Trade Associations and Collusion on Minimum Price: Evidence from Physicians

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Motivation

Collusion is increasingly difficult as number of firms increases (Tirole 1988, etc.)

Many *documented* cartel cases with large number of firms (N>7 in roughly 50% of cases reviewed by Levenstein and Suslow, JEL 2006).

How?

- In practice, through trade associations (prevalent in many professions; e.g., engineering, law, medicine, etc.)

Motivation (cont'd)

Ambivalent role of trade associations

- Information exchanges and standard setters
- But... anticompetitive concern: Can facilitate coordination on prices, establish barriers to entry, or others that diminish competition (FTC, 2018).
- Such anticompetitive agreements not binding: not clear why agents should comply.

Trade Associations and Collusion

More than 35 FTC complaints against physicians associations since 2001.

On the other hand, some antitrust practitioners have been calling to allow associations that seek to counteract large imbalances of power in negotiations (e.g., Australia's ACCC, UK's CMA)

- Hotels vs. Expedia, Booking.com
- Truck owners vs. transport companies

Texas, NJ, Alaska have all passed bills allowing physicians to negotiate collectively.

Question: Do trade associations lead to collusive agreements or collusive behavior?

Colluding Physicians

The Federal Trade Commission today announced its decision to challenge the conduct of several organizations representing more than **2,900 independent Chicago-area physicians for agreeing to fix prices** *and for refusing to deal with certain health plans except on collectively determined terms. (...) The complaint also alleges that in 2001, AHP [Advocate Health Partners]* **terminated its members' contracts** *with a health plan that rejected contract proposals for higher fees, and threatened that it would not contract with the plan for hospital services unless it stopped contracting with individual physicians and agreed to a group contract. The resulting contract included* **fees 20 percent to 30 percent higher** *than the health plan's individual physician contracts.*

\FTC Charges Chicago-Area Doctor Groups With Price Fixing."
FTC, Press Release, December 29, 2006.

This Paper

We study the coordinated strategies of a large number of physicians, who were able to collude through a trade association.

Research question: What was the role of the trade association (strategies) in facilitating collusion?

Main contribution: Empirical analysis of a collusive agreement of a large cartel.

Leverage detailed data on prices, physician visits, and court documents to:

- Rationalize the Association's pro tability and stability
- Provide empirical support for the theoretical predictions of collusion among heterogeneous rms (Harrington, 2016).
- Insights for antitrust policy in the context of bargaining.

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This Paper: Overview

The case: Collusion of large number ($N = 25$) physicians (Ob/Gyn's) through trade association in a small city in Chile.

Break in negotiations between physicians and insurance companies. $)$

1. **Joint contract termination**
2. **Minimum price agreement**.

Rates increased 80%, copays 200%.

Goal: Understand Association strategies

Empirical Strategy:

1. Estimate demand for doctor's visits
2. Supply model to estimate the degree of price coordination and rationalize minimum price
3. Analyze cartel stability

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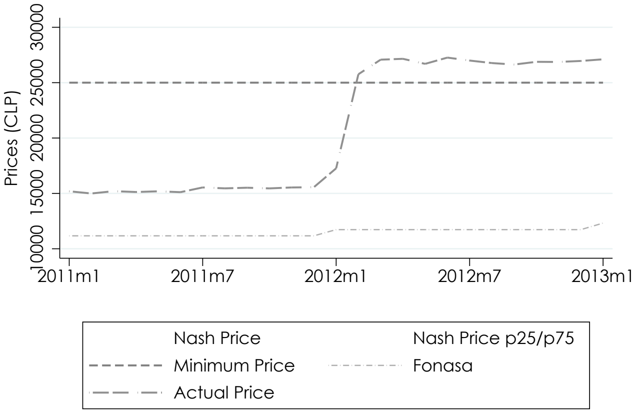
Main Results

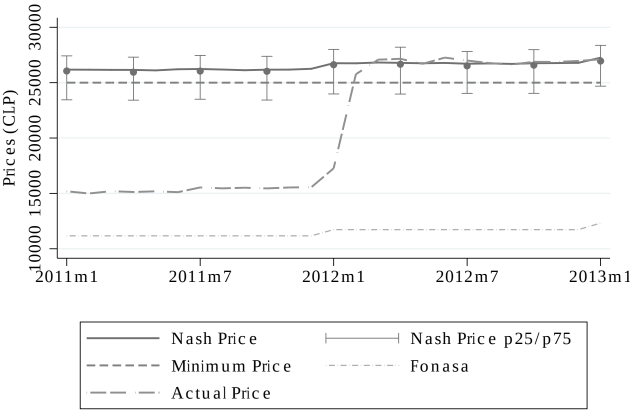
Figure: Simulated and Actual Prices



Note: The Figure shows the average price, and the Fonasa (public) rate.

