

# The Rise of AI Pricing and Its Economic Impact

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- **How is the economic-wide adoption?**



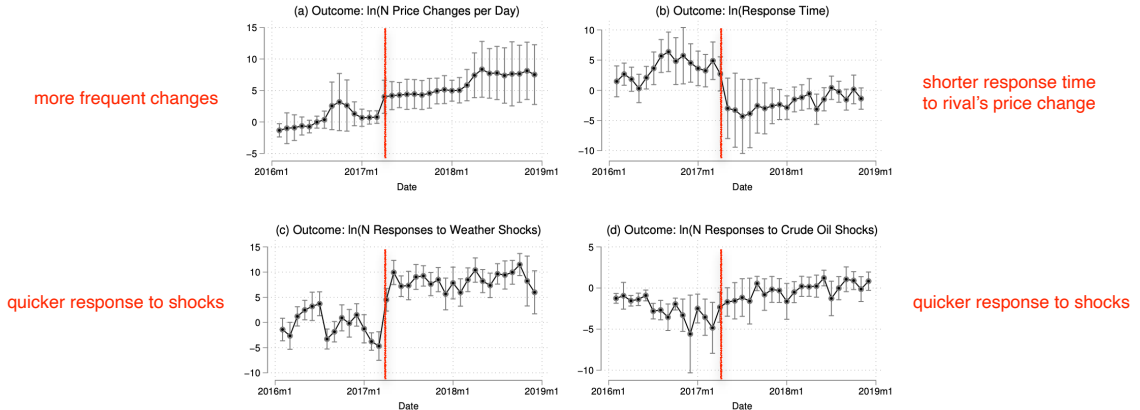
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- How is the economic-wide adoption? **And will there be aggregate implications?**

# Motivation: An Example

Example from the **German Gasoline Market**: Assada-Clarkb-Ershovc-Xu'24 (JPE)

Figure 2: % Difference Between Adopters and Non-Adopters



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- Today: Document economic-wide AI pricing adoptions
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  - The correlation between firm performances with adoption
- Today: Provide some causal evidence on AI pricing adoption and monetary transmission

## Data and Measure

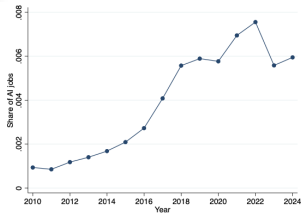
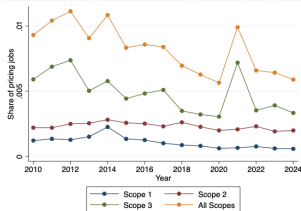
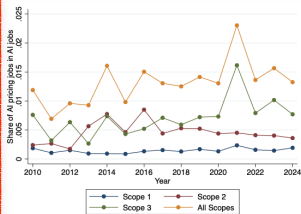
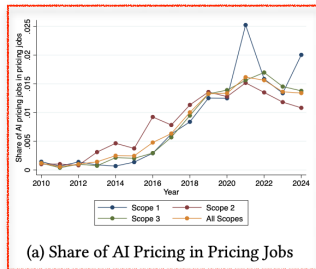
- We rely on Lightcast job posting data (2010-2024Q1) to identify (AI) pricing job posts
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- Merge to Compustat when documenting determinant factors and firm performances
- Merge to CRSP and Bauer and Swanson (2023) monetary shocks when documenting causal evidence
- Summaries omitted for today (to save time)

# [The Rise of AI Pricing]

# Aggregate Time Trends of AI Pricing, Pricing, and AI Jobs





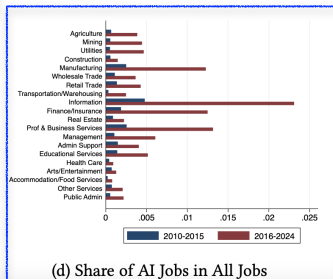
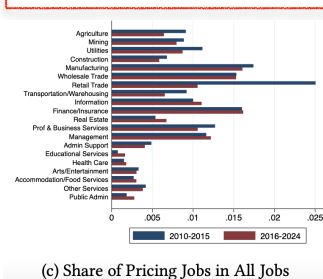
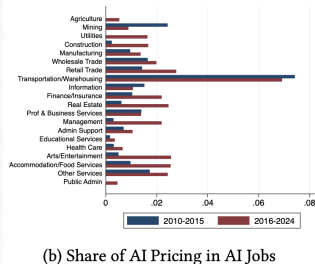
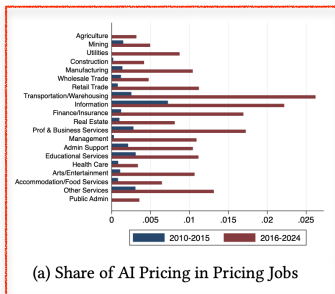
## Leading Firms in AI Pricing Job Postings

