Markets and Competition

PEDL-STEG Virtual Course

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Today's agenda

1. Understanding the landscape: factors hindering and supporting competition in LMICs
2. Measuring competition
   - Challenges and opportunities in LMIC context
   - Experimental approaches (Bergquist and Dinerstein, 2020)
3. Implications of competition on
   - Firm selection (Jensen and Miller, 2018)
   - Prices (Busso and Galiana, 2019)
   - Quality (Bjorkman Nyqvist et al., 2022)
   - Contracting (Macchiavello and Morjaria, 2021)
4. Opportunities for future research

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  - Harder to support a large number of firms in the presence of fixed costs (Bresnahan and Reiss, 1991)
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- Greater barriers to entry
  - Greater red tape to opening a business (Djankov et al., 2002)
  - Corruption and bribes as barriers to entry (Campos et al, 2010)
  - De facto barriers, such as credit constraints (Banerjee et al, 2015)

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- Captive relationships as second-best solution to other market failures
  - Relational contracting when formal contract enforcement is missing (Greif, 1993; Baker et al., 2002)

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  - Limited IP protection to prevent copycat/generic production
- Credit constraints and other market failures might constrain growth more than entry, so that maintain a market of many small firms
  - Depends where in the distribution of latent productivity constraints most bind

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   - Many LMICs have weaker antitrust regulation and/or enforcement, so might find firms more willing to openly discuss
   - But social norms may still drive self-reporting bias
   - *"When asked directly, only 30% report engaging in an explicit price agreement with other traders; however, 72% of traders work in a market in which at least one trader has reported the existence of a price agreement that day."* (Bergquist and Dinerstein, 2020)

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   - Generally not popular because hard to estimate value of capital, hard to assign costs for multi-product firms, etc.
   - This approach may be even harder in LMICs if firms don't keep records (McKenzie and Woodruff, 2014)
   - Seeing large markups may suggest imperfect competition, but without knowing the shape of demand, can't run counterfactuals

Measuring competition

3. Cost minimization (Hall, 1986; DeLoecker & Warzcynski, 2012)
   - If firms minimize costs, then for any flexible input j:

$$\frac{P}{MC} = \frac{\theta_j}{\alpha_j}$$

   - $\theta_j = \frac{\partial lnQ}{\partial lnX_j}$, output elasticity w.r.t. input
   - $\alpha_j = \frac{W_j X_j}{PQ}$, input expenditures as a share of revenues

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     - $\alpha_j = \frac{W_j X_j}{PQ}$, input expenditures as a share of revenues
   - Only need decent records for one variable input (though this may still be a challenge for SMEs in LMICs)
   - Identification challenges in estimating output elasticity (e.g. quality differences may bias estimate) (Katayama et al, 2009; Verhoogen, 2020)
   - Still descriptive; need more to run counterfactuals

Measuring competition

4. Full structural modeling
   - Traditional IO approach (e.g. Berry et al., 1995; Nevo 2001)
     - Assume a particular utility or demand function. Estimate demand elasticity.
     - Assume a particular market structure and firm behavior
     - The above imply particular markups and MC

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     - Assume a particular utility or demand function. Estimate demand elasticity.
     - Assume a particular market structure and firm behavior
     - The above imply particular markups and MC
   - Can do counterfactuals
   - Lots of assumptions: shape of demand, market structure, etc.
   - Can be hard to find good instruments, especially in LMIC small-market settings in which producers are also local consumers (e.g., agricultural HHs, small-scale retail)

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  1. **High transaction costs**: transport costs, search, contractual risk, etc. (Teravaninthorn & Raballand 2009; Aker 2010; Fafchamps et al 2012; Allen, 2014; Startz 2021)
  2. **Imperfect competition among intermediaries**: barriers to entry allow traders to exert market power, possibly collude

Bergquist and Dinerstein (2020)

Provide experimental and model-based evidence on the following questions:

1. What is the market structure and level of competition among traders?
2. How does this market structure affect consumers?
3. What role does entry have in facilitating competition?

