Incentives and the Allocation of Authority in Organizations: A Field Experiment with Bureaucrats*

Oriana Bandiera, Michael Carlos Best, Adnan Khan, & Andrea Prat

December 2018

Abstract

Organizations use combinations of explicit performance incentives and rules prescribing behavior to motivate workers. However, monitoring of adherence to rules creates a second set of agents subject to their own agency problems. We provide a formal model of the effectiveness of performance incentives and worker autonomy in improving organizational performance. The model highlights the importance of the relative alignment of frontline workers and their monitors with organizational goals. We implemented a large-scale randomized control trial with the government of Punjab, Pakistan to provide the first experimental evidence on the effects of incentives and autonomy in a bureaucracy. We find that increasing procurement officers' autonomy vis-à-vis their auditors improves prices paid throughout the fiscal year without reducing quality. Performance pay incentives reduce prices early in the year, but increase them at the end of the year when auditors have greater hold-up power, making the average effect of incentives zero. The results suggest auditors are less concerned with saving public money than procurement officers are. The results have important implications for the design of monitoring and anti-corruption policies.

*Bandiera: o.bandiera@lse.ac.uk, Best: michael.best@columbia.edu, Khan: a.q.khan@lse.ac.uk, Prat: andrea.prat@columbia.edu. This experiment was preregistered in the Social Science Registry at `https://www.socialscienceregistry.org/trials/610`. We are grateful to the World Bank, the International Growth Centre, and the JPAL Governance Initiative for financial support. All remaining errors are our own.

Incentives and the Allocation of Authority in Organizations:
A Field Experiment with Bureaucrats

Oriana Bandiera
@orianabandiera
LSE

Michael Carlos Best
@myklebest
Columbia

Adnan Khan
@adnanqk
LSE

Andrea Prat
@andreapratnyc
Columbia

December 2018

Outline

Motivation

Context & Data

Experimental Design

Average Treatment Effects

Theory

Heterogeneous Treatment Effects

Conclusion

Agency Problems: Rules and Incentives

- Agency problems can be addressed by
  1. Incentives that encourage the right behavior
  2. Rules that regulate behavior directly

Agency Problems: Rules and Incentives

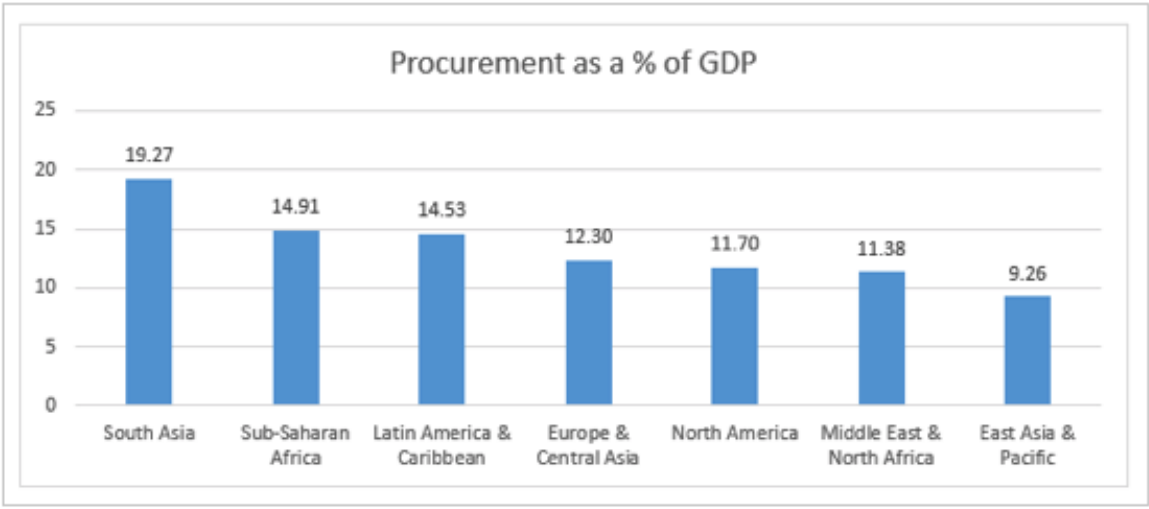
- Agency problems can be addressed by
  1. Incentives that encourage the right behavior
  2. Rules that regulate behavior directly
- Different organizations use different combinations of rules and incentives
- Bureaucracies mostly use rules
- Incentives, if any, are tied to adherence to rules

Public Procurement

- Textbook example of moral hazard:
  Agent buys goods she won't use with money that isn't hers
  - Misalignment of interests $\Rightarrow$ low effort and/or corruption

Public Procurement

- Textbook example of moral hazard:
  Agent buys goods she won't use with money that isn't hers
  - Misalignment of interests $\Rightarrow$ low effort and/or corruption
- Stakes are high



Rules or Incentives in a Bureaucracy?

- Balance depends on the precise nature of the agency problem
- **Rules** that limit the agent's autonomy limit opportunities for corruption *but*
  - Potentially stifle initiative
  - Require another agent to monitor compliance

Rules or Incentives in a Bureaucracy?

- Balance depends on the precise nature of the agency problem
- **Rules** that limit the agent's autonomy limit opportunities for corruption
  but
  - Potentially stifle initiative
  - Require another agent to monitor compliance
- **Performance pay** to implementing agents re-aligns interests
  but
  - Ineffective if agents have no discretion
  - Induce responses by other, unincentivized agents in the organization

This Paper

1. Design and implement method for measuring performance of 600+ procurement officers in charge of procuring generic goods in Punjab, Pakistan

2. Field experiment to generate exogenous variation in *autonomy* and *incentives* faced by procurement officers

3. Theoretical framework

   - Highlights 2 important dimensions of misalignment:

     1. relative alignment of principal with implementing bureaucrat vs supervisor
     2. cooperation between bureaucrat and supervisor

   $\Rightarrow$ Heterogeneity in treatment effects to allow us to recover nature of misalignment

Preview of Findings

1. Experimental results:
   - Autonomy for bureaucrat lowers prices throughout year.
   - Financial incentives don't
   - Autonomy eliminates supervisor-driven seasonality in prices
   - Incentives aggravate it
2. Framework implies:
   - Supervisor misalignment more important,
   - Supervisors and procurement officers don't (perfectly) collude.
3. In this bureaucracy,
   - Performance improved by *increasing* authority of implementing bureaucrat
   - Providing incentives offset by response of monitor.

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- Procurement in Punjab, Pakistan
- Measuring Value for Money

Procurement in Punjab, Pakistan

- Legal authority for public procurement is vested in **Procurement Officers** (POs)
- POs manage **Public Bodies**, allocated budget under different accounting heads (salary, repairs, etc.), including procurement, by the Finance Department
- POs required to submit all expenditures to an independent federal agency - office of the **Accountant General** (AG) - for pre-audit *before* payment can be made.
- AG has offices in each district, responsible for POs in that district

A Typical Procurement Process

1. A demand for an item goes to the PO for approval
2. PO surveys the market for vendors and rates for the items
3. PO receives the goods from the vendors
4. PO sends a request for payment (bill/voucher) to the AG office
5. AG sanctions payment to the vendor or demands more paperwork.

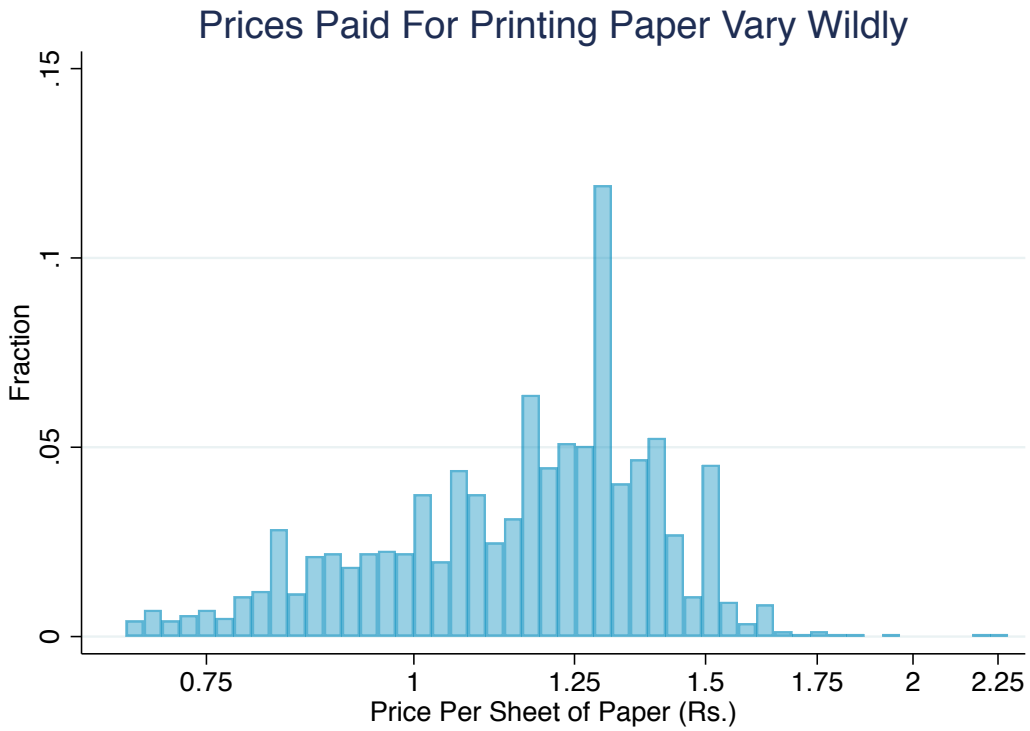
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- Measuring Value for Money

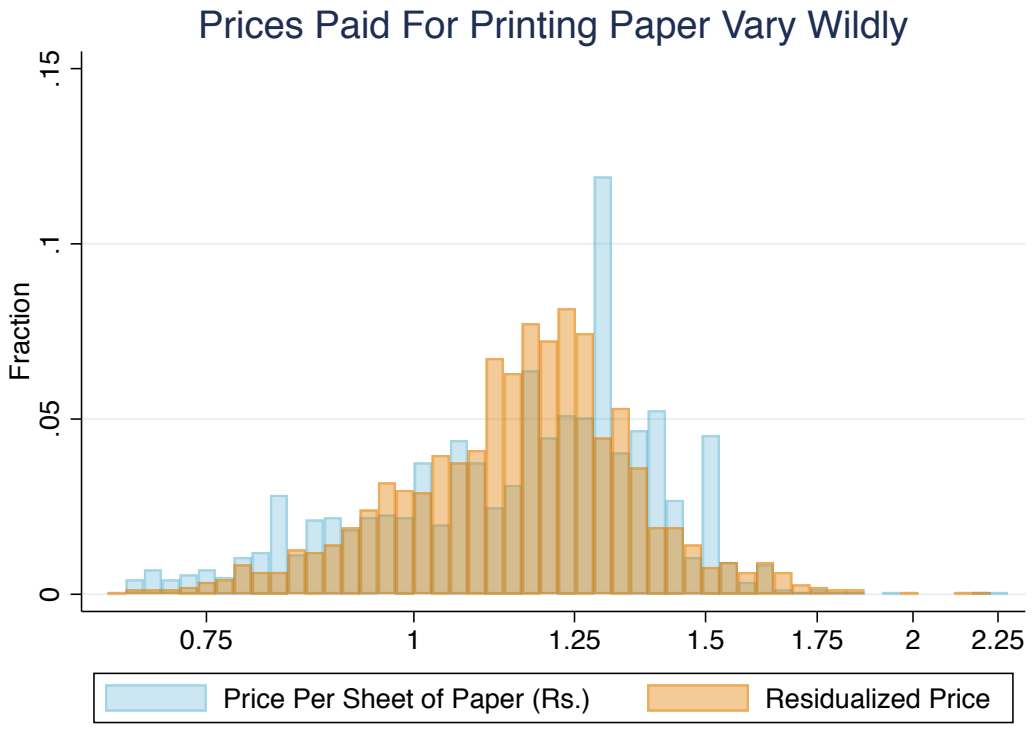
Measuring Value for Money

- We focus on generic (off-the-shelf) goods.
- These account for a large share of government budget
- Bought by many consumers and produced by several suppliers
- Measurable (with some effort!) and comparable performance
- Most are sold in competitive markets, so everybody should pay the same price. And yet. . . .