Main Findings

Figure: Simulated and Actual Prices



Note: The Figure shows the Nash prices for out-of-network coinsurance rates, the average price, and the Fonasa (public) rate.

Main Results

1. Average "Collusive" Price = Average Nash-Bertrand
2. Minimum price was binding only for a few physicians
3. Association was incentive compatible and highly profitable

Main implications:

Collusion most effective on the decision to become out-network.

Trade association provided physicians with better option than bargained prices.

Contribution

Collusion

Porter (1983), Levenstein (1997), Genesove and Mullin (1998, 2001), Asker (2010), Clark and Houde (2013), Igami and Sugaya (2017), and Alé-Chilet (2018)

Methodology: Bresnahan (1987), Nevo (2001), Miller and Weinberg (2017)

Anticompetitive Effects of Trade Associations

Large N: Symeonidis (2002), Levenstein and Suslow (2006, 2011)

Unions: Gu and Kuhn (1998), and Cramton and Tracy (2003)

Negotiation in Vertical Markets

Ho and Lee (2017)

Bargaining goal of horizontal agreements in vertical markets, e.g., mergers: Grennan (2013), Gowrisankaran, Nevo, and Town (2015).

Road Map

1. The Antitrust Case
2. Data
3. Demand Estimation
4. Supply Model
5. Association Stability

Institutional Details

Insurance Coverage in Chile

Private Insurance - 20%:

- 6 Insurance companies.
- Thousands of plans; di erent network, di erent coverage for in-network and out-of-network (i.e., mostly \PPO" structure).
- In-network providers negotiate their rates with insurance companies.
- Out-of-network providers set their rates privately.

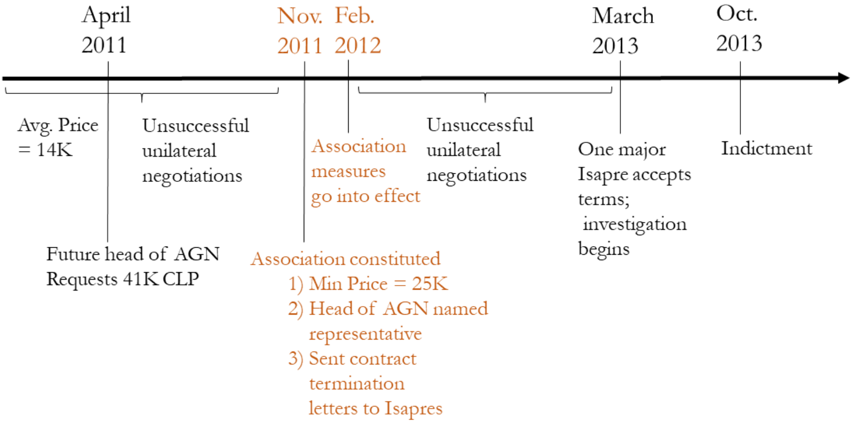
Public Insurance - 80%: (Fonasa)

- Reimburses (private and public) providers with a common rate.

Setting: Chillán, Chile: city of 175,000 inhabitants in southern Chile. 28 Ob/Gyns in the city. 25 formed the trade association.

Many things to do in Chillan besides going to the doctor

The Case


April 2011
Nov. 2011
Feb. 2012
March 2013
Oct. 2013
Avg. Price = 14K
Unsuccessful unilateral negotiations
Future head of AGN Requests 41K CLP
Association measures go into effect
Association constituted
1) Min Price = 25K
2) Head of AGN named representative
3) Sent contract termination letters to Isapres
Unsuccessful unilateral negotiations
One major Isapre accepts terms; investigation begins
Indictment

Data

Source: National Economic Prosecutor's Office

Insurer records + doctor records,

- 2009m1-2013m1; Chillan + Neighboring Cities
- Individual claims with doctor id, patient id, type of claim, total price, out-of-pocket expenditure.