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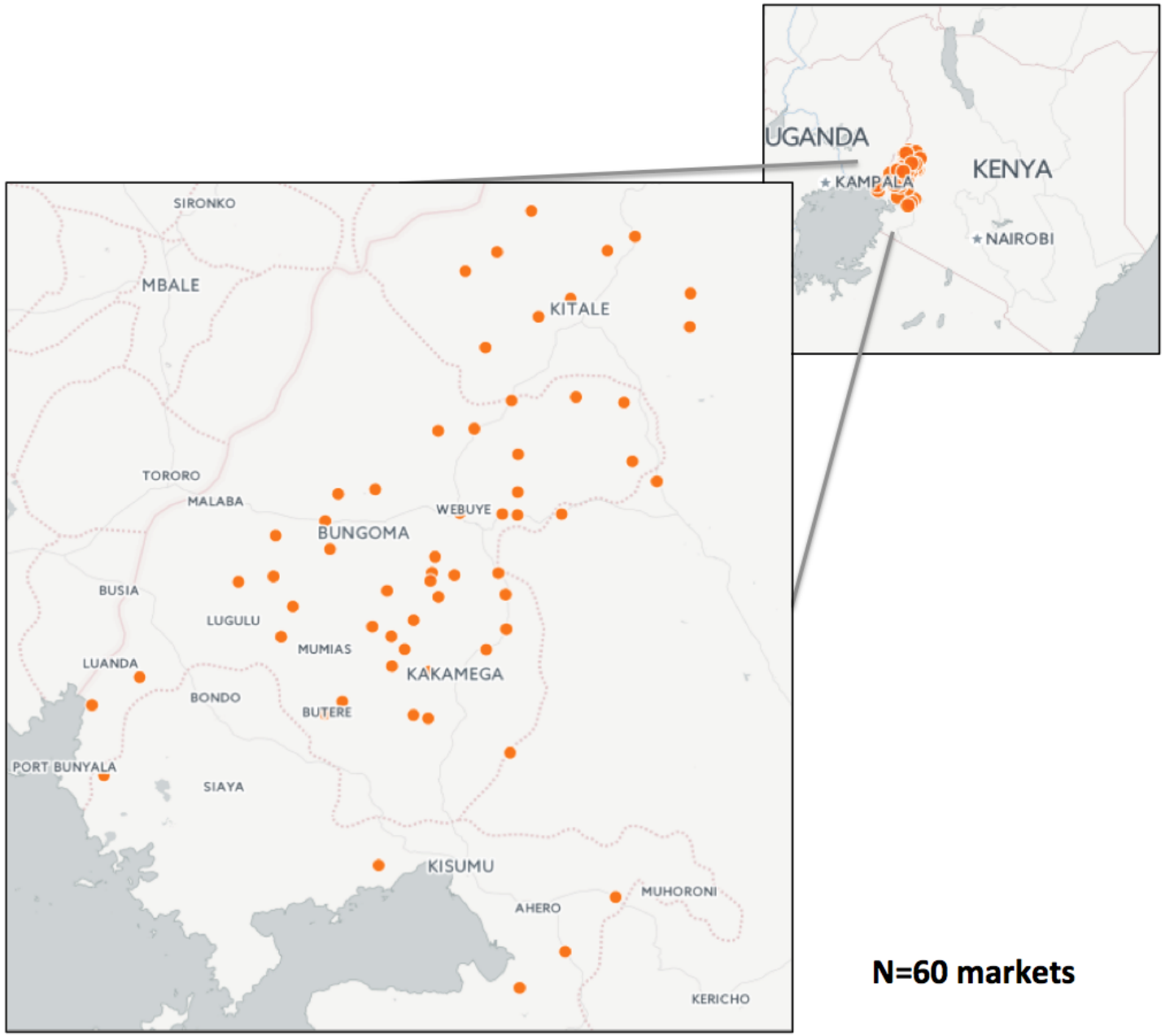
$\Rightarrow$ Estimate structural model with experimentally estimated parameters to identify the level of competition and effects of entry