Firm	No. of AI Pricing Jobs	AI Pricing/AI Jobs	AI Pricing/Pricing Jobs
Deloitte	1672	6.9%	2.4%
Amazon	1198	1.7%	15.0%
Uber	664	21.1%	46.8%
Johnson & Johnson	611	8.5%	7.2%
Accenture	427	2.8%	2.0%
The RealReal	388	7.9%	43.6%
JPMorgan Chase	344	2.7%	2.8%
CyberCoders	337	0.9%	2.8%
USAA	281	7.7%	5.8%
Capital One	273	1.1%	8.1%
Wells Fargo	251	2.2%	3.3%
Wayfair	246	18.3%	25.7%
IBM	200	1.0%	2.8%
General Motors	195	2.5%	6.0%
PricewaterhouseCoopers	186	2.5%	0.6%
Verizon Communications	147	1.7%	3.1%
UnitedHealth Group	143	2.6%	0.6%
Kforce	142	1.7%	1.2%
The Judge Group	133	3.7%	3.0%
CarMax	132	37.0%	13.9%
Target	131	10.5%	3.8%

Firms who deal with more real-time or more complex pricing tasks tend to adopt more

# Variations Across Industries

AI Pricing:  
Transportation  
IT  
Finance  
Business Services  
Retail  
Education  
Manufacturing  
Entertainment



AI:  
IT  
Business Services  
Finance  
Manufacturing

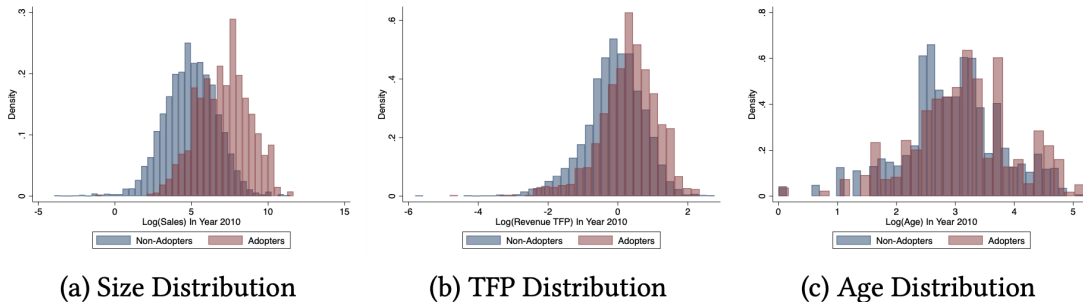
## Takeaways

- A sharp rise of AI pricing jobs as a share of pricing jobs (0.12% to 1.34%)
- A (slow) decline of pricing jobs as a share of all jobs (0.93% to 0.59%)
  - Back of envelope calculation: AI pricing jobs  $\uparrow$  by 1  $\Rightarrow$  Pricing jobs  $\downarrow$  by 50
- Firms who deal with more real-time pricing tasks tend to adopt more
- AI pricing jobs grew more rapidly and spread to broader industries
  - Including transportation, IT, business services, finance, and retail
  - While AI jobs are dominantly concentrated in IT

# [Firm-level Determinants of Adoption]

## Distributions of Adopters and Non-Adopters

Figure 3: Distributions of AI Pricing Adopters and Non-Adopters In the Year 2010



Notes: An adopter ( $\mathbb{I}_{j,2024Q1}^{AP} = 1$ ) is a firm  $j$  that posted at least one AI pricing job since the beginning of our data sample until 2024Q1; Non-Adopter ( $\mathbb{I}_{j,2024Q1}^{AP} = 0$ ) is a firm  $j$  that never posted AI pricing job since the beginning of our data sample until 2024Q1. We provide a comparison to AI adoption in Figure B4.