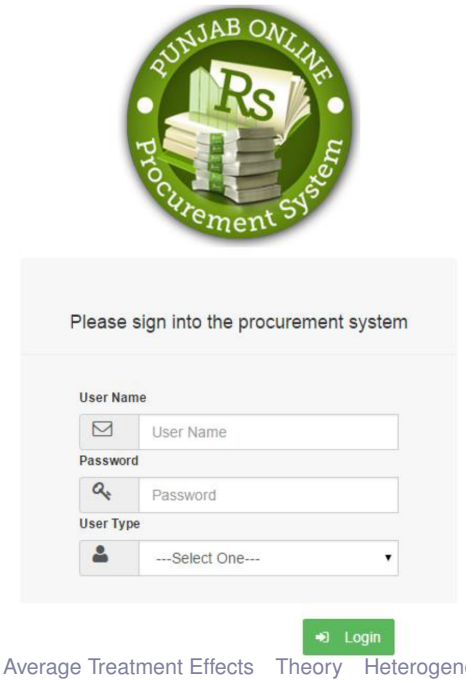
Different POs Pay Very Different Prices for Exactly the Same Good



Different POs Pay Very Different Prices for Exactly the Same Good

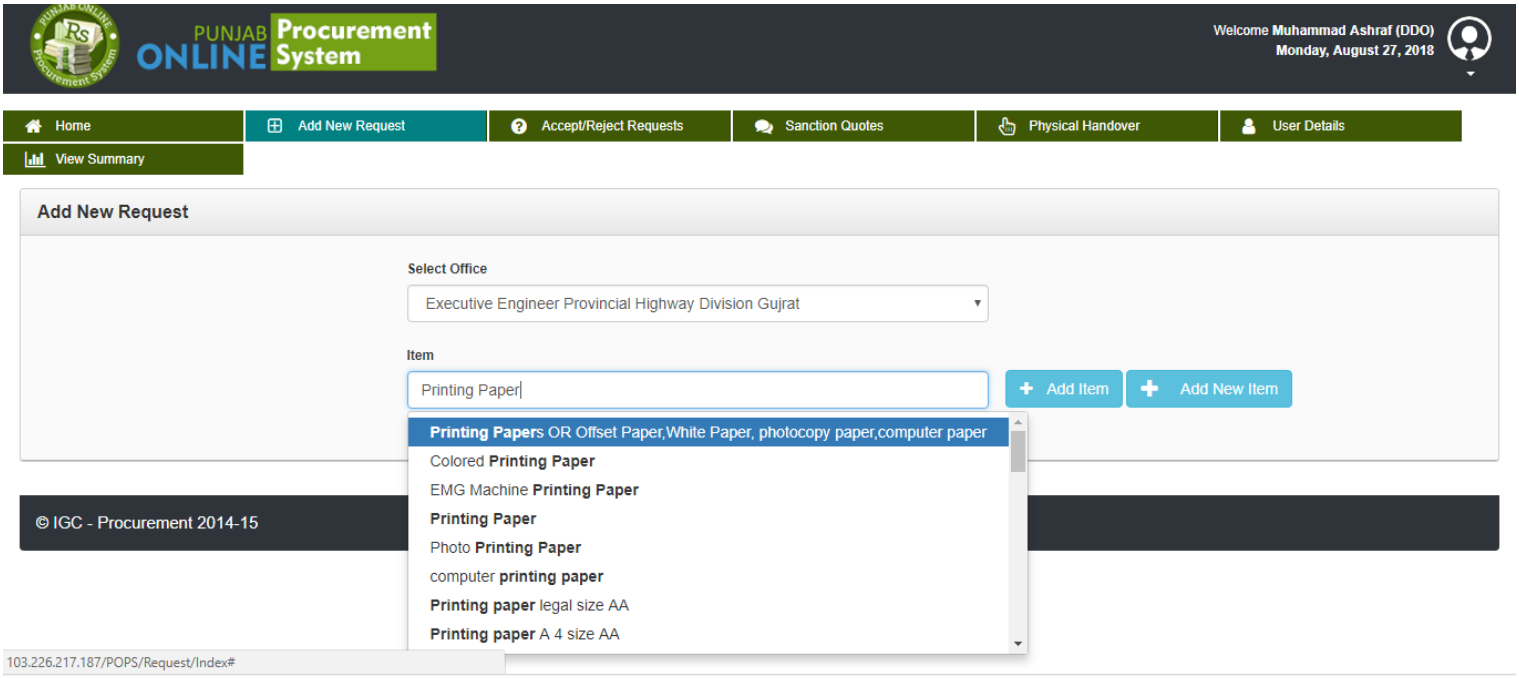


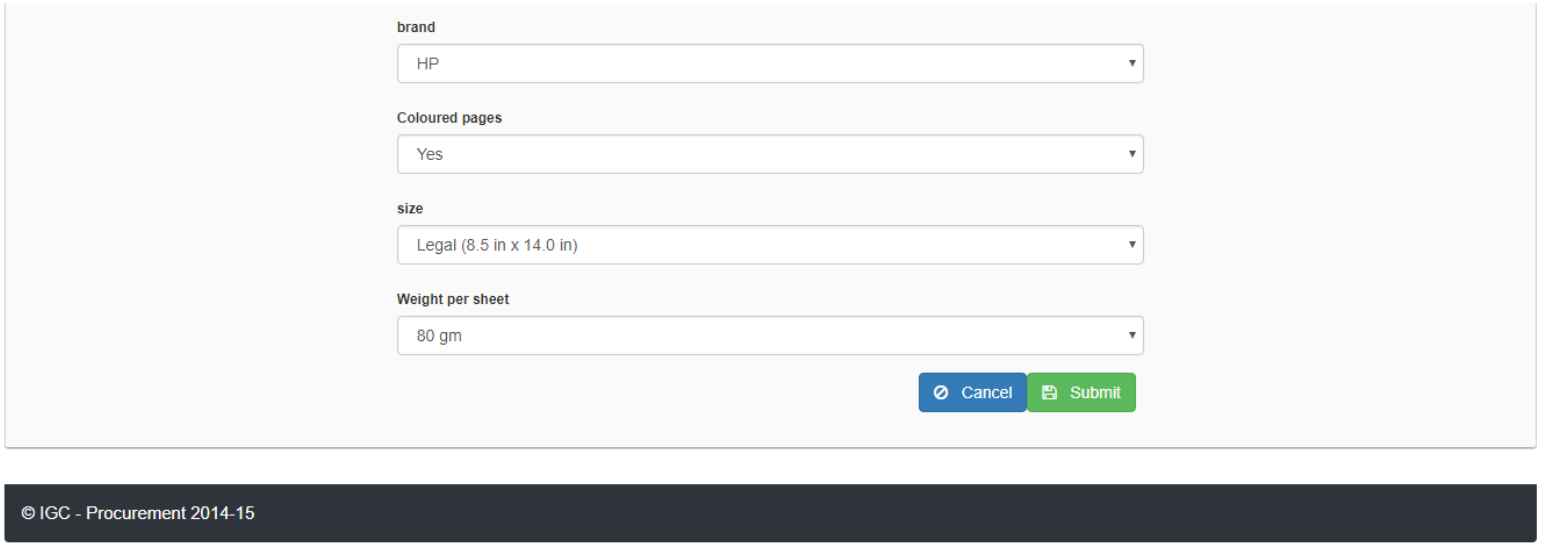
Together with Punjab Procurement Regulatory Authority (PPRA) and Punjab Information Technology Board (PITB), we set up an E-Governance platform: Punjab Online Procurement System (POPS)



POPS Collects Detailed Spending Data

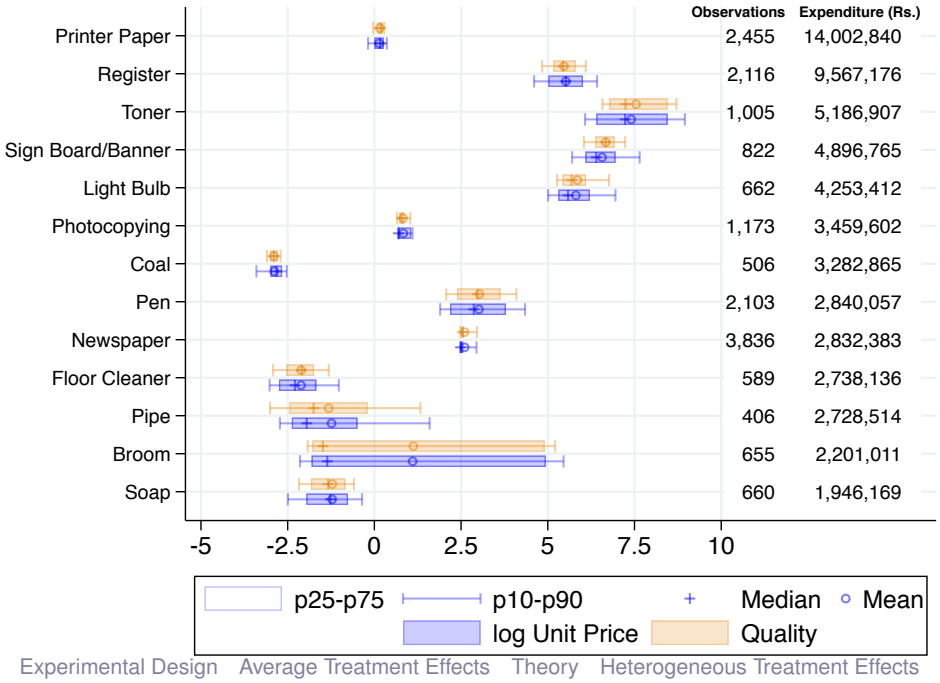
- Through POPS, office staff enter detailed data on what they are buying



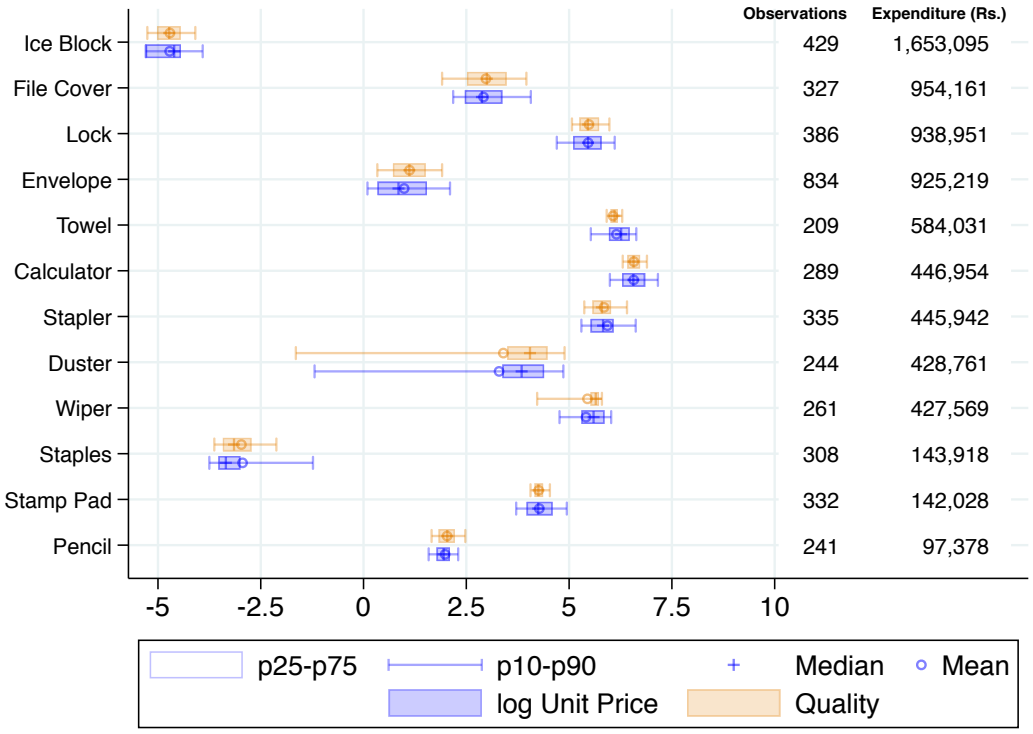

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Coloured pages
Yes
size
Legal (8.5 in x 14.0 in)
Weight per sheet
80 gm
Cancel
Submit
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A Rich Dataset on Public Procurement

- 25 goods, 21,503 purchases.
  Trim top/bottom 1% unit prices for each good $\rightarrow$ 21,183 obs



