Uncertainty tilts pricing toward expectations: $\hat{\gamma}$ rises from ≈ 0 to ≈ 0.8 .
- ▶ Consistent with menu-cost-style state-dependence or specific information structure; harder to reconcile with Calvo or Taylor. [Model Details](#)

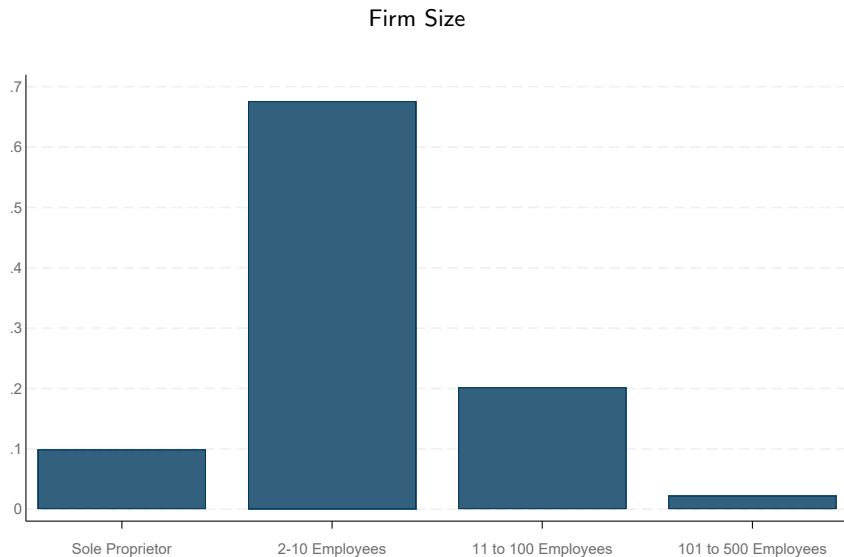
Policy: expected-cost channel makes inflation respond to cost shocks *before* costs realize — communication that anchors both the level and uncertainty of future costs can attenuate this.

Appendix

Owner Characteristics

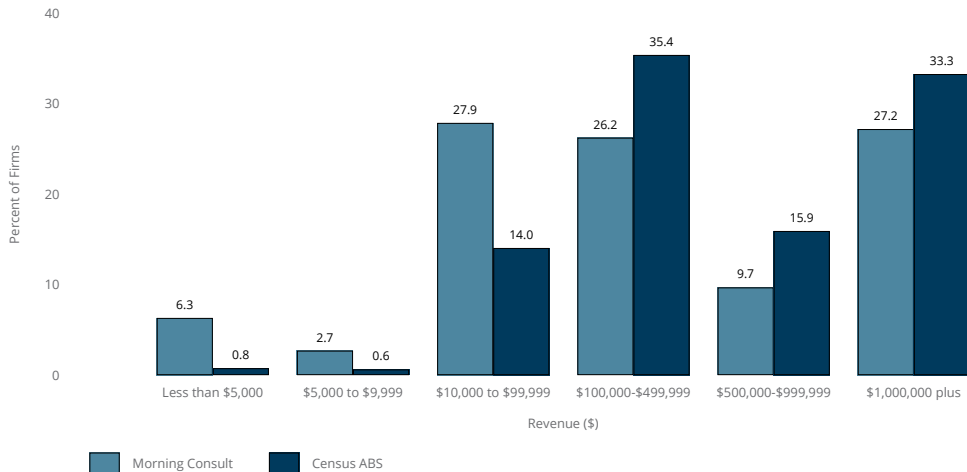
	%		%
Race		Urban vs. Rural	
White	79.0	Urban	30.1
Black	15.0	Suburban	50.6
Other	6.1	Rural	19.3
Ethnicity		Census Region	
Non-Hispanic	90.8	Northeast	19.4
Hispanic	9.2	Midwest	18.5
		South	35.8
Gender		West	26.2
Male	58.1		
Female	41.9	Role	
		C-Level	72.7
Education		Vice President	1.5
less than college	47.2	Director	8.8
bachelor's degree	33.6	Manager	17.0
postgraduate degree	19.2		
Political Ideology			
Liberal	25.6		
Moderate	39.1		
Conservative	35.3	<i>N</i> =599	

Representative Sample – Census Data



Representative Sample – Census Data

Revenues (Untargeted)



Note: Morning Consult sample reweighted based on distribution of firm revenue from Census 2023 Annual Business Survey data.
Source: Morning Consult / U.S. Census Bureau, Annual Business Survey.

