The Government's Price Index

Evidence and Implications for Governments' Productivity

(Very preliminary)

Rodrigo Carril[☆] Manuel García-Santana[⊕] Sampreet S. Goraya[◇]

[☆]UPF, BSE, CEPR [⊕]UPF, CREi, BSE, CEPR [◇]Stockholm School of Economics

STEG, Nairobi

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Introduction

General motivation

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  - Are there government agencies **paying "too much"?**
  - Could governments **provide more public services** if they were to **pay lower prices?**

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Fixing some ideas: governments' production in National Accounts

- The government component of GDP, G, is measured using a cost approach:

$$\Rightarrow \boxed{\text{Governments' value of production} = \text{Governments' incurred cost}}$$

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- **This paper**: understanding the factors driving P_g and its implications for governments' productivity

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Motivating examples: purchases of specific products in 2019

- *Electrocardiography EKG monitoring electrode patches (42181708-4)*
  - \$3.72 per unit (paid by Hospital Angol)
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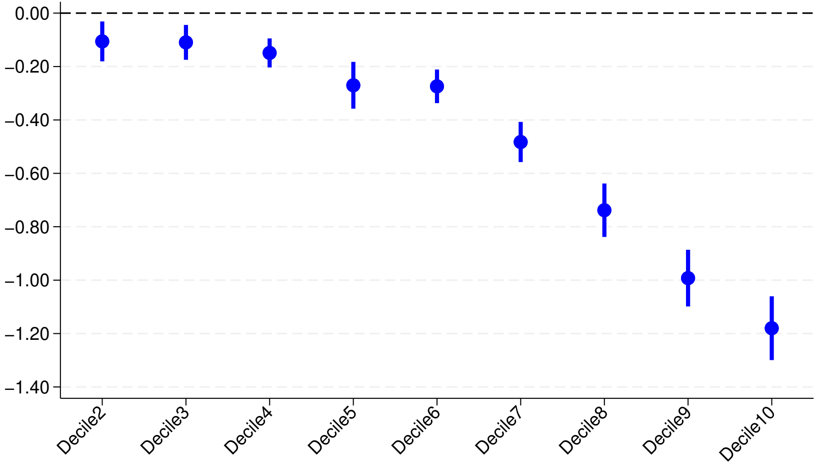

Price discounts (log points) in *Electrocardiography EKG monitoring electrode patches* **by quantity decile**

This paper

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1. **Data:** Universe of public procurement in Chile at the transaction-level
   - Almost 20 years of data: 2007-present
   - Approx. 70 million transactions
   - Products very narrowly defined ($\approx$ 188,000 products), e.g., 10 types of insulin
   - Value, quantity, prices
   - Info on agency buying and identity of the firm selling the product

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2. **Evidence:** Large dispersion in prices paid by agencies within narrowly defined categories
    - Currently exploring the role of buyers' size, quantity discounts, etc.

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3. **Measurement:** government agencies' price indexes

   - Nested CES structure

     - ⋆ Whole government → Agency types → Agencies → Products → Suppliers

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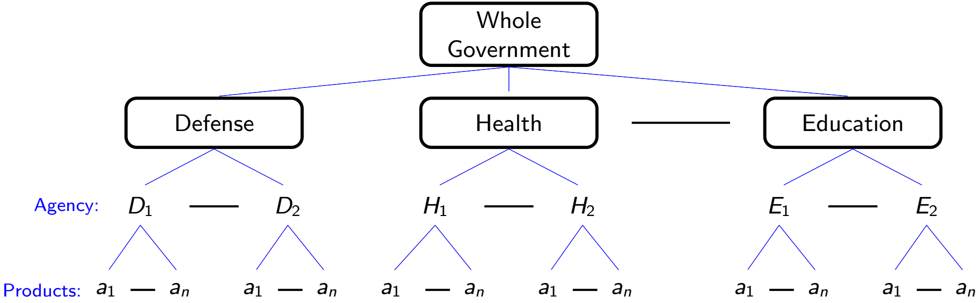
A simple sketch of government structure



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   - Infer underlying markups charged to different agencies
     - ⋆ Today (first step): infer markups as "**wedges**" within narrow categories, e.g., *product-supplier-month*
     - ⋆ Plan: estimate markups using **data on actual procurement auctions**

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4. **Counterfactuals**
   - Remove "markups" and compute resulting price indexes
   - How much more Y_g could the government produce keeping expenditure unchanged?