Keep *visits* only

Aggregate data at physician/insurer/month level

- Each insurer/month is a \market"

Figure: Prices and Coinsurance rates over time

(a) Average Visit Price (b) Average Coinsurance Rate

Note: The Figure shows the median visit price and coinsurance rate faced by patients of the average gynecologists in Chillán and in two other major neighboring cities (Concepción and Los Angeles). Prices are in Chilean Pesos (approximately CLP 500 = USD 1).

Figure: Histogram of Median Prices

(a) Pre-Association

(b) Association

Note: The Figure shows the distribution of the median price across Chilean gynecologists in the period before and after collusion (2011 and 2012). We drop prices in the transition month of January 2012. Prices are in Chilean Pesos (approximately CLP 500 = USD 1). The dashed line is the rate paid by the public insurance (Fonasa) and the dotted line is the minimum price set by the TA.

Figure: Average Number of Visits and Pro ts over Time

Note: The Figure shows the average number of visits and pro ts (using Fonasa as the cost) for associated and not associated physicians.

Figure: Did Patients or Insurers Lose?

Note: The Figure shows the aggregated expenses of patients and insurers due to physicians visits.

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Demand Estimation

Reduced Form Evidence

Evidence of large demand responses.

We look at switching rates of patients across doctors.

Figure: Physician switching rates in Ñuble and surrounding provinces

Note: The figure shows the average switching rates across doctors for OBGyN visits in the province of Ñuble (where collusion occurred) and in surrounding provinces (Biobío and Concepción). The vertical line marks the date of the collusion.

▸ Table

Demand Estimation

Structural Model

Demand model in a nutshell:

- Nested logit model. Define nests based on the doctor's geographic location
- Instrument for price and within-share:
- $Z_{it} = (\text{Association}_i; \text{Association}_i \quad \text{Post}_t)$
- Many zero-shares:
  - Logit models do not handle zero shares (censoring). Empirical Bayesian estimator of the choice probabilities (Gandhi et al., 2014).

Nested Logit

- The set of physicians is partitioned into non-overlapping nests $k = 1, \ldots, K$.
- Nests allows for higher correlations (s) within predetermined groups
- Indirect utility of patient p enrolled in j from visiting doctor i in nest k is

$$u_{pijt} = d_{ijt} + e_{ijt} + h_{pkjt} + (1 \quad s) n_{pijt},$$

where

$$d_{ijt} = a p_{ijt} (1 \quad c_{ijt}) + m_{ij} + f(t).$$

p_{ijt} is the list price, $1 \quad c_{ijt}$ is the coinsurance rate, m_{ij} represent F.E's for doctor-insurer pairs, $f(t)$ represent time controls (common shocks); and $h_{pkjt} + (1 \quad s) n_{pijt} \quad EV(1)$

Estimation: Locations and Nests

Note: The Figure plots the geographic location of physician's main address. Each color represents a di erent nest. Large circles represent groups of ve or more co-located physicians. Small dots represent groups of three or less physicians.

Estimation Challenges

Using Berry's (1994) inversion, can estimate model from

$$\ln(s_{ijt}) \quad \ln(s_{0jt}) = a p_{ijt}(1 \quad c_{ijt}) + m_{i,j} + f(t) + s \ln(s_{ijt/B_k}) + e_{ijt}$$

where a measures price sensitivity, s within nest substitutability.

- Endogeneity
  - Leverage price shock brought about by Association; IV for price and within-share $Z_{it} = (Post_t; Association_i \quad Post_t)$
- Zero-shares
  - Large number (26%) of zeros of physician-insurer-month observations (datase is of private patients)
  - Empirical Bayesian estimator of the choice probabilities.