# Firm-level Determinants of AI Pricing Adoption

Table 4: Firm-level Determinants of AI Pricing Adoption

	AI Pricing Adopter Dummy Indicator, 2010-2024Q1 ( $\mathbb{I}_{j,2024Q1}^{AP} = 1$ )									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log Sales 2010	0.089*** (0.002)									0.109*** (0.004)
Log TFP 2010		0.103*** (0.006)								0.024** (0.012)
Log Age 2010			0.032*** (0.005)							0.007 (0.008)
Tobin's Q 2010				0.011*** (0.003)						0.006 (0.004)
Log Markup					0.016** (0.007)					0.009 (0.016)
R&D/Sales 2010						-0.000 (0.000)				0.351*** (0.065)
ROA 2010							-0.225*** (0.081)			0.130 (0.136)
Cash/Assets 2010								-0.104*** (0.023)		0.020 (0.042)
Debt/Assets 2010									0.071*** (0.020)	-0.013 (0.037)
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	7768	7060	7304	7785	7748	3790	7776	7787	7299	3021
adj. R <sup>2</sup>	0.205	0.060	0.022	0.018	0.017	0.021	0.017	0.004	0.002	0.239

# Firm-level Determinants of AI Pricing Adoption

Table 5: Firm-level Determinants of Cumulative AI Pricing Job Postings

	Total AI Pricing Job Postings, 2010-2024Q1 ( $APN_{j,2024Q1}$ )									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log Sales 2010	3.754*** (0.210)									4.413*** (0.434)
Log TFP 2010		5.485*** (0.547)								3.232*** (1.128)
Log Age 2010			1.417*** (0.502)							0.367 (0.813)
Tobin's Q 2010				1.126*** (0.291)						0.271 (0.426)
Log Markup 2010					0.594 (0.627)					-2.457 (1.578)
R&D/Sales 2010						-0.007 (0.031)				12.475** (6.298)
ROA 2010							-8.341 (7.489)			3.730 (13.223)
Cash/Assets 2010								1.962 (2.134)		6.235 (4.094)
Debt/Assets 2010									1.721 (1.388)	-4.315 (3.553)
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	7768	7060	7304	7785	7748	3790	7776	7787	7299	3021
adj. $R^2$	0.053	0.028	0.016	0.016	0.014	0.016	0.014	0.014	0.007	0.060

# Firm-level Determinants of AI Pricing Adoption

Table 6: Firm-level Determinants of Cumulative AI Pricing Job Postings Intensity

	Total AI Pricing Job Postings/Total Pricing Job Postings, 2010Q1-2024Q1 ( $APS_{j,t}$ )									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log Sales 2010	0.001*** (0.000)									0.000 (0.001)
Log TFP 2010		0.004*** (0.001)								0.007*** (0.002)
Log Age			-0.002*** (0.001)							-0.004*** (0.001)
Tobin's Q 2010				0.001*** (0.000)						-0.000 (0.001)
Log Markup 2010					0.001 (0.001)					-0.007*** (0.003)
R&D/Sales 2010						-0.000 (0.000)				0.022* (0.011)
ROA 2010							0.008 (0.017)			-0.012 (0.032)
Cash/Assets 2010								0.008** (0.004)		-0.003 (0.008)
Debt/Assets 2010									0.003 (0.003)	0.022*** (0.006)
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	6229	5826	5925	6238	6215	3047	6232	6240	5875	2552
adj. $R^2$	0.010	0.012	0.012	0.011	0.009	0.007	0.009	0.010	0.010	0.019



## Takeaways

- Larger, more productive, and more R&D intensive firms are more likely to adopt and adopt more
- Age, financial conditions, and operation conditions do not matter much