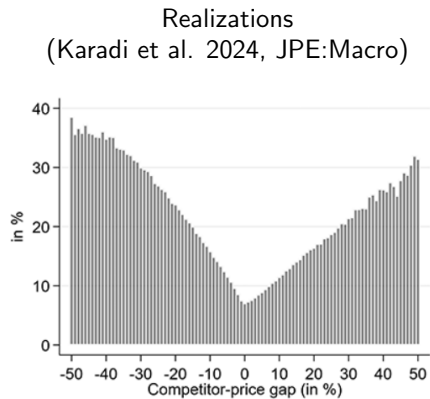
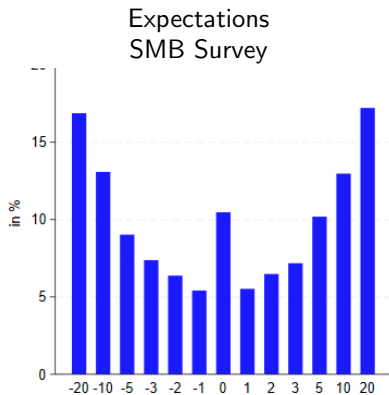
Representative Sample – Census Data

	Weight	Target
Group 1	32.0	32.2
Professional, Scientific, and Technical Services	16.2	14.4
Finance and Insurance	5.7	4.0
Real Estate and Rental and Leasing	5.1	5.9
Management of Companies and Enterprises	2.8	0.2
Information	2.2	1.5
Administrative and Support and Waste Management and Remediation Services	0.0	6.2
Group 2	26.0	24.6
Health Care and Social Assistance	8.3	11.2
Education Services	6.6	1.7
Arts, Entertainment, and Recreation	5.6	2.3
Accommodation and Food Services	5.5	9.3
Group 3	20.3	18.8
Retail Trade	16.3	10.5
Wholesale Trade	3.9	4.4
Transportation and Warehousing	0.1	3.8
Group 4	17.7	17.4
Construction	10.8	12.8
Manufacturing	4.0	4.0
Agriculture, Forestry, Fishing and Hunting	2.2	0.3
Utilities	0.7	0.1
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.2
Group 5	4.1	7.0
Other Services (except Public Administration)	4.1	7.0

Survey Validation: Hazard Rates

How valid are firms' responses in the survey?

- Compare hazard rate from hypothetical scenario question (2025:Q1) with evidence from micro data



Main Survey Questions: Price Change

Q4: Please think of your main product or service and the most recent price change for it. By how much did the price change?

- ☐ Price increased by _____ %
- ☐ Price decreased by _____ %

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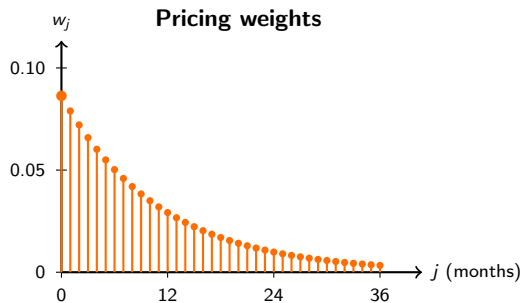
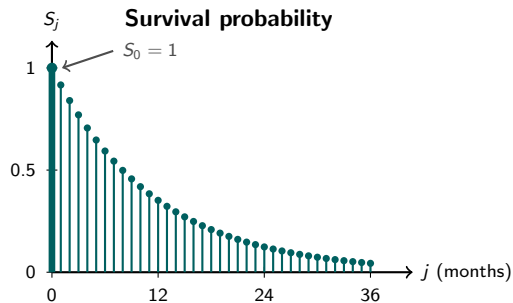
Main Survey Questions: Cost Changes

Q5: Now please think back to the most recent time you adjusted your price. We are interested in how your firm's costs have changed between the most recent and previous price adjustments, and how recent trade policy may have contributed to those cost changes. Think about any changes—upward, downward or none—in your firm's costs over this period, and how much of those changes were related to trade policy. Please enter your responses as percentages.