Related literature

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Waste in procurement

- Bandiera et al. (AER, 2009)
  - Some public agencies pay systematically more than others in Italy
  - Focus on 21 standardized products (e.g., “Heating diesel”)
  - Mostly driven by “passive waste”

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Efficiency losses from price dispersion in the private sector

- Burstein, Cravino, Rojas (WP, 2025)
  - Use firm-to-firm transaction data from Chile
  - Some firms pay systematically more than others for the same input
  - Significant productivity gains from equating markups paid by buyers

1. Data

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Universe of public procurement in Chile at the transaction-level

- Almost 20 years of data: 2007-present
- Approx. 70 million transactions
- Products at the *United Nations Standard Products and Services Code* ($\approx$ 188,000 products)
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1. Data

Aggregated transaction data accounts for a significant fraction of GDP

Table: Summary Statistics

Year	All	Goods	Services	All/GDP (%)	Goods/GDP (%)	Services/GDP (%)
2014	4,154	2,139	2,015	2.81	1.45	1.36
2015	5,203	2,302	2,900	3.28	1.45	1.83
2016	5,782	2,773	3,009	3.43	1.64	1.78
2017	6,685	2,685	4,001	3.73	1.50	2.23
2018	6,607	2,547	4,060	3.49	1.34	2.14
2019	11,316	2,923	8,393	5.79	1.50	4.29

- Today: focus on Goods

1. Data

Classifying agencies into "Types"

Table: Distribution of Sectors

Entity Sector	Num entities	Total Value	Share (%)
Defense	377	1,970	4.96
Health - Governance	8	3,699	9.31
Health - Public Services	222	9,253	23.28
Education - Governance	67	504	1.27
Education - Public Services	22	2,505	6.30
Central Government	383	4,445	11.18
Local Government	455	14,437	36.32
Other	266	1,717	4.32
NA	227	1,217	3.06

- Today: focus on Health - Public Services

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  - "*Plain savory biscuits (50181903-3)*"

2. Evidence

Measurement issues. An example

(a) Time series

(b) Histogram

Coverage:

Products	Product-Clusters
11,765	15,854

Takeaway: ~67% of observations belong to a single price cluster; ~33% exhibit price heterogeneity

Distribution of Cluster Counts:

No. Clusters	Share
1	66.86%
2	22.75%
3	6.06%
4	3.52%
5	0.82%

2. Evidence
Price dispersion within narrowly defined categories

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Variables definition

- Let's $p_{ib\tau}$ denote the price paid by agency b for product-cluster i in transaction τ
- p_i be monthly average of prices paid for product i across all buyers

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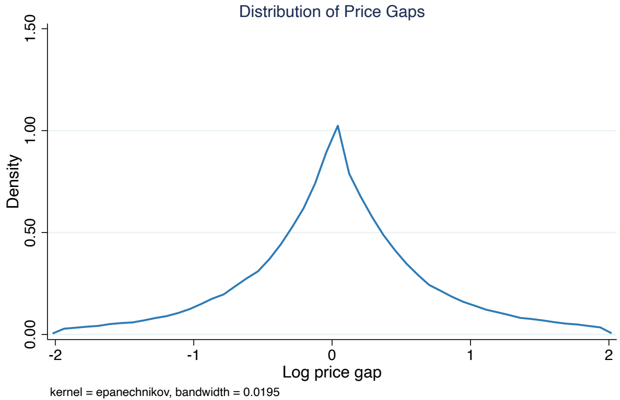
- Let's $p_{ib\tau}$ denote the price paid by agency b for product-cluster i in transaction τ
- p_i be monthly average of prices paid for product i across all buyers
- Define the "price gap" as:

$$\psi_{ib\tau} \equiv log\left(\frac{p_{ib\tau}}{p_i}\right)$$

2. Evidence. Price dispersion

A. Large dispersion in "price gaps" across agencies



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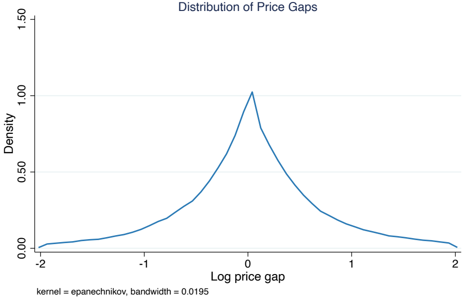
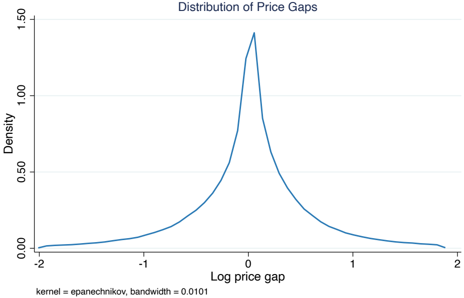