# [AI Pricing and Firm Performance]

# Long-differences Results

Table 7: AI Pricing and Firm Performance: Long-differences

	$\Delta \text{ Log Sales}$		$\Delta \text{ Log Employment}$		$\Delta \text{ Log Assets}$		$\Delta \text{ Log Markup}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta APS_{j,[2010,2023]}$	1.193*** (0.332)	0.857*** (0.291)	0.996*** (0.286)	0.559** (0.252)	1.134*** (0.343)	0.806*** (0.309)	0.259 (0.166)	0.282** (0.121)
Share of AI		-0.029 (0.663)		-0.332 (0.570)		-0.237 (0.706)		-0.634** (0.277)
Share of Pricing		0.252 (0.188)		0.712*** (0.243)		0.321 (0.201)		-0.035 (0.079)
Log Sales		-0.088*** (0.009)		-0.098*** (0.008)		-0.107*** (0.009)		0.005 (0.004)
Log TFP		-0.014 (0.020)		0.118*** (0.018)		-0.013 (0.021)		-0.085*** (0.008)
Log Age		-0.117*** (0.016)		-0.114*** (0.014)		-0.110*** (0.017)		0.003 (0.007)
Tobin's Q		0.436*** (0.035)		0.360*** (0.032)		0.684*** (0.038)		-0.032** (0.015)
Cash/Assets		0.003 (0.103)		0.173* (0.095)		-0.291*** (0.110)		0.184*** (0.043)
Controls	N	Y	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
N	4014	3583	3677	3293	4025	3587	4014	3583
adj. $R^2$	0.064	0.184	0.086	0.228	0.049	0.201	0.018	0.054

## Long-differences Results

Table 8: AI Pricing and Heterogeneous Firm Performance: Long-differences

	$\Delta \text{ Log Sales}$		$\Delta \text{ Log Employment}$		$\Delta \text{ Log Assets}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta APS_{j,[2010,2023]} \times \text{Size Small}$	0.606 (0.516)	0.235 (0.479)	0.606 (0.516)	0.235 (0.479)	0.606 (0.516)	0.235 (0.479)
$\Delta APS_{j,[2010,2023]} \times \text{Size Medium}$	2.008*** (0.605)	1.676*** (0.534)	2.008*** (0.605)	1.676*** (0.534)	2.008*** (0.605)	1.676*** (0.534)
$\Delta APS_{j,[2010,2023]} \times \text{Size Large}$	2.919*** (0.875)	2.305*** (0.787)	2.919*** (0.875)	2.305*** (0.787)	2.919*** (0.875)	2.305*** (0.787)
Controls	N	Y	N	Y	N	Y
Industry $\times$ Size Group FE	Y	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y
$N$	4005	3583	4005	3583	4005	3583
adj. $R^2$	0.135	0.221	0.135	0.221	0.135	0.221

## Evidence from High-frequency Monetary Shocks

$$R_{j,e} = \beta_0 + \beta_1 MP_e + \beta_2 MP_e \times X_{j,t-1} + \beta_3 X_{j,t-1} + \beta_4 Z_{j,t-1} + \beta_5 MP_e \times Z_{j,t-1} + \gamma_j + \gamma_e + \epsilon_{je}, \quad (1)$$

- $R_{j,e}$  denotes the daily stock return of firm  $j$  in the event date  $e$
- $MP_e$  is our monetary shocks (sign-flipped, divided by 25 bps)
- $X_{j,t-1}$  denote the variables of interest (demeaned if are continuous), including
  - firm-level lagged AI pricing adoption dummy  $1_{j,t-1}^{AP}$
  - firm-level lagged AI pricing adoption share  $APS_{j,t-1}$
  - industry-level frequency of price adjustment  $FPA_s$  (standardized)

## Evidence from High-frequency Monetary Shocks

Table 10: Response of Stock Return to Monetary Shocks: AI Pricing Dummy Baseline

	(1)	(2)	(3)	(4)	(5)	(6)
$MP_e \times \mathbb{I}_{j,t-1}^{AP} = 0$	2.444*** (0.079)	2.430*** (0.079)	2.471*** (0.079)	2.825*** (0.189)	2.897*** (0.171)	2.943*** (0.172)
$MP_e \times \mathbb{I}_{j,t-1}^{AP} = 1$	2.956*** (0.094)	2.965*** (0.107)	3.079*** (0.109)	3.302*** (0.210)	3.174*** (0.242)	3.350*** (0.246)
$\mathbb{I}_{j,t-1}^{AP} = 1$	0.038*** (0.014)	0.024 (0.016)	-0.047* (0.025)	0.025 (0.032)	0.033 (0.037)	-0.030 (0.059)
$MP_e \times FPA_s$				0.527*** (0.140)	0.525*** (0.128)	0.524*** (0.128)
$FPA_s$				0.040** (0.016)	0.018 (0.016)	
Controls	N	Y	Y	N	Y	Y
Firm FE	N	N	Y	N	N	Y
$N$	184996	149043	149043	49418	36840	36840
adj. $R^2$	0.010	0.011	-0.010	0.010	0.013	-0.011