	Costs increase by %	No cost change	Costs decreased by %
Change in costs between the most recent <i>price</i> adjustment and the previous one			
Change in costs between the most recent <i>price</i> adjustment and the previous one, only due to trade policy			

Analogous question for expected cost changes. [Back](#)

Model: Survival Function and Pricing Weights

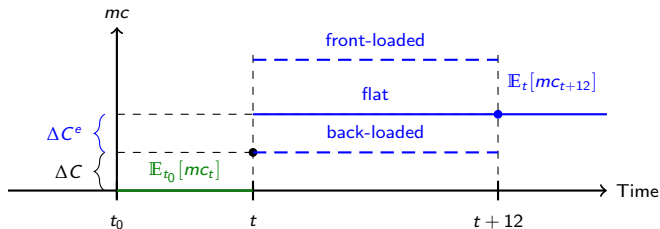


► w_0 = weight on *contemporaneous* costs; $\sum_{j \geq 1} w_j = 1 - w_0$ = weight on the future.

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Identification Challenge 1: Expected Cost Paths

Potential issue: the 12-month-ahead expected cost change can correspond to different expected cost paths so that omitted expected costs down the path enter u_t and can be correlated with ΔC_t^e inducing omitted variable bias.



Three prototypical paths:

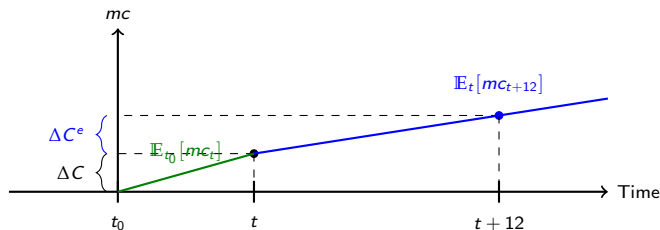
- ▶ **Flat path:** expected tariff-induced cost changes are persistent, so ΔC_t^e captures the model-relevant future cost path. No bias in baseline.
- ▶ **Front-loaded path:** expected costs decline after $t + 12$, so $\hat{\gamma} < 1 - w_0$.
- ▶ **Back-loaded path:** expected costs keep rising after $t + 12$, so $\hat{\gamma} > 1 - w_0$.

Identification Challenge 2: Anticipated Cost Changes

Potential issue: expectations formed at t_0 may already contain information about costs realized or expected at t .

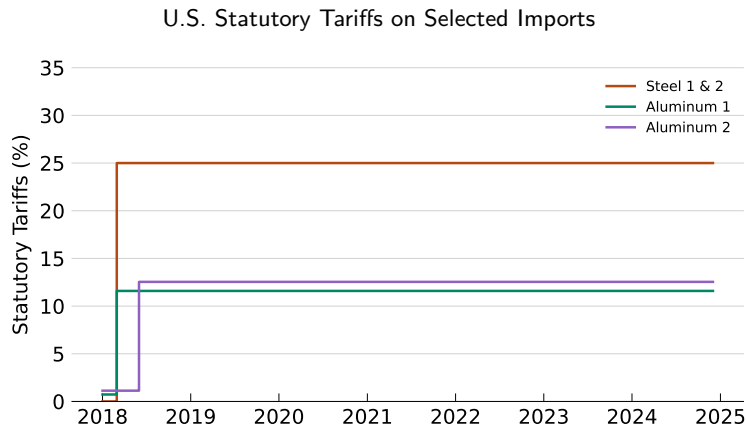
Then:

- ▶ ΔC_t is not purely new information.
- ▶ ΔC_t^e may also be partly anticipated.
- ▶ β and γ no longer separately isolate current and expected cost pass-through.