A Rich Dataset on Public Procurement



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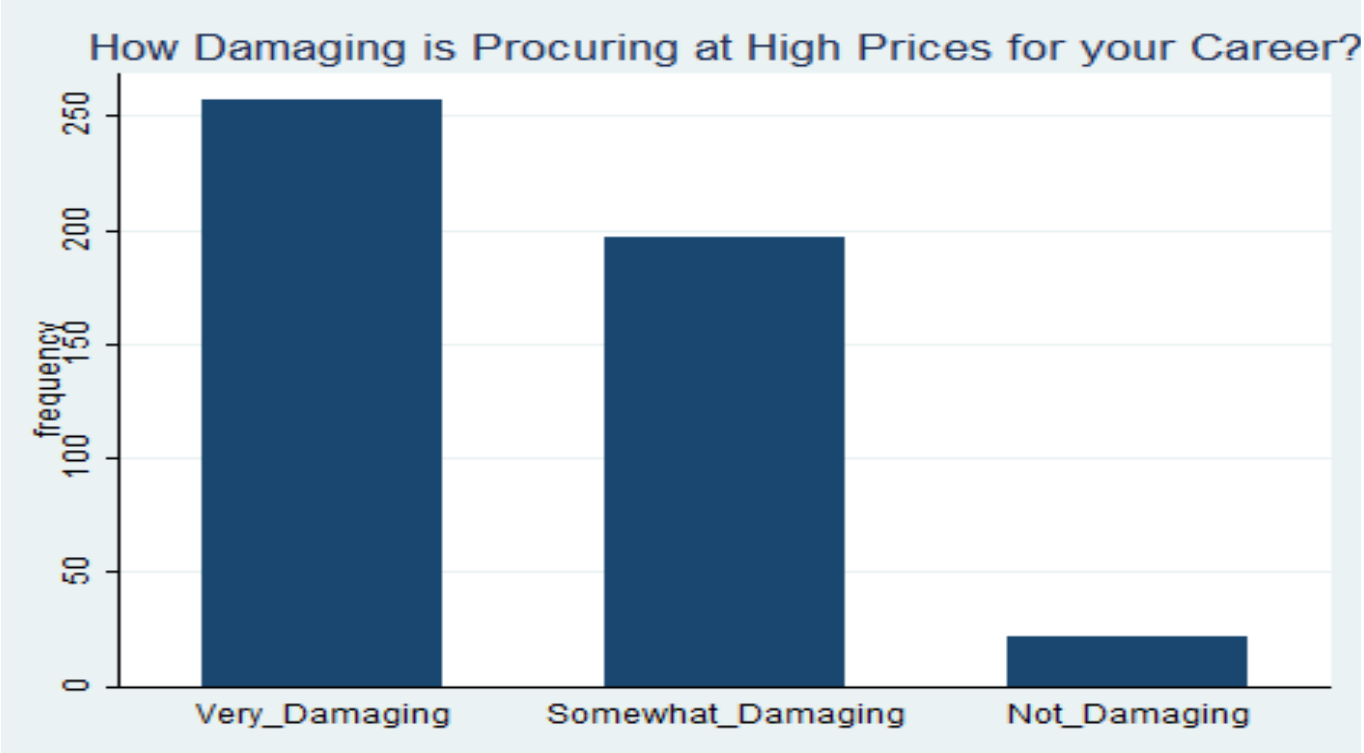
Heterogeneous Treatment Effects

Conclusion

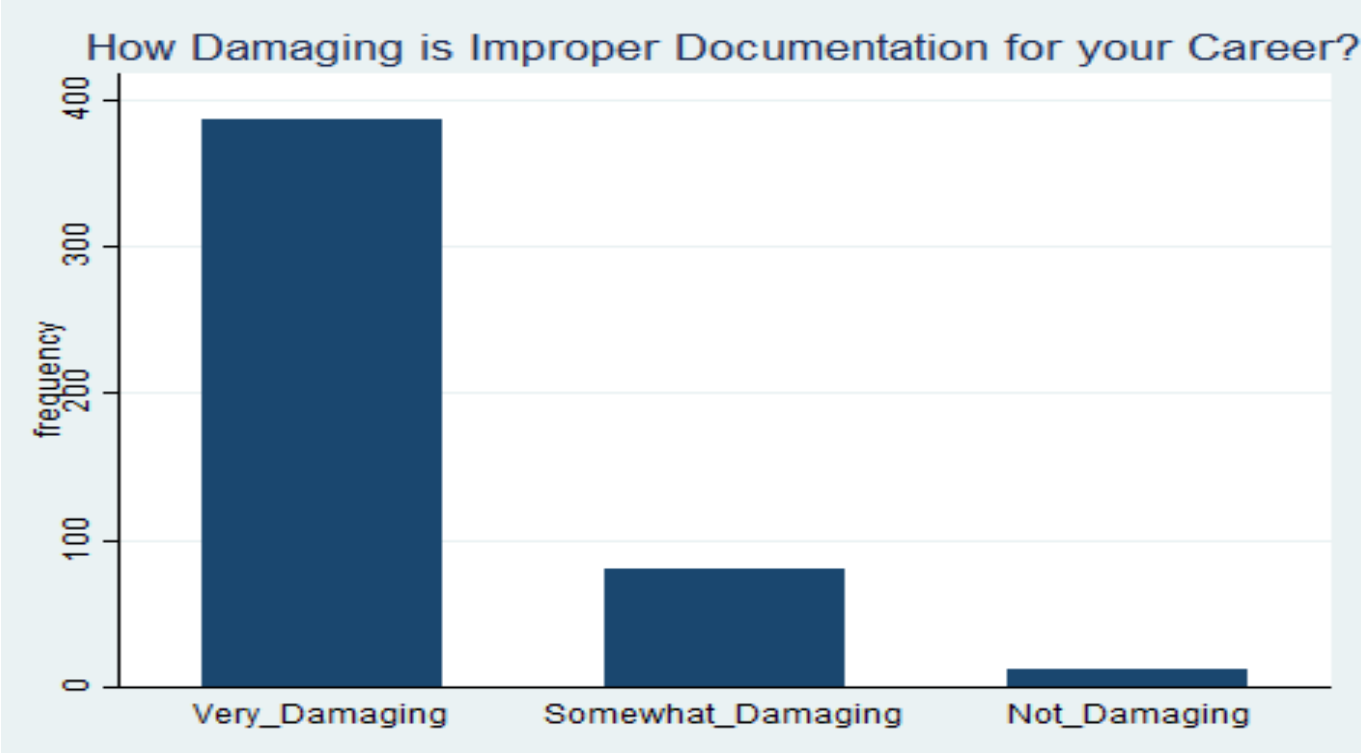
Subjects

- 688 Procurement Officers in charge of procurement of 778 Public Bodies
  - (88% in charge of 1 PB, 10% 2, 2% 3 or more)
  - take-up 85% –> sample contains 587 POs
- 26 Districts (out of 36) - cover over 80% of the population (110million)
- 4 Departments:
  - Agriculture (254 PBs)
  - Higher Education (404 PBs)
  - Health (32 PBs)
  - Communication and Works (60 PBs)

At Baseline Agents Care About Prices...



...But Rules Are Key

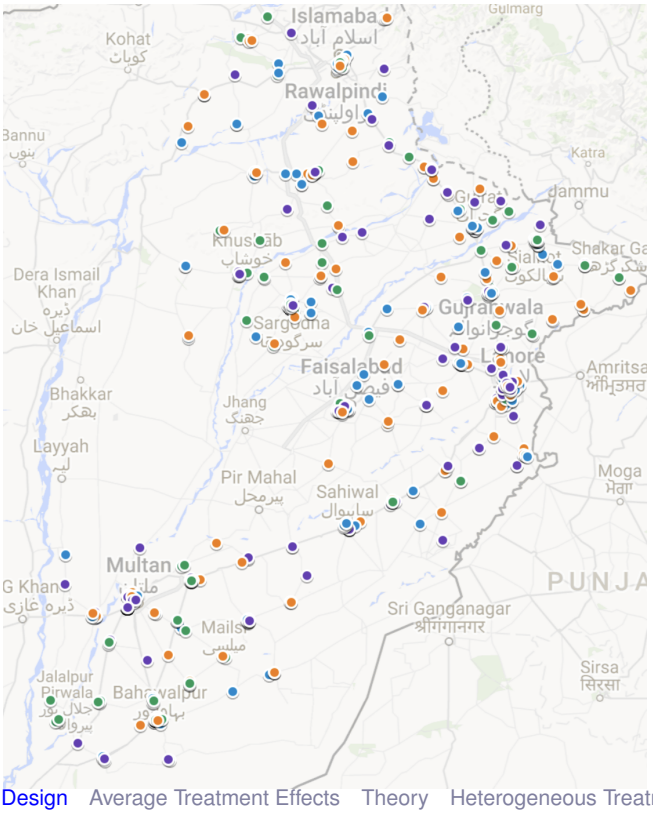


Design

- We assign the POs to 4 equally sized groups

1. Incentives
2. Autonomy
3. Incentives + Autonomy
4. Control

Location


Islamabad
اسلام آباد
Kohat
کوہاٹ
Rawalpindi
راولپنڈی
Gulmarg
Katra
Jammu
Khushab
خوشاب
Dera Ismail Khan
ڈیرہ اسماعیل خان
Sargodha
سرگودھا
Faisalabad
فیصل آباد
Gujranwala
گوجرانوالہ
Lahore
Amritsar
Bhakkar
بھکر
Jhang
جھنگ
Layyah
لیہ
Pir Mahal
پیر محل
Sahiwal
ساہیوال
Moga
Multan
ملتان
Mailsi
میلسی
Sri Ganganagar
Sirsa
Jalalpur Pirwala
جلال پور پیروالا
Bahawalpur
بہاولپور

Office Characteristics

	(1) Incentives		(2) Autonomy		(3) Both		(4) Control		T-test P-value					
Variable	N	Mean/SE	N	Mean/SE	N	Mean/SE	N	Mean/SE	(1)-(2)	(1)-(3)	(1)-(4)	(2)-(3)	(2)-(4)	(3)-(4)
Number of Goods Purchased	148	10.5 (.382)	150	11.9 (.38)	153	10.9 (.389)	136	10.6 (.414)	.00764***	.454	.788	.0574*	.0216**	.65
Number of Purchases	148	35.5 (2.49)	150	40.9 (2.43)	153	35 (1.92)	136	32.6 (1.96)	.12	.865	.37	.0548*	.00907***	.394
Number of Public Bodies	148	1.49 (.0839)	150	1.33 (.0667)	153	1.45 (.0681)	136	1.26 (.0545)	.153	.742	.0303**	.218	.432	.0365**
Agriculture	148	.297 (.0377)	150	.36 (.0393)	153	.327 (.038)	136	.301 (.0395)	.251	.582	.939	.544	.296	.645
Communication and Works	148	.0608 (.0197)	150	.02 (.0115)	153	.0588 (.0191)	136	.0515 (.019)	.0736*	.942	.734	.0837*	.149	.786
Health	148	.0473 (.0175)	150	.0333 (.0147)	153	.0392 (.0157)	136	.0441 (.0177)	.541	.731	.899	.785	.637	.836
Higher Education	148	.595 (.0405)	150	.587 (.0403)	153	.575 (.0401)	136	.603 (.0421)	.89	.733	.887	.84	.78	.633
Total Budget	148	9,271,347 (5,274,235)	150	5,258,172 (1,369,315)	153	7,044,117 (2,332,649)	136	12,481,201 (8,407,425)	.459	.696	.742	.512	.375	.513
Total Expenditure	148	8,840,801 (5,243,519)	150	4,839,366 (1,339,506)	153	6,253,272 (2,118,133)	136	11,868,959 (8,298,088)	.458	.644	.754	.575	.382	.491
Procurement Budget	148	8,437,791 (5,179,918)	150	4,555,726 (1,259,792)	153	6,138,478 (2,105,183)	136	11,427,006 (8,122,342)	.464	.678	.753	.521	.382	.508
Procurement Expenditure	148	8,121,803 (5,162,743)	150	4,180,919 (1,240,081)	153	5,471,008 (1,905,507)	136	10,927,008 (8,045,449)	.456	.626	.766	.572	.386	.488
Share of Budget Spent	145	.873 (.00993)	149	.885 (.00979)	151	.867 (.0104)	136	.857 (.012)	.417	.634	.303	.203	.0763*	.564
Share of Procurement Budget Spent	145	.875 (.00923)	149	.87 (.011)	151	.869 (.00949)	136	.856 (.0121)	.746	.663	.209	.939	.38	.386

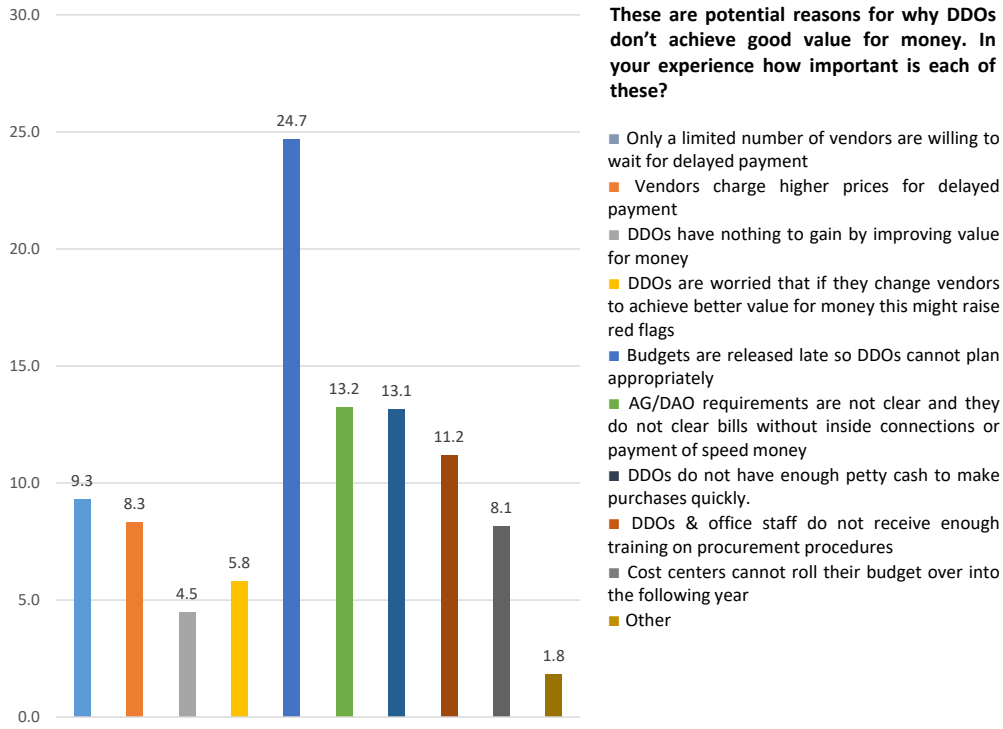
Incentive Treatment: Decrease α

- Twice per year, an independent commission awards 3 prizes

1. "gold": 2 months wages, to the top 7.5%
2. "silver": 1 month wages, to the next 22.5%
3. "bronze": 0.5 month wages, to the next 45%
4. nothing to remaining 25%

- Commissioners: senior private sector auditor & head PPRA (co-chair), representatives of all departments (10 members)
- Data on quality adjusted prices provided by us

Autonomy Treatment?