## Evidence from High-frequency Monetary Shocks

Table 11: Response of Stock Return to Monetary Shocks: AI Pricing Share Baseline

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MP_e$	2.394*** (0.067)	2.432*** (0.070)	2.488*** (0.070)		2.805*** (0.148)	2.898*** (0.152)	2.942*** (0.152)	
$MP_e \times APS_{j,t-1}$	3.930*** (1.360)	3.656*** (1.398)	3.546** (1.410)	4.231*** (1.275)	6.680** (2.990)	6.252** (2.948)	5.810* (3.021)	5.743** (2.744)
$APS_{j,t-1}$	0.084 (0.164)	-0.010 (0.173)	0.055 (0.440)	0.223 (0.397)	0.271 (0.331)	0.404 (0.341)	0.577 (0.692)	0.517 (0.629)
$MP_e \times FPA_s$					0.494*** (0.127)	0.497*** (0.129)	0.510*** (0.129)	0.564*** (0.117)
$FPA_s$					0.029* (0.015)	0.025 (0.019)		
Controls	N	Y	Y	Y	N	Y	Y	Y
Firm FE	N	N	Y	Y	N	N	Y	Y
Event FE	N	N	N	Y	N	N	N	Y
$N$	112844	104855	104855	104855	28779	26790	26790	26790
adj. $R^2$	0.011	0.012	-0.008	0.176	0.013	0.015	-0.006	0.170

# Evidence from High-frequency Monetary Shocks

Table 12: Response of Stock Return to Monetary Shocks: Interaction with Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$MP_e \times APS_{j,t-1}$	4.881* (2.704)	5.354** (2.694)	5.391** (2.695)	5.377** (2.695)	5.794** (2.695)	5.362** (2.694)	5.725** (2.699)	5.460** (2.694)	5.200* (2.715)
$MP_e \times FPA_s$	0.486*** (0.116)	0.470*** (0.116)	0.491*** (0.122)	0.469*** (0.116)	0.426*** (0.117)	0.430*** (0.118)	0.443*** (0.118)	0.406*** (0.120)	0.409*** (0.127)
$MP_e \times \text{Share of AI}$	10.855** (4.608)								13.588*** (4.702)
$MP_e \times \text{Share of Pricing}$		-2.934 (2.108)							-2.762 (2.113)
$MP_e \times \text{Log Sales}$			-0.040 (0.083)						0.039 (0.107)
$MP_e \times \text{Log Age}$				-0.133 (0.170)					-0.159 (0.182)
$MP_e \times \text{Log TFP}$					-0.628*** (0.164)				-0.690*** (0.251)
$MP_e \times \text{Log Tobin's Q}$						-0.598** (0.253)			-0.239 (0.311)
$MP_e \times \text{Cash/Asset}$							-1.351* (0.775)		-0.889 (1.016)
$MP_e \times \text{Log Markup}$								-0.556** (0.235)	0.262 (0.345)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Event FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	24432	24432	24432	24432	24432	24432	24432	24432	24432
adj. $R^2$	0.175	0.175	0.175	0.175	0.176	0.175	0.175	0.175	0.176

Increase APS  
from 0 to 10%  
is similar to  
increase FPA by 1 std



## Takeaways

- Firms with more AI pricing are associated with higher growth and markup
- Firms with more AI pricing have larger stock returns upon monetary expansion
  - Just as if the firm is in an industry with more flexible prices
- Magnitude: from non-AI-pricing to Amazon (16%), responses increase by 33%
- Equivalent to an increase in the frequency of price adjustment by two standard deviations!

## Remarks and In-progress

- AI pricing is rising rapidly and is widely adopted in broad industries
- Preliminary results show that it may act as reducing price stickiness in the aggregate
- In-progress: A sticky information model + AI pricing and BLS micro-pricing patterns