Details: Zero Shares | Capacity Constraints

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Table: Demand Estimates

	(1) Logit OLS	(2) Logit IV	(3) NL OLS	(4) NL IV
$p_{ijt}\,(1 \quad c_{ijt})$	0.004	-0.146***	0.004	-0.050***
	(0.010)	(0.017)	(0.004)	(0.018)
ln within-share			1.040***	0.735***
			(0.005)	(0.152)
h_{pre}	0.02	-0.60	-0.29	-0.65
h_{post}	0.04	-1.53	-0.75	-1.68
Observations	6620	6620	6620	6620
AR F-stat		39.42		39.42
AP F-stat 1		1899.99		334.84
AP F-stat 2				19.83

Note: All speci cations include month-of-the-year and year xed e ects. Expenditures are in thousand CLP. The AR F-stat corresponds to the Anderson-Rubin Wald F-statistic. The AP F-stat 1 and 2 correspond to the rst-stage F statistics of the excluded instrument. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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Supply Model

Model allows to calculate equilibrium prices for any "level of collusion κ."

Colluding physician i decides a unique list price p_i for all (J) insurance companies, results in price vector p and sales q_j, $j \in 1..J$ (omitting t).

FOC (Nevo, 1998, 2001; Miller and Weinberg, 2017):

$$p \quad mc = \quad W(\kappa) \left(\sum_j S_j \right)^{1} \sum_j q_j(p, c_j),$$

Where

- $W(\kappa)$ matrix with diagonal elements 1, non-diagonal elements κ. Nests Nash-Bertrand competition when κ=0; full collusion when $\kappa = 1$.
- $S_j \quad E_j \quad \tilde{C}_j$, matrix of price sensitivity 1- coverage.
  - $E_j(r, s) \quad \frac{\partial q_{sj}}{\partial p_r}$ matrix of derivatives wrt out-of-pocket prices, $\tilde{C}_j(r, s) \quad 1 \quad c_{rj}$.
- Assumption: mc is equal to the public rate: opportunity cost of a visit. Arguably lower bound; but close to pre-agreement price (upper bound).

Main Results

Figure: Simulated and Actual Prices

Note: The Figure shows the average price, and the Fonasa (public) rate.

Main Findings

Figure: Simulated and Actual Prices

Note: The Figure shows the Nash prices for out-of-network coinsurance rates, the average price, and the Fonasa (public) rate.

Figure: Distribution of Nash-Bertrand Prices

Note: The Figure plots the histogram of the estimated Nash prices of each associated physician, averaged over the Association period. The dashed line shows the Association's minimum price.

Main Results: Price Level

Average Nash-Bertrand price (CLP 26,800) is

almost equal to average observed price set by Association members.

The distribution of the Nash-Bertrand prices is such that the minimum price barely binds (min NASH min price)

Collusive price ($k = 1$) is equal to CLP 52,336; 2x the average observed price

Figure: Predicted v/s Actual Price as a function of k

Note: The Figure shows the ratio between the sales-weighted average price predicted by the supply model and the sales-weighted average observed price in the post-association period.

Loss Function Minimization

Implications

- Collusion mainly on the decision to become out-of-network. Minimum price did not bind.
- Association pricing was competitive, but no longer constrained by insurers.
- Trade association served to move to a di erent equilibrium from bargaining providing physicians with a better option than the pre-association one.
- Minimum price served as competitive \focal price"
  - Harrington (2016): Minimum price preserves heterogeneity, incentive compatible.

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Counterfactuals

The stability and the role of the Association

Stability . We compare pro ts under:

I Association

Nash Prices, out-of-network coinsurance

II Unilateral Deviation from Association

Deviation to pre-association price and in-network coinsurance

The role of the Association . We compare pro ts under:

I Unilateral Contract Termination

Out-of-network pro t maximizing price given all others in-network

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out-of-network Nash, others in out-network Nash.

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In-network prices and coinsurance rates.