Autonomy Treatment: Decrease γ

1. “Cash in hand”, Rs 100,000 ($1,000)
2. Budget released in two timely installments instead of four
3. Transparent and predictable audit procedure

- Don’t need AG approval to spend cash in hand
- Greater ability to plan ahead
- PO greater bargaining power when facing AG

Timeline

Year 1: July 2014 – June 2015	
06/14	Cost Centers allocated to treatment arms
07–08/14	Trainings on POPS and treatment brochures
08–09/14	Follow-up trainings on POPS
03–04/15	Baseline Survey
Year 2: July 2015 – June 2016	
07–10/15	Refresher trainings on treatments and POPS
10/15	Cash in Hand rolled out
03–04/16	Midline Survey
04/16	Performance Evaluation Committee Midline Meeting
06/16	Experiment Ends
Post-Experiment	
08-09/16	Endline Survey Part 1 & Missing Data Collection
02/17	Performance Evaluation Committee Endline Meeting
02–03/17	Endline Survey Part 2

Estimation

- We estimate

$$p_{igto} = \alpha + \sum_{k=1}^{3} \eta_k \text{Treatment}_o^k + \beta q_{igto} + \rho_g s_{igto} + \delta_s \text{Department}_o \times \text{District}_o + \gamma_g + \varepsilon_{igto}$$

  - p_{igto} is log unit price,
  - s_{igto} size of purchase,
  - q_{igto} is good quality,
  - δ_s, γ_g stratum, good FEs.
  - Weight by control expenditure shares,
  - cluster ε_{igto} by public body.

Identification

$$p_{igto} = \alpha + \sum_{k=1}^{3} \eta_k \text{Treatment}_o^k + \beta q_{igto} + \rho_g s_{igto} + \delta_s \text{Department}_o \times \text{District}_o + \gamma_g + \varepsilon_{igto}$$

- η_k: causal effect of treatment k on quality-adjusted prices if

1. treatment does not affect control POs e.g. through AG. SUTVA
   - Experimental POs are a small fraction of total POs supervised
2. quality not affected by treatment. bad control
   - no effect on quality, very similar Diff in Diff results
3. q_{igto} adequately captures quality

Measuring Quality

3. q_{igto} adequately captures quality

- Method 1: control for all goods' attributes in price regression (*fine* measure)
- Method 1b: aggregate by "pricing" attributes in control group.

$$p_{igto} = \mathbf{X}_{igto}\lambda_g + \rho_g s_{igto} + \gamma_g + \varepsilon_{igto}$$

s_{igto} is the size of the purchase, $\mathbf{X}_{igto}$ are attributes of the item

  - Use $\hat{\lambda}$s to control for quality $\Rightarrow q_{igto} = \sum_{j \in A(g)} \hat{\lambda_j} X_j$ where $A(g)$ is the set of attributes of good g

- Method 2: control for simpler measure of quality (*coarse* measure)
  - Use attributes with large $\hat{\lambda}$s to classify purchases into "high" or "low" quality
- In progress: Use simple ML tools to a) find optimal coarseness; b) allow more nonlinearity

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Treatment Effects

	No Quality	Detailed Attributes			Simple Quality	
	(1)	(2)	(3)	(4)	(5)	(6)
	Price					
Incentives	-0.028					
	(0.038)					
	[0.498]					
Autonomy	-0.084					
	(0.038)					
	[0.045]					
Both	-0.071					
	(0.041)					
	[0.121]					
Quality						
Item FEs	yes					
Item Attributes	no					
Simple Quality	no					
p(Incentives $\geq$0)	0.498					
p(Autonomy $\geq$0)	0.045					
p(Both $\geq$0)	0.121					
Observations	11,469					

Treatment Effects

	No Quality	Detailed Attributes			Simple Quality	
	(1)	(2)	(3)	(4)	(5)	(6)
	Price			Quality		Quality
Incentives	-0.028			0.016		0.019
	(0.038)			(0.030)		(0.023)
	[0.498]			[0.626]		[0.446]
Autonomy	-0.084			0.029		0.009
	(0.038)			(0.030)		(0.023)
	[0.045]			[0.359]		[0.721]
Both	-0.071			0.055		0.059
	(0.041)			(0.029)		(0.023)
	[0.121]			[0.083]		[0.017]
Quality						
Item FEs	yes			yes		yes
Item Attributes	no					
Simple Quality	no					
p(Incentives $\geq$0)	0.498					
p(Autonomy $\geq$0)	0.045					
p(Both $\geq$0)	0.121					
Observations	11,469			11,469		11,469

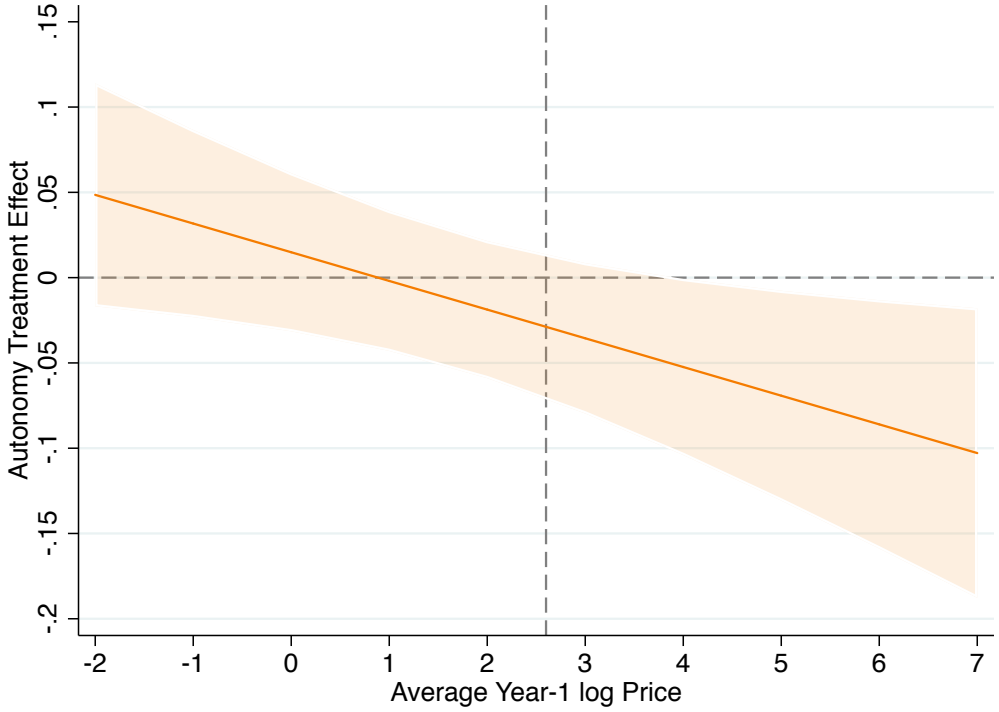
Treatment Effects

	No Quality	Detailed Attributes			Simple Quality	
	(1) Price	(2) Price	(3) Price	(4) Quality	(5) Price	(6) Quality
Incentives	-0.028	-0.031	-0.033	0.016	-0.027	0.019
	(0.038)	(0.031)	(0.032)	(0.030)	(0.035)	(0.023)
	[0.498]	[0.368]	[0.350]	[0.626]	[0.496]	[0.446]
Autonomy	-0.084	-0.087	-0.079	0.029	-0.082	0.009
	(0.038)	(0.032)	(0.031)	(0.030)	(0.034)	(0.023)
	[0.045]	[0.014]	[0.016]	[0.359]	[0.022]	[0.721]
Both	-0.071	-0.081	-0.075	0.055	-0.087	0.059
	(0.041)	(0.033)	(0.034)	(0.029)	(0.039)	(0.023)
	[0.121]	[0.024]	[0.037]	[0.083]	[0.038]	[0.017]
Quality			0.751			
			(0.029)			
Item FEs	yes	yes	yes	yes	yes	yes
Item Attributes	no	yes	no		no	
Simple Quality	no	no	no		yes	
p(Incentives $\geq$0)	0.498	0.368	0.350		0.496	
p(Autonomy $\geq$0)	0.045	0.014	0.016		0.022	
p(Both $\geq$0)	0.121	0.024	0.037		0.038	
Observations	11,469	11,469	11,469	11,469	11,469	11,469

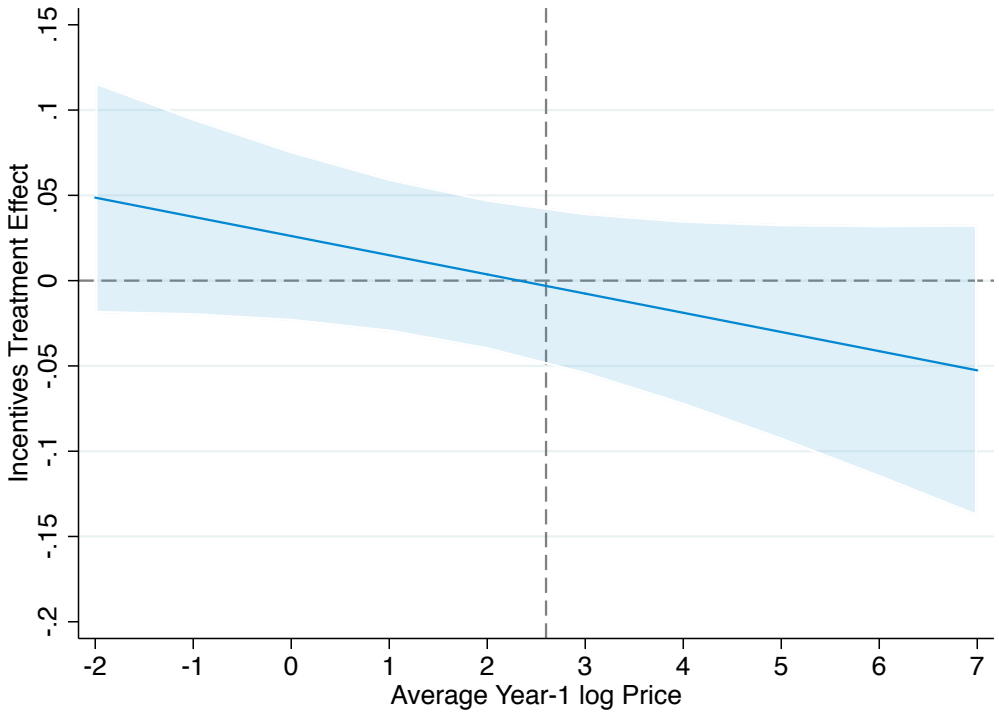
Treatment Effects: Diff in Diff

	No Quality	Detailed Attributes			Simple Quality	
	(1) Price	(2) Price	(3) Price	(4) Quality	(5) Price	(6) Quality
Incentives × Year 2	-0.036	-0.052	-0.048	0.017	-0.040	0.022
	(0.049)	(0.041)	(0.043)	(0.025)	(0.044)	(0.032)
	[0.463]	[0.236]	[0.280]	[0.481]	[0.374]	[0.494]
Autonomy × Year 2	-0.111	-0.117	-0.108	-0.004	-0.116	0.023
	(0.048)	(0.044)	(0.044)	(0.024)	(0.046)	(0.029)
	[0.020]	[0.007]	[0.008]	[0.890]	[0.009]	[0.417]
Both × Year 2	-0.091	-0.111	-0.111	0.028	-0.095	0.051
	(0.051)	(0.043)	(0.044)	(0.028)	(0.047)	(0.033)
	[0.071]	[0.007]	[0.008]	[0.331]	[0.041]	[0.140]
Quality			0.688			
			(0.022)			
Item FEs	yes	yes	yes	yes	yes	yes
Item Attributes	no	yes	no		no	
Simple Quality	no	no	no		yes	
p(Incentives $\geq$0)	0.463	0.236	0.280		0.374	
p(Autonomy $\geq$0)	0.020	0.007	0.008		0.009	
p(Both $\geq$0)	0.071	0.007	0.008		0.041	
Observations	21,183	21,183	21,183	21,183	21,183	21,183