(a) Price gaps within products

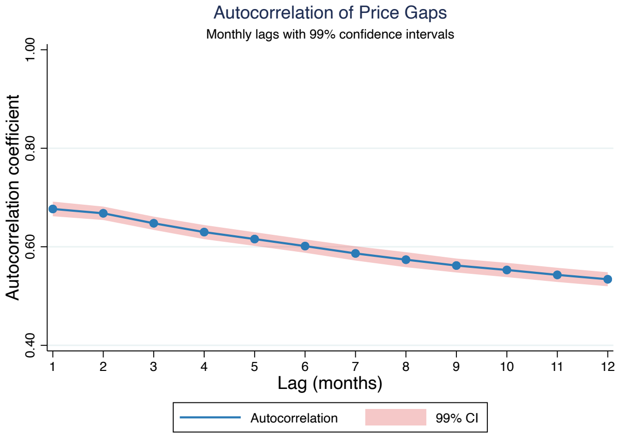


(b) Price gaps within products-seller

2. Evidence. Price dispersion

B. These "price gaps" are persistent over time

Persistence in Price Gaps



2. Evidence. Price dispersion

C. These "price gaps" are lower when the buyer is large

- Compute buyer size as the total quantity of the product purchased across all time periods
- Compare average price gaps across buyers of different sizes.

Table: Price Gaps and Buyer Size

	(1)	(2)
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Log(Total Quantity)	-0.052***	-0.069***
	(0.001)	(0.001)
Product-cluster FE	Yes	Yes
Buyer FE	No	Yes
Observations	375,452	375,451
R^2	0.264	0.279

2. Evidence. Price dispersion

D. These "price gaps" are lower when relationships are longer

Table: Price Gaps and Length of Relationships

	(1)	(2)
Recent Relationship (<1 *Year*)	-0.005	-0.006**
	(0.004)	(0.003)
Established Relationship ($\geq$ 1 *Year*)	-0.009**	-0.013***
	(0.004)	(0.003)
Product-cluster FE	Yes	Yes
Buyer-Seller FE	No	Yes
Observations	7,153,240	7,122,308
R^2	0.179	0.329

2. Evidence. Price dispersion

E. These "price gaps" are lower when transactions are larger

Table: Price Gaps and Buyer-Seller Relationships

	(1)	(2)	(3)	(4)
Log(Quantity)	-0.182***	-0.190***	-0.098***	-0.135***
	(0.003)	(0.004)	(0.002)	(0.004)
Log(Quantity) × Log(Quantity)		0.001***		0.005***
		(0.000)		(0.000)
Product-cluster FE	Yes	Yes	No	No
Buyer-Seller FE	Yes	Yes	No	No
Product-Buyer-Seller FE	No	No	Yes	Yes
Observations	7,122,308	7,122,308	6,777,667	6,777,667
R^2	0.391	0.391	0.530	0.530

2. Evidence. Price dispersion across buyers

F. Differences in “price ranges” across products

- $max(p_{ibt})$ = maximum price paid for product-cluster i across all buyers in month t
- $min(p_{ibt})$ = minimum price paid for product-cluster i across all buyers in month t

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F. Differences in "price ranges" across products

- $max(p_{ibt})$ = maximum price paid for product-cluster i across all buyers in month t
- $min(p_{ibt})$ = minimum price paid for product-cluster i across all buyers in month t
- Compute the "price range" of a product-cluster i as:

$$\mathrm{range}_i \equiv log\left(\frac{max(p_{ibt})}{min(p_{ibt})}\right)$$

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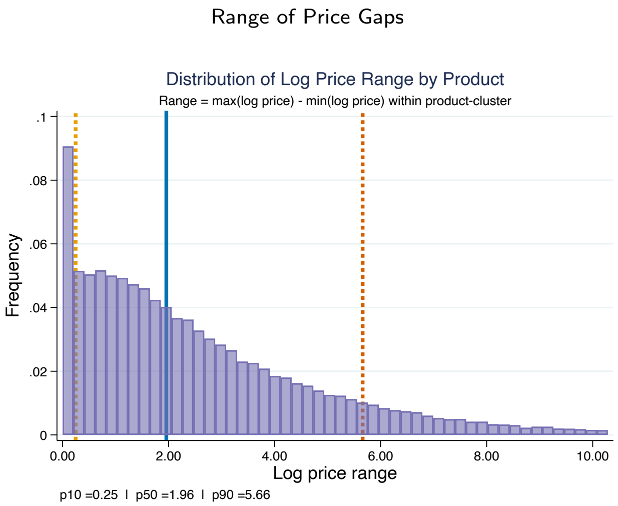
F. Differences in "price ranges" across products



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Construct "baseline" price indexes in "Health - Public Services"

- In "Health - Public Services", the government buys through many agencies, i.e., hospitals g

$$Y = \left[\left(\frac{1}{G} \right)^{1/\sigma_g} \sum_g Y_g^{(\sigma_g - 1)/\sigma_g} \right]^{\sigma_g/(\sigma_g - 1)} ; \quad P = \left[\frac{1}{G} \sum_i P_g^{1-\sigma_g} \right]^{1/(1-\sigma_g)}$$