Study area: western Kenya



N=60 markets

Weekly markets

Market details

Traders:

- Buy 66% of stock from farmers and sell 64% in weekly markets More
- Median has completed some secondary school More
- Small owner-run business: only 37% have full-time employees More
- Regulars in market: 95% work in that market most weeks More
- 6% visit multiple in-sample markets in a week

Customers:

- 2/3 individual household consumers, 1/3 village retailers
- Median customer buys once a week only from her local market More

Product:

- Only 4% sold on credit More
- Little evidence of price discrimination More
- Little evidence of product differentiation More
- Little evidence of price stickiness More

Simplified theoretical framework

Trader j chooses quantity to maximize the weighted sum of his profits and his $(N-1)$ identical rivals' profits:

$$\max_{q_j}(P-c)q_j+\omega\sum_{k\neq j}(P-c)q_k$$

where ω has the following interpretation:

$$\omega=\begin{cases}0 & \text{when Cournot competitive}\\ 1 & \text{when perfectly collusive}\end{cases}$$

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Taking the derivative wrt q_j yields his first order condition:

$$\begin{aligned}P &= c-\frac{\partial P}{\partial Q}(q_j+\omega\sum_{k\neq j}q_k)\\ &= c-(1+(N-1)\omega)\frac{\partial P}{\partial Q}\frac{Q}{N}\ \text{(under symmetry)}\end{aligned}$$

Simplified theoretical framework

Therefore two features determine the level of competition in a market:

1. The number of traders in the market N
2. The way these traders interact ω

Define a single "competitiveness index" parameter:

$$\sigma = \frac{N}{1 + (N - 1)\omega} = \begin{cases} N & \text{when Cournot competitive} \\ 1 & \text{when collusive} \end{cases}$$

Also nests Bertrand: $\sigma = \infty$

Pass-through

Returning to the symmetric trader's F.O.C.:

$$P = c - (1 + (N-1)\omega)\frac{\partial P}{\partial Q}\frac{Q}{N}$$

Taking the derivative wrt c yield an equation for **pass-through**, defined as:

$$\rho = \frac{\partial P}{\partial c} = \left\{1 + \frac{1+E}{\sigma}\right\}^{-1}$$

where $E \equiv$ the elasticity of the slope of inverse demand $\left(\left\{\frac{Q}{\frac{\partial P}{\partial Q}}\right\}\left\{\frac{\partial \frac{\partial P}{\partial Q}}{\partial Q}\right\}\right)$

Therefore, the observed pass-through (ρ) reflects both the level of competition ($\sigma(\omega, N)$) and the curvature of demand (E)

Mapping the experiments to parameters to be estimated

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$\Rightarrow$ Back out σ (or ω), the “competitiveness parameter."

Experiment 1: Targeting ρ

- **All traders** in the market offered a subsidy per bag sold, to mimic a common shock to **marginal costs**
  - 3/4 of markets received a low subsidy of 200Ksh/bag (8% of total price)
  - 1/4 of markets received a high subsidy of 400Ksh/bag (15% of total price)
- Subsidy offered for four weekly market-days in a row, covering a **month** in total
- Transaction-level price data for each trader yields an estimate of how much of the subsidy is **passed through** to customers (ρ)

Experiment 2: Targeting E

- **Randomized discounts** in the price paid by individual customers in the market (within market-day variation)
- Customers agreed to a price and quantity with a trader
- One of ten randomized discounts is drawn
- Customers then chose the quantity they wanted to purchase at this reduction in price
- Using this **exogenous shift in prices** and the resulting change in quantities desired, parameterize a flexible functional form for demand and estimate E (more details later)

Experiment 3: Estimating effect of entry

- For each market, three “entry traders” (traders who had never worked in that market before) were offered a **grant** to enter the market on specific dates and attempt to sell
- Size of the grant offer randomized: low, medium, and high (like variation in fixed costs to enter)
- The offers given for **four weeks** in a row, in order to try to induce long(ish)-run entry
- Transaction-level data to measure effect of increasing N on **prices**