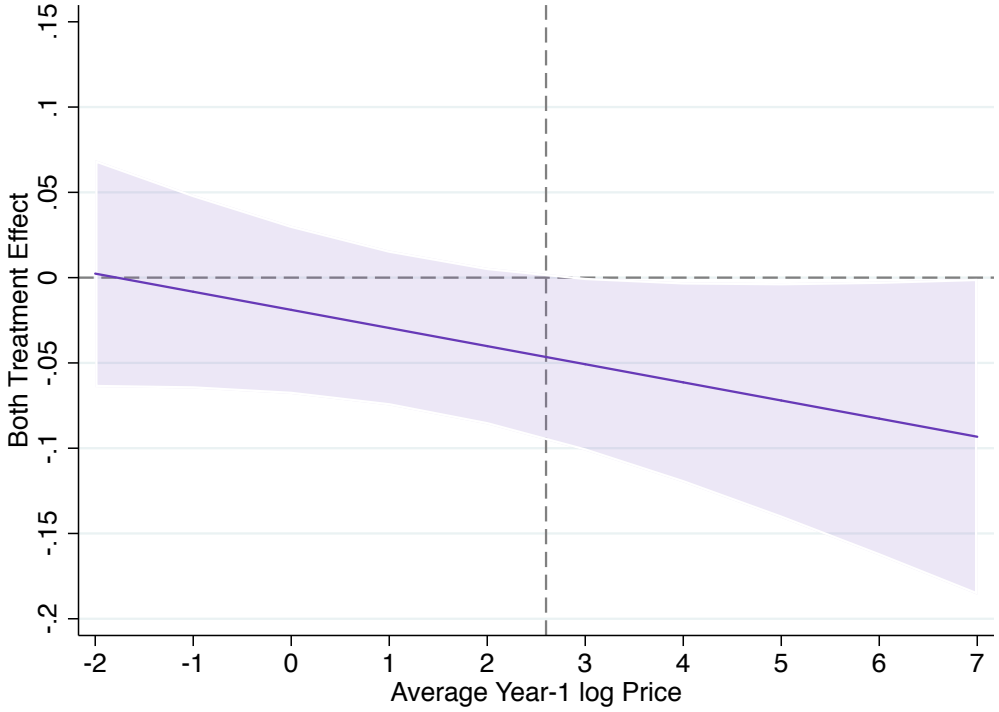
Autonomy Effect Stronger for More Expensive Goods



Incentives Effect Similar Across Prices



Both Effect Stronger for More Expensive Goods



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A Model of Shifting Agency Problems

- Monitoring of rules creates a second set of agents - auditors, inspectors- who are also subject to an agency problem (Shleifer & Vishny 1993; Barron & Olken 2009)
- Solution to downstream agents' problem might exacerbate monitor problem
  - more rules $\rightarrow$ more authority to the monitor $\rightarrow$ can exploit it to personal advantage
  - incentives to downstream agent $\rightarrow$ response by monitor $\rightarrow$ dampen equilibrium price response
- Choice of incentives and the allocation of authority needs to strike a *balance* between the two agency problems

Model Setup

- Procurement purchases are made by an agent and monitored by a supervisor with probability γ
- c = marginal cost and x_a (x_s) = mark-up chosen by the agent (supervisor)
- "Mark-up" captures all sources of interest misalignment: bribes, effort, fastidiousness
- Final price:

$$p = \begin{cases} c + x_a + x_s & \text{if the purchase is audited,} \\ c + x_a & \text{otherwise} \end{cases}$$

- Average price over all purchases:

$$\bar{p} = c + x_a + \gamma x_s$$

Payoffs

- Agent's payoff:

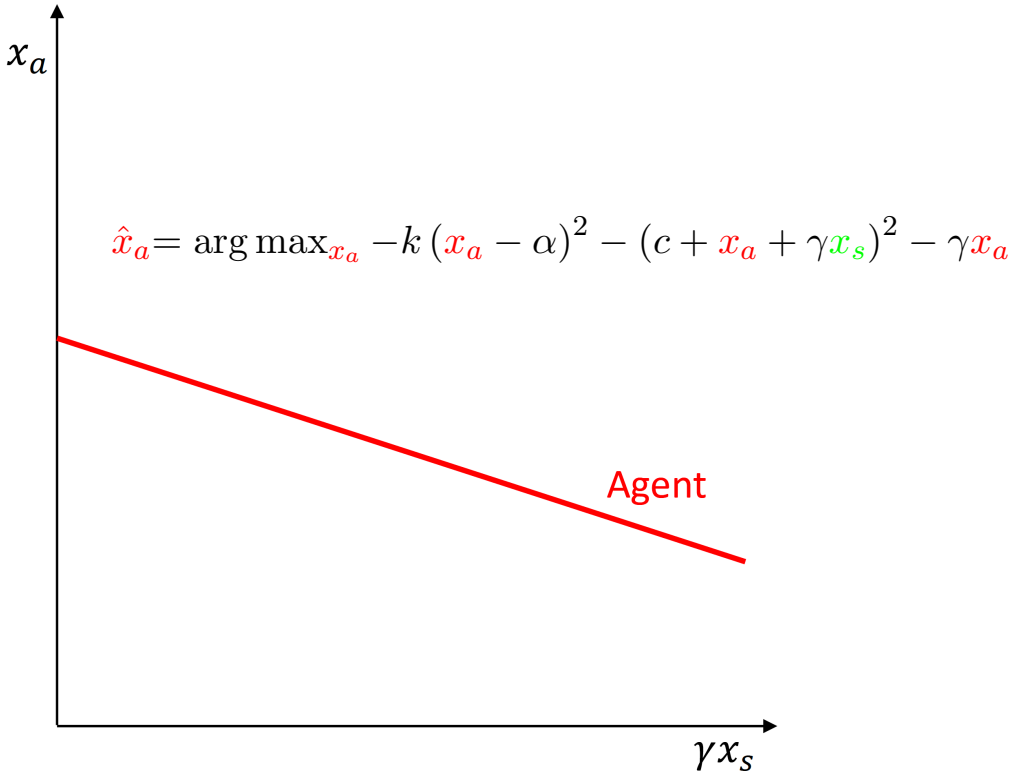
$$V_a = -k\left(x_a - \alpha\right)^2 - \bar{p}^2 - \gamma x_a$$

- Supervisor's payoff:

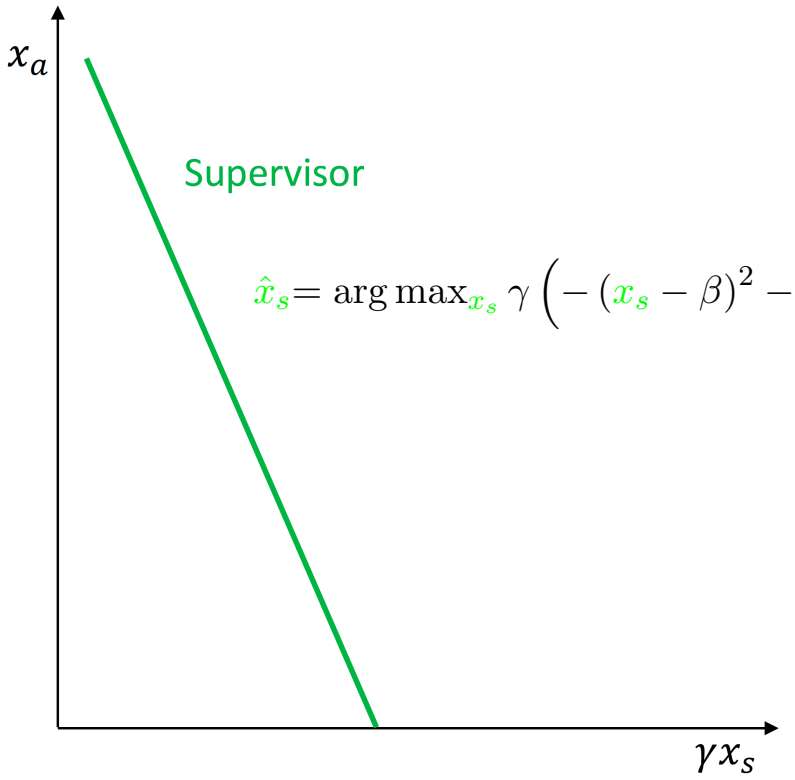
$$V_s = \gamma\left(-k\left(x_s - \beta\right) - \bar{p}^2\right)$$

- Key Parameters:
  1. α: Agent's misalignment ("dishonesty")
  2. β: Supervisor's misalignment ("dishonesty")
  3. γ: Supervisor's power (– agent's autonomy)
- Players move simultaneously (non-cooperatively now, cooperatively later)

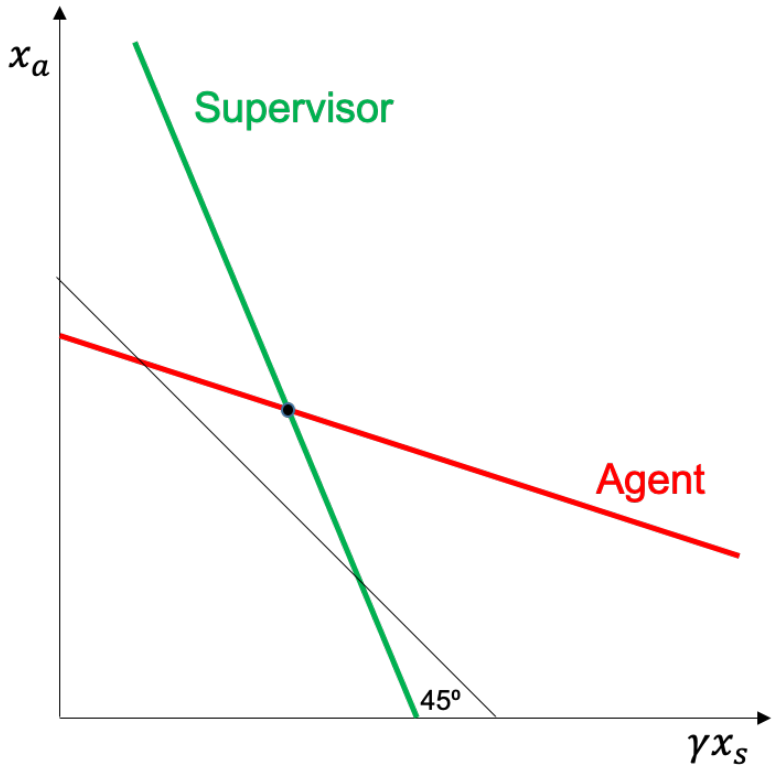
Agent's Reaction Function



Supervisor's Reaction Function



Equilibrium Markups



Autonomy Treatment: Decrease in γ

Proposition

A decrease in supervisory power γ
decreases average price $\bar{p}$ *if and only if the supervisor is sufficiently misaligned*
$\left(\beta > \bar{\beta} > 0\right)$

Autonomy Treatment: Decrease in γ

Proposition

A decrease in supervisory power γ decreases average price $\bar{p}$ if and only if the supervisor is sufficiently misaligned $\left(\beta > \bar{\beta} > 0\right)$

Decreasing γ has 2 effects:

1. Agent less supervised $\rightarrow$ increases markup x_a
2. Supervisor has less chance to impose her own markup x_s

Incentive Treatment: Decrease in α

Proposition

A decrease in the agent's misalignment α causes the average price weakly to go down. The size of the reduction depends on k (and it can be arbitrarily close to zero)

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A decrease in the agent's misalignment α causes the average price weakly to go down. The size of the reduction depends on k (and it can be arbitrarily close to zero)

Decreasing α has 2 effects:

1. Agent less misaligned $\rightarrow$ decreases markup x_a
2. Supervisor increases markup x_s

- net effect is $\frac{d\bar{p}}{d\alpha} = \frac{k}{\gamma^2+k+1} > 0$ but vanishes as $k \rightarrow 0$

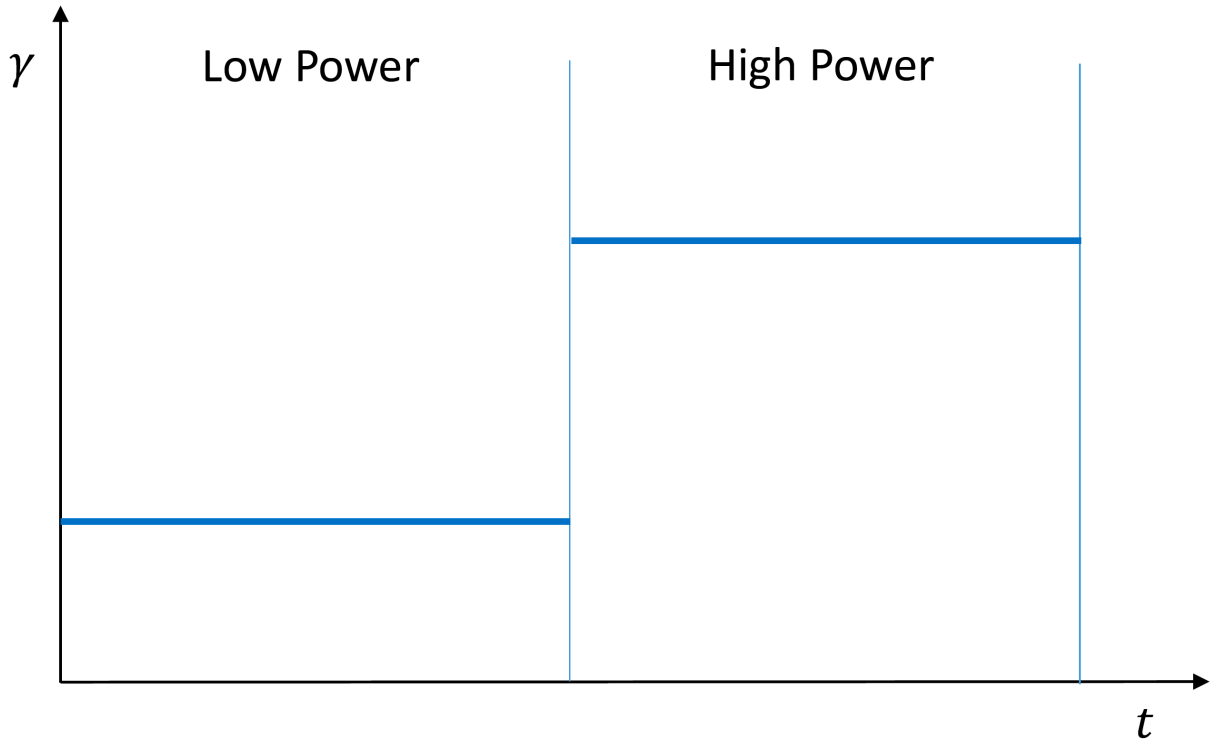
Cooperative Case

- Players have commitment power and can transfer money to each other (or are in a cooperative equilibrium of a repeated game)
- Total surplus $V_a + V_s$ is maximized
- Predictions
  1. The autonomy treatment has an ambiguous effect. Depends on supervisor's relative alignment, similar to in the noncooperative case
  2. The incentive treatment always reduces prices