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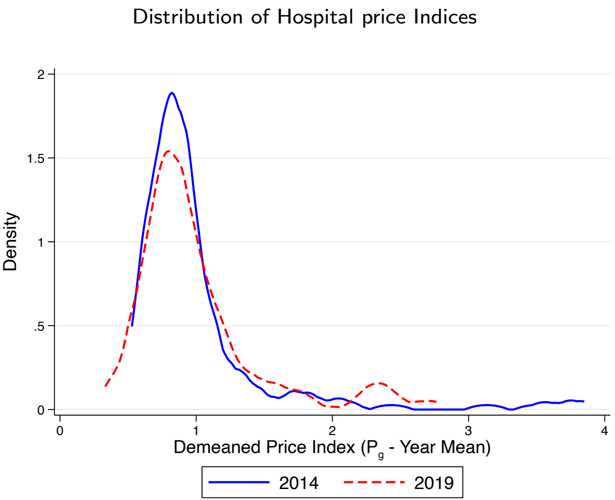
- Each hospital g buys different combination of products i

$$Y_g = \left[\left(\frac{1}{I_g} \right)^{1/\sigma_f} \sum_i y_{gi}^{(\sigma_f - 1)/\sigma_f} \right]^{\sigma_f/(\sigma_f - 1)} \quad ; \quad P_g = \left[\frac{1}{I_g} \sum_i p_{gi}^{1-\sigma_f} \right]^{1/(1-\sigma_f)}$$

- We use $\sigma_f = 5$ and $\sigma_g = 3$.

3. Measurement: governments' price indexes

Large dispersion in price indexes across hospitals



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A simple (preliminary) approach

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  - Counterfactual 2: $min(p_{ig})$ is the minimum price paid by hospitals within a month-seller-product category.

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  - Counterfactual 2: $min(p_{ig})$ is the minimum price paid by hospitals within a month-seller-product category.
  - Note: If no variation within a given category, price is kept the same

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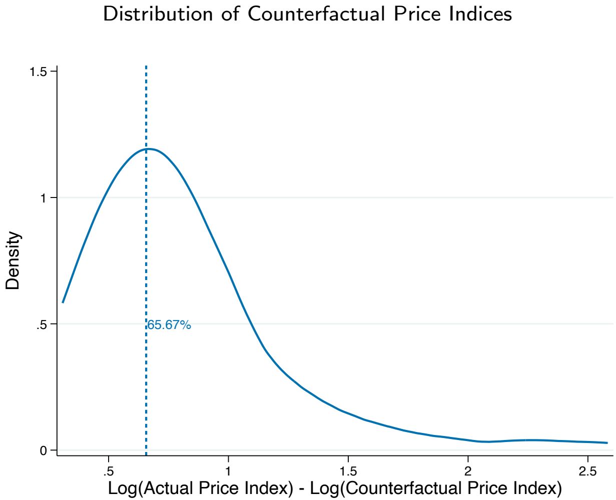

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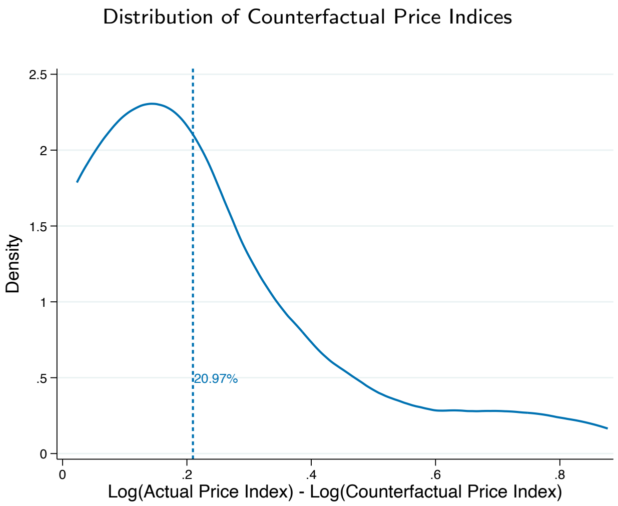

Final remarks

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- Our (super) preliminary numbers suggest that
  - Governments could produce 20-65% more if they were to pay less for their intermediate inputs
- Lots of work to be done. Examples:
  - Measurement issues, quality, etc.
  - Markups estimation
  - Estimation of elasticities of substitution
- Policy implications?

Clustering Methodology

Objective: Identify homogeneous goods based on price distribution within each *productid*

Approach:

- Focus on log of price, pooling all buyers and sellers
- Outliers removed beforehand

Algorithm: PAM (Partitioning Around Medoids) / CLARA

- K-medoids clustering: each cluster represented by an actual data point (medoid)
- CLARA extension used for large samples

Optimal k selection:

- Unsupervised: test all possible k from 1 to $n - 1$ buyers
- Selection criterion: **Silhouette score** (ranges -1 to 1; higher = better fit)