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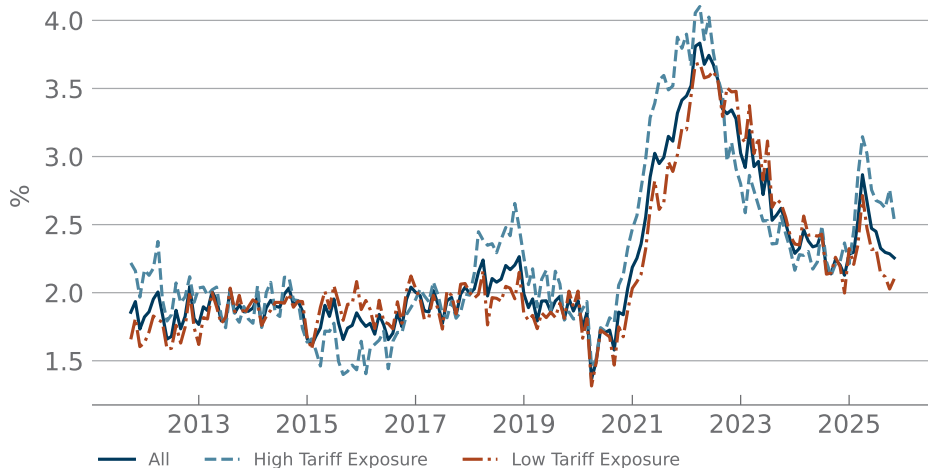
Identification Challenge 1: Expected Cost Paths



- For tariff shocks, the “flat” path is a plausible baseline: past tariffs, such as the 2018 Trump steel and aluminum tariffs, have been highly persistent.

External validation of tariff policy as an instrument for cost expectations

Atlanta Fed BIE: Year-Ahead Unit Cost Expectations



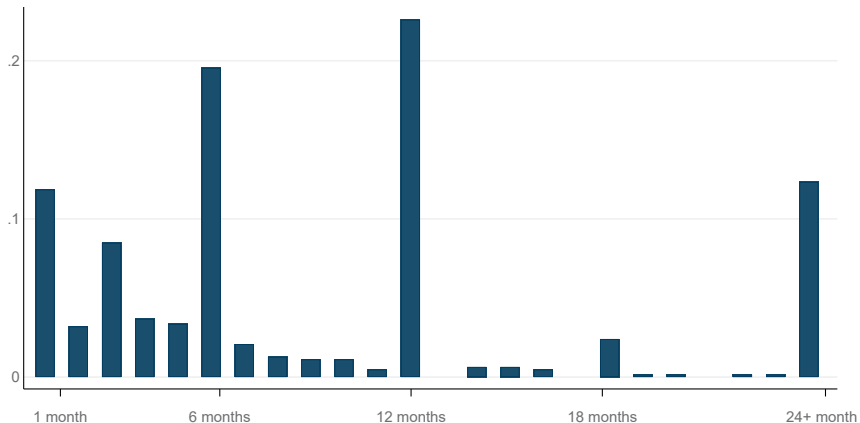
Source: Federal Reserve Bank of Atlanta / Author's Calculations

Note: Sectors are sorted by exposure to tariffs using direct import shares from Barbiero and Stein (2025).

Price Rigidity Distribution

- Split sample by average duration of prices:

“On average, how often does the price for this product or service change?”



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Main Survey Questions: Uncertainty

Q6: Now, please continue thinking back to the most recent time you adjusted your price. What were your expectations back then of how costs and prices would change in the future? Please enter your responses as percentages, using negative values for decreases.