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Assessing the Cartel's Stability

Counterfactual: unilateral deviation from the agreement

- "Deviation": Pre-agreement list price (p_i^d) instead of Nash (p_i^N) and in-network coinsurance rate ($c_{i,j}^I$) instead of out-of-network ($c_{i,j}^O$)

- Compute deviation profits:

$$\pi_i^d - \pi_i^N = \pi(p_i^d, p^N_{-i}, c^I_{i,j}, c^O_{-i,j}) - \pi(p_i^N, p^N_{-i}, c^O_{i,j}, c^O_{-i,j})$$

$$= \underbrace{\pi(p_i^d, p^N_{-i}, c^O_{i,j}, c^O_{-i,j}) - \pi(p_i^N, p^N_{-i}, c^O_{i,j}, c^O_{-i,j})}_{\text{out-of-ntwk price deviation } < 0} + \underbrace{\pi(p_i^d, p^N_{-i}, c^I_{i,j}, c^O_{-i,j}) - \pi(p_i^d, p^N_{-i}, c^O_{i,j}, c^O_{-i,j})}_{\text{higher sales from higher coverage } > 0}$$

- Sign is ambiguous: empirical question.
- Robust to re-estimating p^N_{-i} given i's deviation.

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$$p_i^d \quad p_i^N = p(p_i^d, p^N_i, c^I_{i,j}, c^O_{i,j}) \quad p(p_i^N, p^N_i, c^O_{i,j}, c^O_{i,j})$$

$$= \underbrace{p(p_i^d, p^N_i, c^O_{i,j}, c^O_{i,j}) \quad p(p_i^N, p^N_i, c^O_{i,j}, c^O_{i,j})}_{\text{out-of-ntwk price deviation } < 0} +$$

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Counterfactual I: Stability

Figure: Unilateral Deviation Pro ts; $\frac{p^d \quad p^N}{p^N}$

(a) Deviation Pro ts; Step 1

(b) Deviation Pro ts; Step 2

Note: The Figure shows the distribution of per-period deviation pro ts across physicians. Each point in the gure corresponds to the deviation pro t of a di erent physician, as a percentage of the pro t from staying in the Association.

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In-network prices and coinsurance rates.

Counterfactual II: The role of the association

Figure: Termination Pro ts as a Share of In-network Pro ts

Note: The Figure plots the gains from leaving the network if all doctors of the Association leave the network (Joint Termination) and if only the focal doctor becomes out-of-network (Unilateral Termination). Baseline pro ts correspond to all doctors staying in-network.

Counterfactual II: The role of the association

Unilateral deviation did not happen. This is consistent with the physicians' goal to reach (ultimately) better terms with the insurers.

Coordinated action was used to increase the physicians' bargaining positio which raised their outside option to the point where the negotiation broke down.

These facts show that coordination/communication played an important role in the breakdown of negotiations.

Summary and Discussion

- We empirically study a case of a collusive agreement among large number agents through a trade association.
- Coordination on minimum price and on joint contract termination, but did no achieve supra-competitive prices.
- Highly successful (increased pro ts) and stable.

Summary and Discussion (cont'd)

Antitrust implications

- Di erence between economic collusion and illegal anticompetitive practices (e.g., minimum price).
- Role of communication: despite sustained coordination, association did not raise prices above competitive levels.
- Find Association more e ective on joint contract termination.
  - Maybe di erent nature makes it easier to coordinate in variables other than price.
- Joint bargaining. Role of antitrust policy in horizontal coordination with vertical agreements.
- Trade associations and collusion? Not economic collusion, but consumers de nitely worse o .

THANKS

Figure: Changes in Visits and Changes in Out-of-Pocket Prices

Note: The Figure plots the percentage changes in out-of-pocket prices against percentage changes in visits in 2012 with respect to 2011 for every physician, and a linear t. The size of the markers correspond to the physician's total number of visits in the period, which are also the linear t weights.

Back:Data

Switching Rates

For patient p in province l and period t, we estimate the di -in-di s model:

$$w_{plt} = a_t + bT_l + dAfter_t + gT_l \quad After_t + l_t + e_{ilt}$$

where w is a switch indicator, T_l is a Ñuble indicator, l_t are time controls. The parameter g is the estimated e ect of the collusion on switching rates in Ñuble.

Table: Physician switching rates

	(1)	(2)
$T_l = 1$	0.08***	0.08***
	(0.01)	(0.01)
$After_t$	0.03***	
	(0.01)	
$(After_t) \quad T_l$	0.07***	0.07***
	(0.02)	(0.02)
Year-month FE	N	Y
N	16,742	16,742
R^2	0.02	0.02
Baseline switching	0.22	0.22

Note: The baseline switching rate corresponds to the switching rate in Ñuble before the agreement period. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Capacity Constraints

No observable capacity constraints

Note: The Figure plots the distribution of the 75-99.9 percentiles of the visits per month distribution of ob/gyn in Ñuble and in other neighboring provinces.