22% pass-through

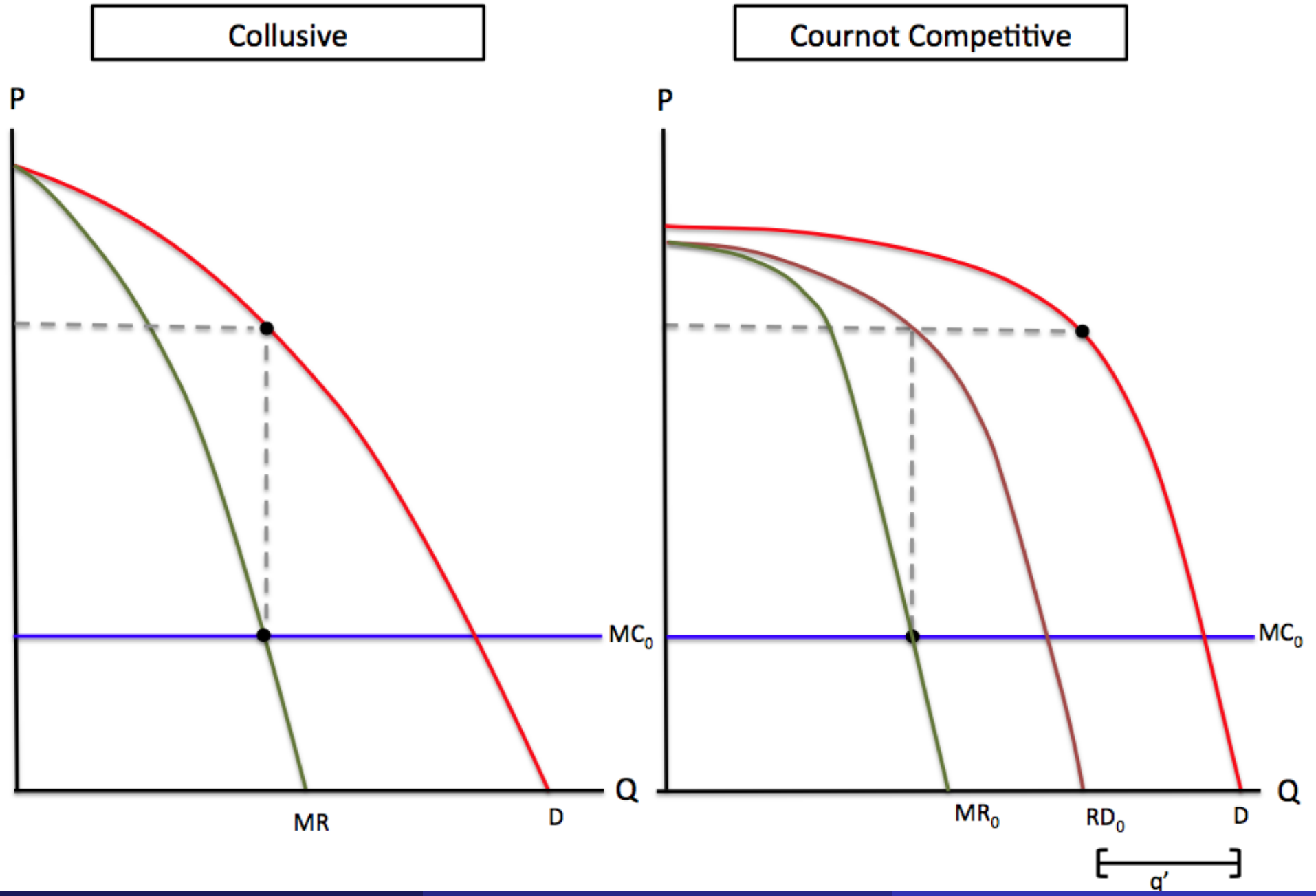
	(1) Price	(2) Price
Cost Change	0.224***	
	(0.0434)	
Cost Change - Low		0.219***
		(0.0538)
Cost Change - High		0.228***
		(0.0618)
Mean Dep Var	28.92	28.92
N	1860	1860
Market FE	Yes	Yes
Week FE	Yes	Yes

No obvious heterogeneity by:

Market size: More

Other characteristics More

Low pass-through due to collusion or demand curvature?