	Average change in %	Lowest possible change in %	Highest possible change in %
As of the time you most recently adjusted your price, expected change in <i>costs</i> over the following 12 months			
As of the time you most recently adjusted your price, expected change in <i>costs</i> over the following 12 months, only due to trade policy			

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Uncertainty – Measurement

- ▶ Use triangular distribution to compute uncertainty in expected cost changes due to trade policy
- ▶ Isolate uncertainty from the size of cost shocks:

- ▶ Firms facing larger expected or past cost changes also report higher uncertainty.
- ▶ To avoid conflating uncertainty with the magnitude of cost shocks, we residualize:

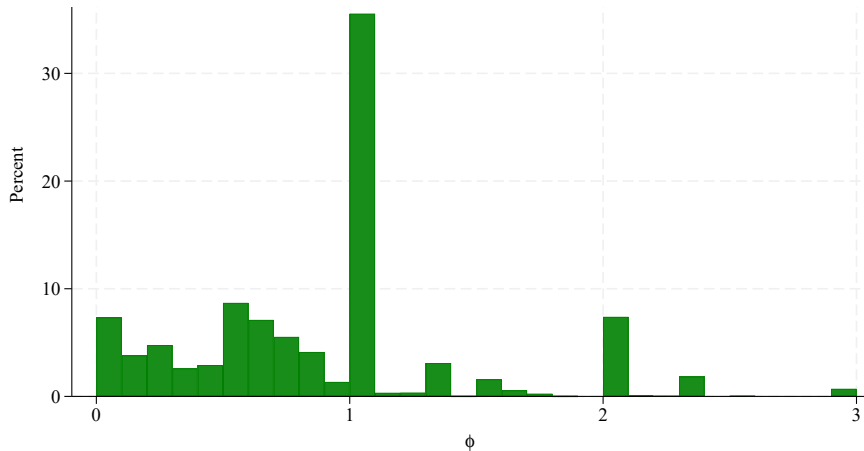
$$\sigma_i^{trade} = a + b_1 Z_{1i} + b_2 Z_{2i} + \epsilon_i^{\sigma, trade}$$

Z_{1i} : past trade-policy cost changes

Z_{2i} : expected trade-policy cost changes

- ▶ The residual $\epsilon_i^{\sigma, trade}$ captures uncertainty orthogonal to cost levels, allowing us to study how uncertainty itself affects pricing.

Sufficient Statistic (Werning 2022): Firm-level proxy ϕ_i



- ▶ Overall distribution shows a lot of mass at 1 (Calvo).
- ▶ Is expectations pass-through higher in a group with higher ϕ ?

Modeling Implications 1/2

- Major pricing models all predict role of pricing frictions for cost expectations:

Under Taylor and Calvo pricing, pass-through weights on expected marginal costs w_j increase in price stickiness far enough into future:

$$\frac{\partial w_j^{Taylor}(N)}{\partial N} \begin{cases} \leq 0 & \forall 0 \leq j \leq N-1 \\ \geq 0 & \forall j > N-1 \end{cases} \quad \frac{\partial w_j^{Calvo}(\theta)}{\partial \theta} \begin{cases} \leq 0 & \forall j < \frac{\beta\theta}{(1-\beta\theta)} \\ \geq 0 & \forall j \geq \frac{\beta\theta}{(1-\beta\theta)} \end{cases}$$

Intuition: mass shifted to survival dominates expected life-time increase

- Positive sign for conventional parameters for our one-year ahead forecast horizon (Calvo): $\theta = 0.65^4$, $\beta = 0.97$: $j^* = 0.194$.
- Similar result for menu cost model, closed form under some assumptions.

Modeling Implications 2/2

- ▶ Models differ in their prediction for uncertainty.
- ▶ Models with exogenous pricing kernels: no role for uncertainty through duration structure in the linear-quadratic setting.
Precautionary effects can arise in higher-order solutions with convexity/asymmetric losses; see Oh (2020), Cho et al. (2021).
- ▶ Models with endogenous pricing kernels:
 - ▶ Option value of waiting shifts weight to future periods (e.g. Aruoba et al. 2024).
 - ▶ Volatility effect raises hazards and shifts weight to current periods.
- ▶ Imperfect-information models:
 - ▶ When signals mix current and future fundamentals, uncertainty can make expectations more informative about persistent cost components.
 - ▶ This can amplify the loading on expected future costs.
- ▶ Evidence points to models where uncertainty changes forward-looking pricing behavior: endogenous pricing kernels and/or imperfect information.