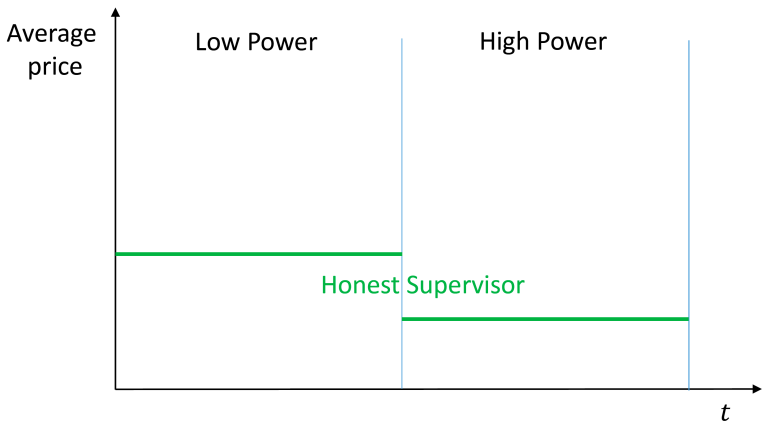
Summarizing

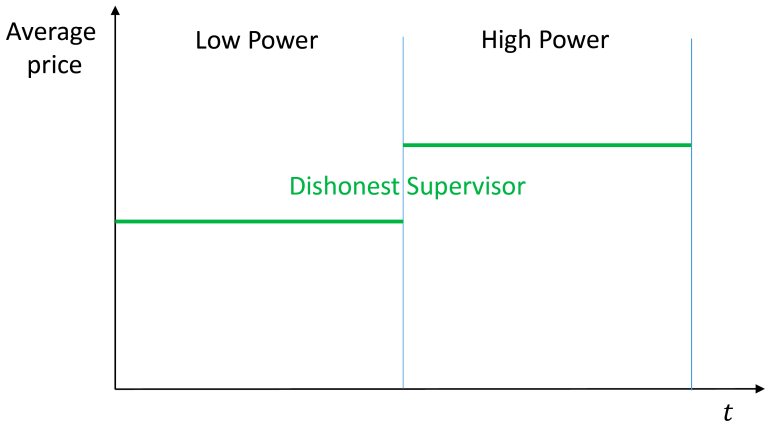
- Cooperative and non-cooperative models make same prediction for autonomy treatment
  - $\Rightarrow$ Autonomy Average treatment effect allows us to discern whether supervisor of agent misalignment more important
  - $\Rightarrow$ Predicts larger treatment effects of autonomy when supervisor more misaligned
- Model also makes predictions about price dynamics that allow us to test between cooperative and non-cooperative model using variation in supervisors' power at the end of the fiscal year

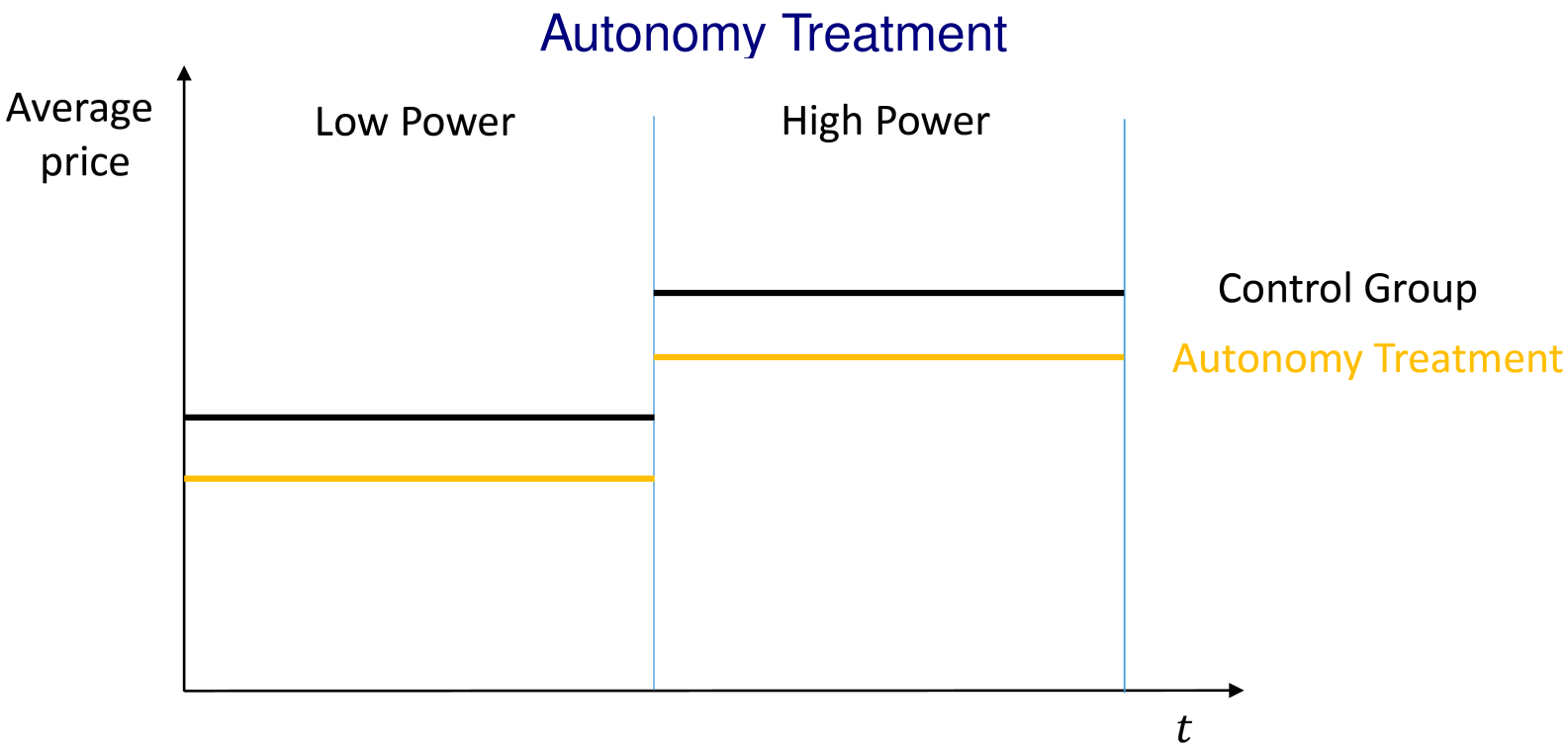
Time Variation in Supervisor Power



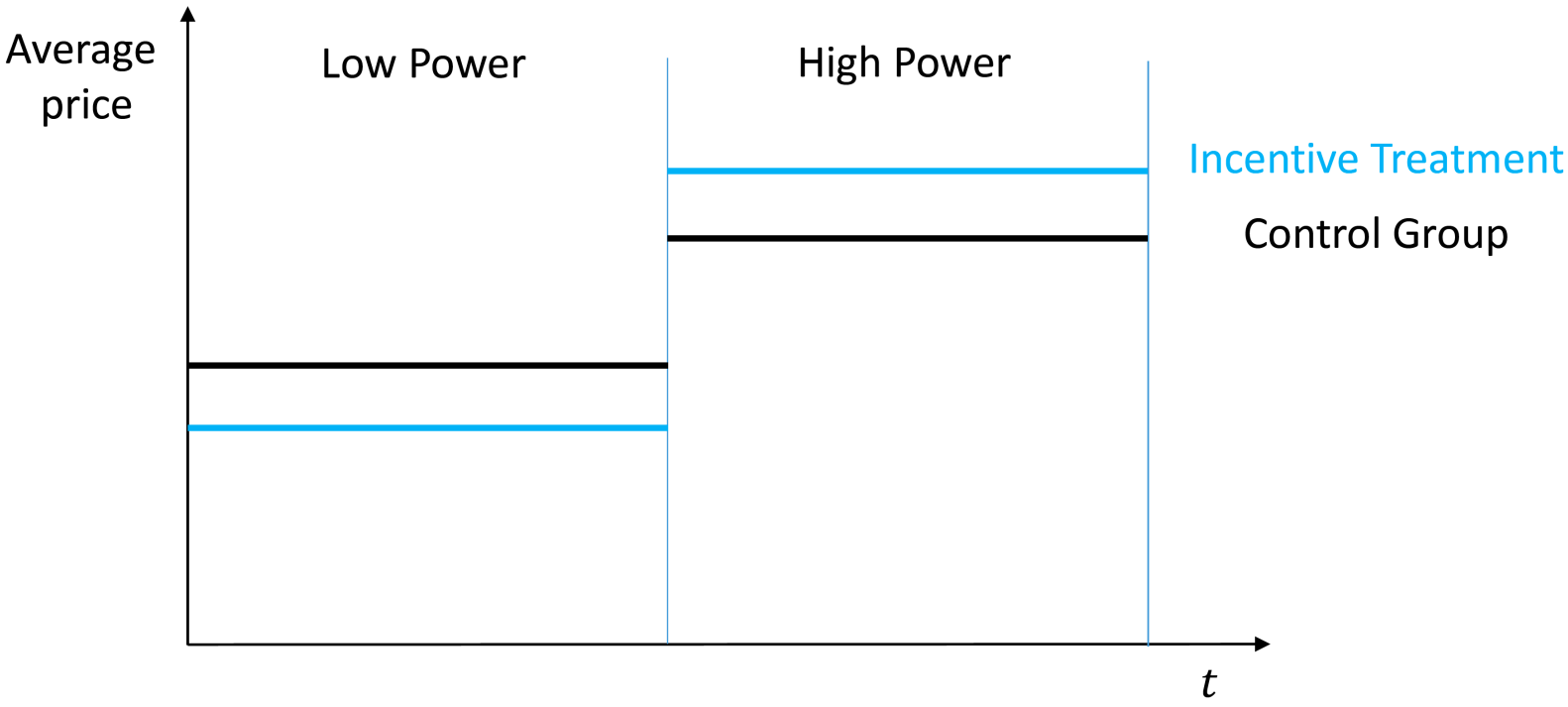
Time Variation in Supervisor Power






Autonomy Treatment
Average price
Low Power
High Power
Control Group
Autonomy Treatment
t

Incentives Treatment



Predicted Dynamic Treatment Effects

- Non-cooperative case:
  - Autonomy treatment effect is constant
  - Incentives treatment effect reduces prices early on and increases them at the end of the fiscal year

Predicted Dynamic Treatment Effects

- Non-cooperative case:
  - Autonomy treatment effect is constant
  - Incentives treatment effect reduces prices early on and increases them at the end of the fiscal year
- Cooperative case:
  - Because utility is concave, players will choose constant prices over the whole period
  - Treatments may change prices but not have dynamic effects
  - Predicted (constant) treatment effects as in static model