Return

Zero Shares

- Large number (26%) of zeros of physician-insurer market shares in data.
- Logit models do not handle zero shares (censoring).
- Ad-hoc standard approaches: (1) drop zero sales or (2) replace with (sm#;all) highly sensitive.

- Data-driven \optimal" transformation of empirical shares based on Gandhi e al. (2014). Empirical Bayesian estimator of the choice probabilities.
  - Observed shares $\mathbf{s}_{ijt}$ are the realization of the shares in a small-sample, which di er from the true population probabilities p_{ijt} implied by the model.
  - Infer conditional distribution of choice probabilities given empirical shares assuming sales accord with Zipfs' law.

Return

Zero Shares (2)

Assuming

(A1) $M \quad s \quad MN(p, M)$

(A2) $\frac{p}{1 \quad p_0} j J, M, s_0 \quad Dir(q 1_J)$ (Zipf's law for sales)

Then

$$M_j \frac{s_{ijt}}{1 \quad s_{0jt}} j l_{jt}, M_j, s_{0jt} \quad DCM(q_j 1_I, M_j(1 \quad s_{0jt})),$$

And

$$\log(\hat{p}_j) \quad \log(\hat{p}_0) = y(q + Ms_j) \quad y(Ms_0)$$

$$\log(\hat{p}_j) \quad \log(\hat{p}_c) = y(q + Ms_j) \quad y(\underset{j}{å} \; Ms_j)$$

Where y is the Digamma Function.

Return

Zero Shares (3)

1. Estimate θ_j via ML.
2. Estimate

$$\overbrace{\psi(\theta_j + M_j s_{ijt}) - \psi(M_j s_{0jt})}^{E[\ln(s_j) - \ln(s_0)]} = \alpha p_{ijt}(1 - \chi_{ijt}) + \mu_{i,j} + \xi(t) + \sigma \underbrace{\left[\psi(\theta_j + M_j s_{hjt}) - \psi\Big(\sum_{h \in k} \theta_j + M_j s_{ijt}\Big) \right]}_{E[\ln(s_j / s_J)]} + \varepsilon_{ijt}.$$

Return

Table: Nested Logit Estimates{Zero Market Shares Correction

	(1)	(2)	(3)
p_{ijt} (1 c_{ijt})	-0.015	-0.028***	-0.050***
	(0.011)	(0.008)	(0.018)
ln within-share	1.066***	0.850***	0.735***
	(0.148)	(0.108)	(0.152)
Correction	No Zeros	Ones	Dirichlet
h_{pre}	0.62	-0.61	-0.65
h_{post}	1.63	-1.58	-1.68
Observations	4870	6620	6620
AR F-stat	52.04	73.72	39.42
AP F-stat 1	329.78	429.49	334.84
AP F-stat 2	31.90	46.55	19.83

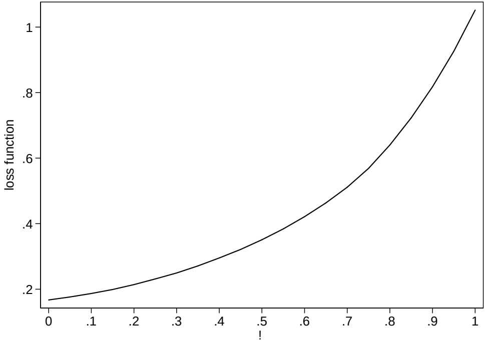
Note: All speci cations include month-of-the-year and year xed e ects. Expenditures are in thousand CLP. The AR F-stat corresponds to the Anderson-Rubin Wald F-statistic. The AP F-stat 1 and 2 correspond to the rst-stage F statistics of the excluded instruments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Finding k

Formally, we define $f(k)$ as

$$f(k) = \frac{1}{T}\sum_{t \geq t_0} \frac{\frac{1}{N}\sum_i \left|1 - \frac{P^N_{it}(k)}{P_{it}}\right| q_{ijt}(k)}{\sum_i q_{ijt}(k)},$$

Figure: Loss Function k



Return