Outline

Motivation

Context & Data

Experimental Design

Average Treatment Effects

Theory

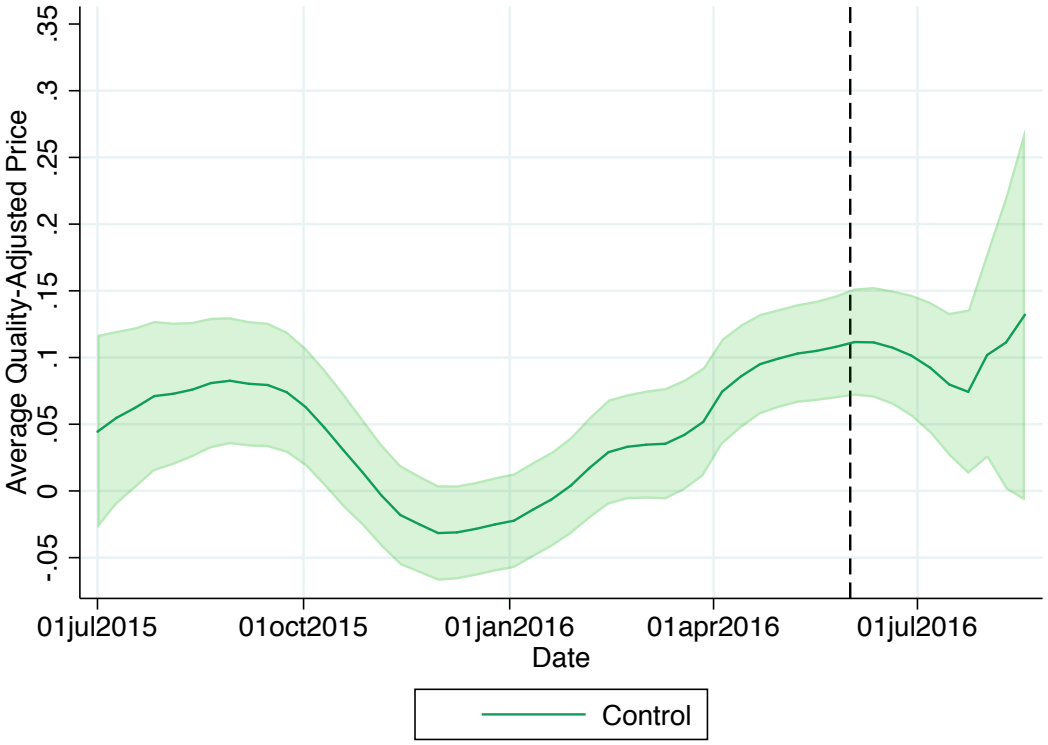
Heterogeneous Treatment Effects

Conclusion

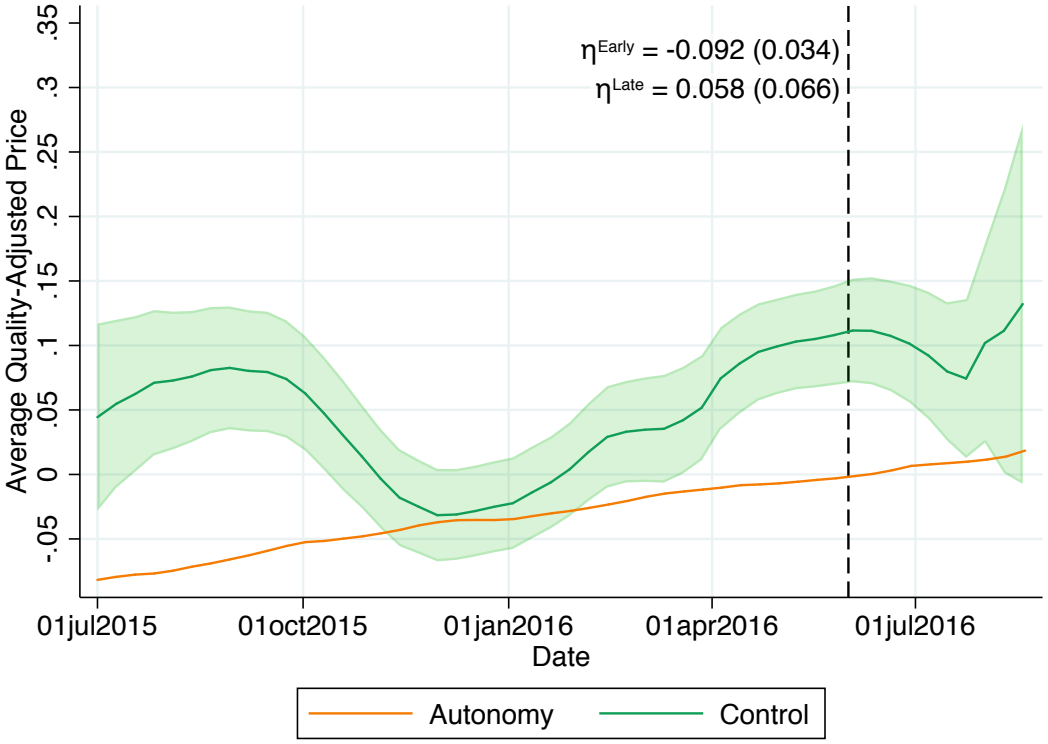
Outline

Heterogeneous Treatment Effects
Dynamic Treatment Effects
Supervisor Dishonesty

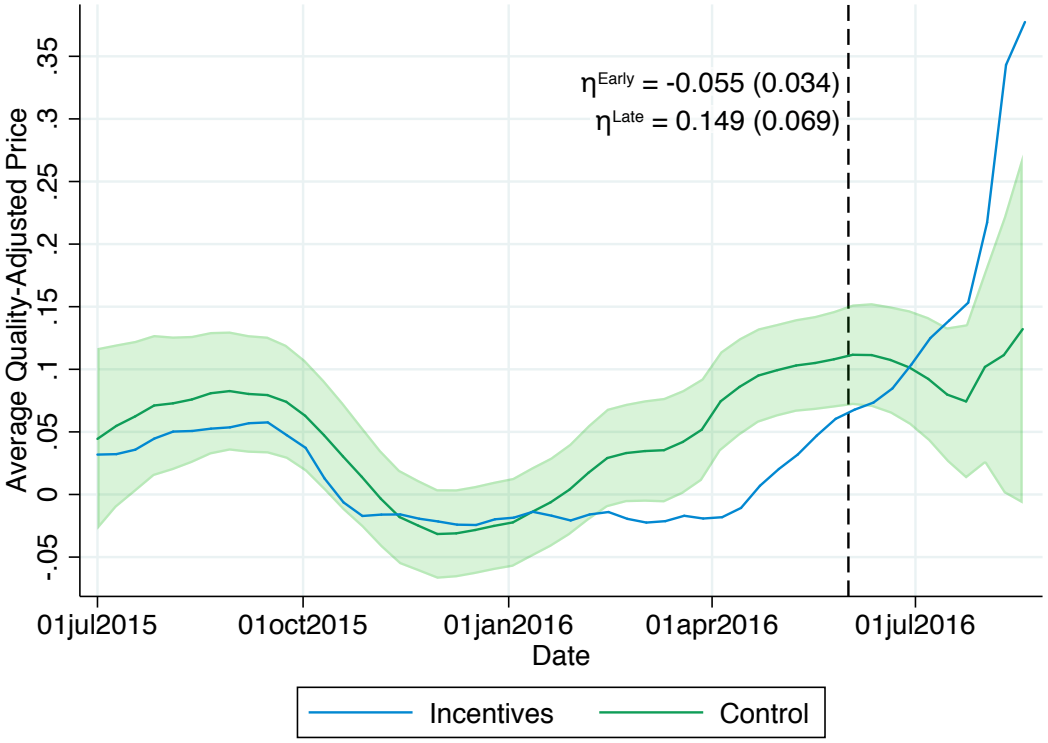
Time Trend of Prices in the Control Group



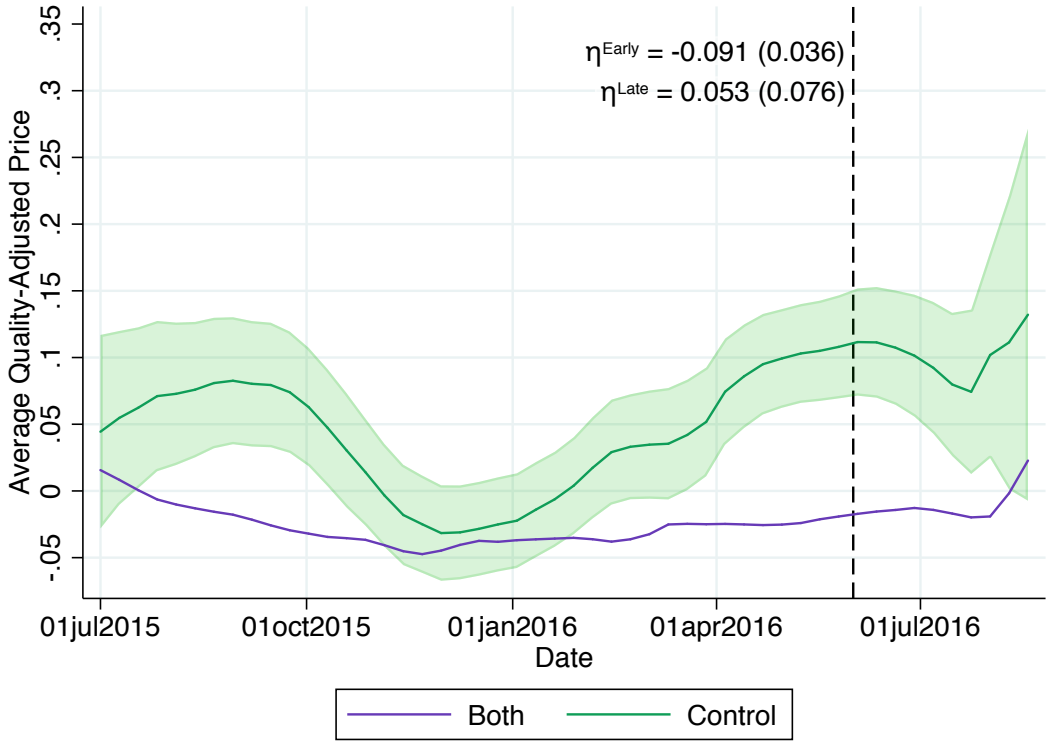
FYE TE: Autonomy Lowers Prices Throughout



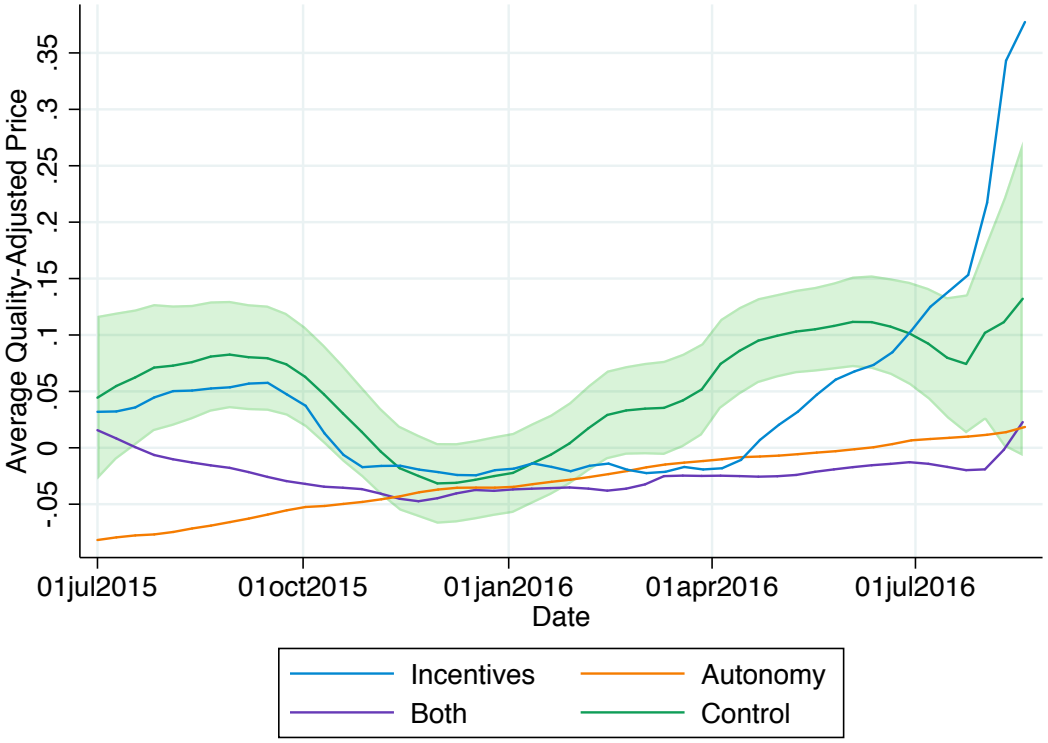
FYE TE: Incentives Lower and then Raise



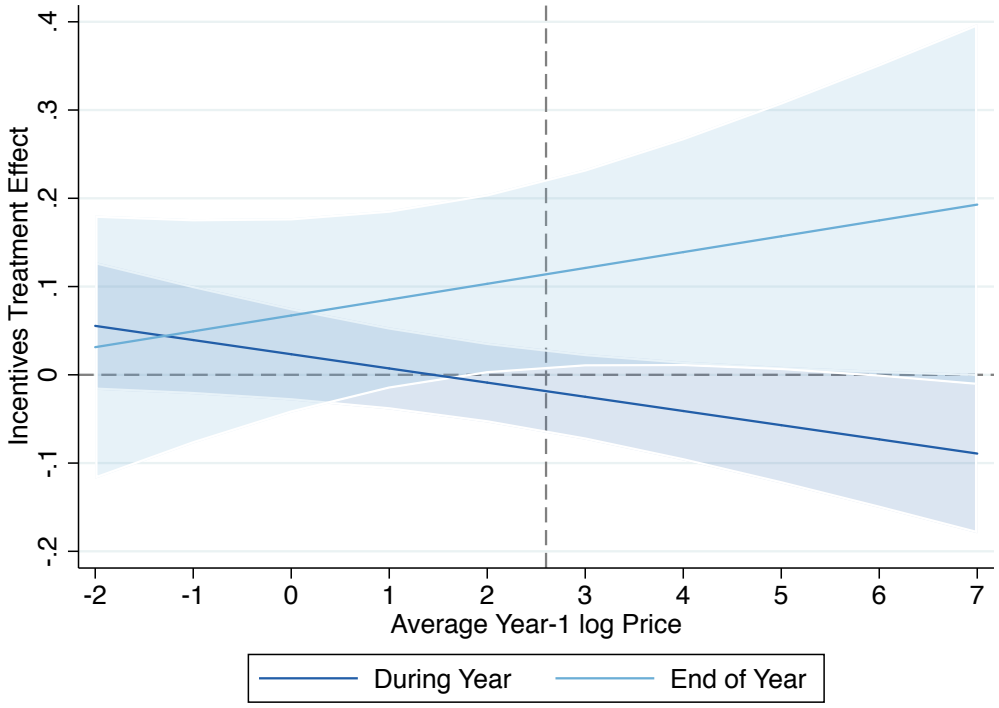
FYE TE: Effect of Combination Looks Like Autonomy



FYE TEs: All


Average Quality-Adjusted Price
-.05
0
.05
.1
.15
.2
.25
.3
.35
01jul2015
01oct2015
01jan2016
01apr2016
01jul2016
Date
Incentives
Autonomy
Both
Control

Incentives End of Year Effect Driven By Expensive Goods



	(1)	
Incentives	-0.063	(0.034)
		[0.101]
Autonomy	-0.090	(0.034)
		[0.023]
Both	-0.087	(0.036)
		[0.028]
Incentives × End of Year	0.155	(0.067)
		[0.038]
Autonomy × End of Year	0.043	(0.065)
		[0.531]
Both × End of Year	0.074	(0.075)
		[0.378]
Incentives × Quality		
Autonomy × Quality		
Both × Quality		
Incentives × Quality × EOY		
Autonomy × Quality × EOY		
Both × Quality × EOY		
Interaction Variable	End of Year	
p(Incentives Interaction $\geq$0)	0.989	
p(Autonomy Interaction $\geq$0)	0.745	
p(Both Interaction $\geq$0)	0.837	
Observations	11053	

	(1)		(2)		(3)	
Incentives	-0.063	(0.034)	-0.011	(0.027)	0.010	(0.025)
		[0.101]		[0.640]		[0.719]
Autonomy	-0.090	(0.034)	0.005	(0.025)	0.018	(0.025)
		[0.023]		[0.829]		[0.477]
Both	-0.087	(0.036)	-0.024	(0.027)	-0.012	(0.025)
		[0.028]		[0.350]		[0.625]
Incentives × End of Year	0.155	(0.067)	0.144	(0.067)	0.025	(0.047)
		[0.038]		[0.049]		[0.597]
Autonomy × End of Year	0.043	(0.065)	0.037	(0.063)	-0.051	(0.052)
		[0.531]		[0.584]		[0.290]
Both × End of Year	0.074	(0.075)	0.069	(0.076)	-0.013	(0.048)
		[0.378]		[0.407]		[0.784]
Incentives × Quality			-0.016	(0.008)	-0.022	(0.009)
				[0.082]		[0.027]
Autonomy × Quality			-0.030	(0.008)	-0.034	(0.009)
				[0.003]		[0.001]
Both × Quality			-0.020	(0.009)	-0.024	(0.009)
				[0.030]		[0.018]
Incentives × Quality × EOY					0.040	(0.019)
						[0.065]
Autonomy × Quality × EOY					0.029	(0.018)
						[0.144]
Both × Quality × EOY					0.026	(0.023)
						[0.296]
Interaction Variable	End of Year		Quality		Quality × EOY	
p(Incentives Interaction ≥0)	0.989		0.028		0.983	
p(Autonomy Interaction ≥0)	0.745		0.000		0.943	
p(Both Interaction ≥0)	0.837		0.010		0.872	
Observations	11053		11053		11053	

Outline

Heterogeneous Treatment Effects
- Dynamic Treatment Effects
- Supervisor Dishonesty

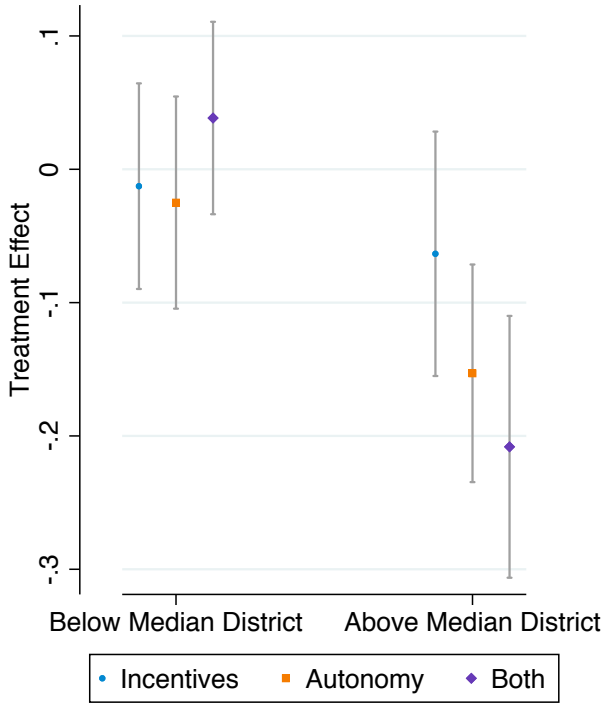
Proxying for AG type

- We do not observe AG type β directly.
- But different AG in each district means we can use district-level proxies:
  1. Average district prices in (untreated) Year 1
  2. End of year spike in prices in Year 1

Proxying for AG type

- We do not observe AG type β directly.
- But different AG in each district means we can use district-level proxies:
  1. Average district prices in (untreated) Year 1
  2. End of year spike in prices in Year 1
- Theory predicts that when β is higher
  - Autonomy should lead to a larger reduction in prices throughout the year
  - Incentives lead to a larger FYE effect

Heterogeneity by AG type



	(1)	
Incentives	-0.029	(0.039)
		[0.516]
Autonomy	-0.046	(0.037)
		[0.281]
Both	-0.033	(0.041)
		[0.454]
Incentives × Year 1 Spike	-0.059	(0.072)
		[0.460]
Autonomy × Year 1 Spike	-0.113	(0.079)
		[0.217]
Both × Year 1 Spike	-0.166	(0.077)
		[0.052]
Incentives × EOY		
Autonomy × EOY		
Both × EOY		
Incentives × Spike × EOY		
Autonomy × Spike × EOY		
Both × Spike × EOY		
AG Type Proxy	1{Jun=Max P}	
Interaction Variable	1{Jun=Max P}	
p(Incentives Interaction $\geq$0)	0.208	
p(Autonomy Interaction $\geq$0)	0.077	
p(Both Interaction $\geq$0)	0.016	
Observations	9515	

	(1)		(2)		(3)	
Incentives	-0.029	(0.039)	-0.049	(0.040)	-0.042	(0.041)
		[0.516]		[0.269]		[0.344]
Autonomy	-0.046	(0.037)	-0.051	(0.038)	-0.050	(0.039)
		[0.281]		[0.238]		[0.250]
Both	-0.033	(0.041)	-0.036	(0.042)	-0.039	(0.042)
		[0.454]		[0.435]		[0.393]
Incentives × Year 1 Spike	-0.059	(0.072)	-0.048	(0.072)	-0.073	(0.074)
		[0.460]		[0.536]		[0.380]
Autonomy × Year 1 Spike	-0.113	(0.079)	-0.114	(0.079)	-0.117	(0.083)
		[0.217]		[0.214]		[0.230]
Both × Year 1 Spike	-0.166	(0.077)	-0.165	(0.077)	-0.155	(0.080)
		[0.052]		[0.056]		[0.091]
Incentives × EOY			0.122	(0.067)	0.082	(0.074)
				[0.166]		[0.364]
Autonomy × EOY			0.045	(0.046)	0.041	(0.056)
				[0.459]		[0.585]
Both × EOY			0.011	(0.075)	0.038	(0.074)
				[0.898]		[0.657]
Incentives × Spike × EOY					0.299	(0.123)
						[0.028]
Autonomy × Spike × EOY					0.016	(0.086)
						[0.848]
Both × Spike × EOY					-0.101	(0.203)
						[0.671]
AG Type Proxy	1{Jun=Max P}		1{Jun=Max P}		1{Jun=Max P}	
Interaction Variable	1{Jun=Max P}		1{Jun=Max P}		1{Jun=Max} × EOY	
p(Incentives Interaction ≥0)	0.208		0.252		0.992	
p(Autonomy Interaction ≥0)	0.077		0.074		0.576	
p(Both Interaction ≥0)	0.016		0.017		0.310	
Observations	9515		9515		9515	

Outline

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Conclusion

- Organizations often use rules and monitoring to deal with agency issues
  - Creates two sets of agents: implementing agents and monitoring agents.
  - Rules allocate authority between the two agents
  - Incentives to one agent offset by response of the other agent

Conclusion

- Organizations often use rules and monitoring to deal with agency issues
  - Creates two sets of agents: implementing agents and monitoring agents.
  - Rules allocate authority between the two agents
  - Incentives to one agent offset by response of the other agent
- Experimental results from procurement bureaucrats in Punjab, Pakistan show
  - Incentives to implementing agents largely offset by response of monitors
    - no effect on prices on average
    - improvements in early part of year offset by much worse outcomes at end of year
  - Shifting authority to implementing agents improves outcomes
    - prices go down on average
    - monitor-driven seasonality reduced

Conclusion

- We develop a theoretical framework to show how tradeoff between rules and incentives depends on
  - Misalignment: Is implementing or monitoring agent more aligned with principal?
  - Nature of interactions: Do agents act cooperatively or non-cooperatively?
- Theory shows how we can use responses to changes in autonomy and incentives to back out nature of agency problem.

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- In our setting: bureaucratic performance improved by shifting authority to implementing agents. Little autonomy to respond to incentives.

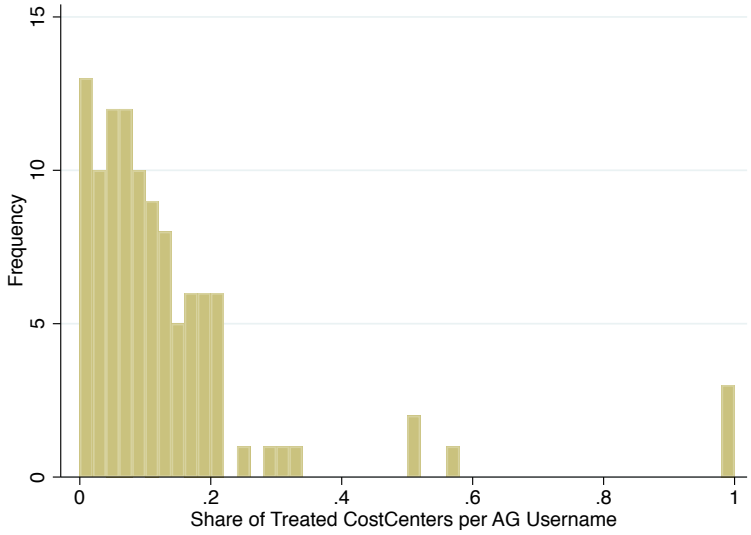
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- Theory shows how we can use responses to changes in autonomy and incentives to back out nature of agency problem.
- In our setting: bureaucratic performance improved by shifting authority to implementing agents. Little autonomy to respond to incentives.
- In general: Allocation of authority and incentives to different sets of agents hinges on precise nature of agency problems. Provide diagnostic tool

Appendix Slides

SUTVA

1. treatment does not affect control POs e.g. through AG (sutva)
   - treated POs are a small fraction of total POs supervised



   - controlling or not for district FEs (each district has an AG) doesn't affect results

Back

Bad Control

2. quality not affected by treatment (bad control)

- Potential outcomes framework:
  - potential price outcomes $p(D, q)$, treatment $D \in \{0, 1\}$, quality $q \in \{0, 1\}$
  - potential quality outcomes $q(D)$
  - Experiment $\rightarrow$ unconfoundedness $\{p_i(D, q), q_i(D)\} \perp D_i | X_i$
- Bad control problem?:

$$\begin{aligned}
&\mathbb{E}[p|D = 1, q = 1] - \mathbb{E}[p|D = 0, q = 1] \\
=&\underbrace{\mathbb{E}[p(1, 1)|q(1) = 1] - \mathbb{E}[p(0, 1)|q(1) = 1]}_{\text{treatment effect on price}} \\
&+ \underbrace{\mathbb{E}[p(0, 1)|q(1) = 1] - \mathbb{E}(p(0, 1)|q(0) = 1)}_{\text{composition effect}\neq 0?}
\end{aligned}$$

- Results don't show treatment effect on quality
- Diff in Diff results the same

Back