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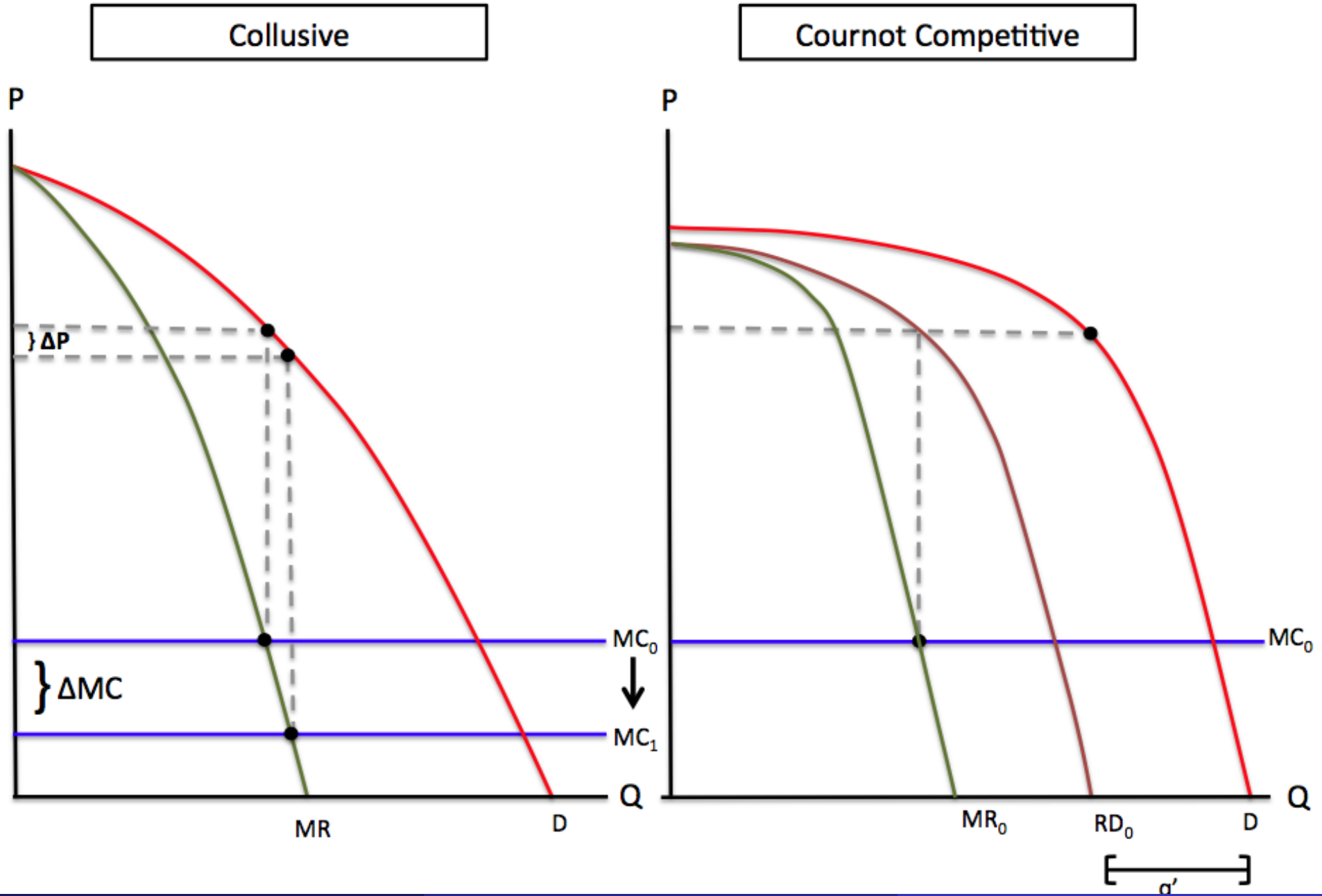

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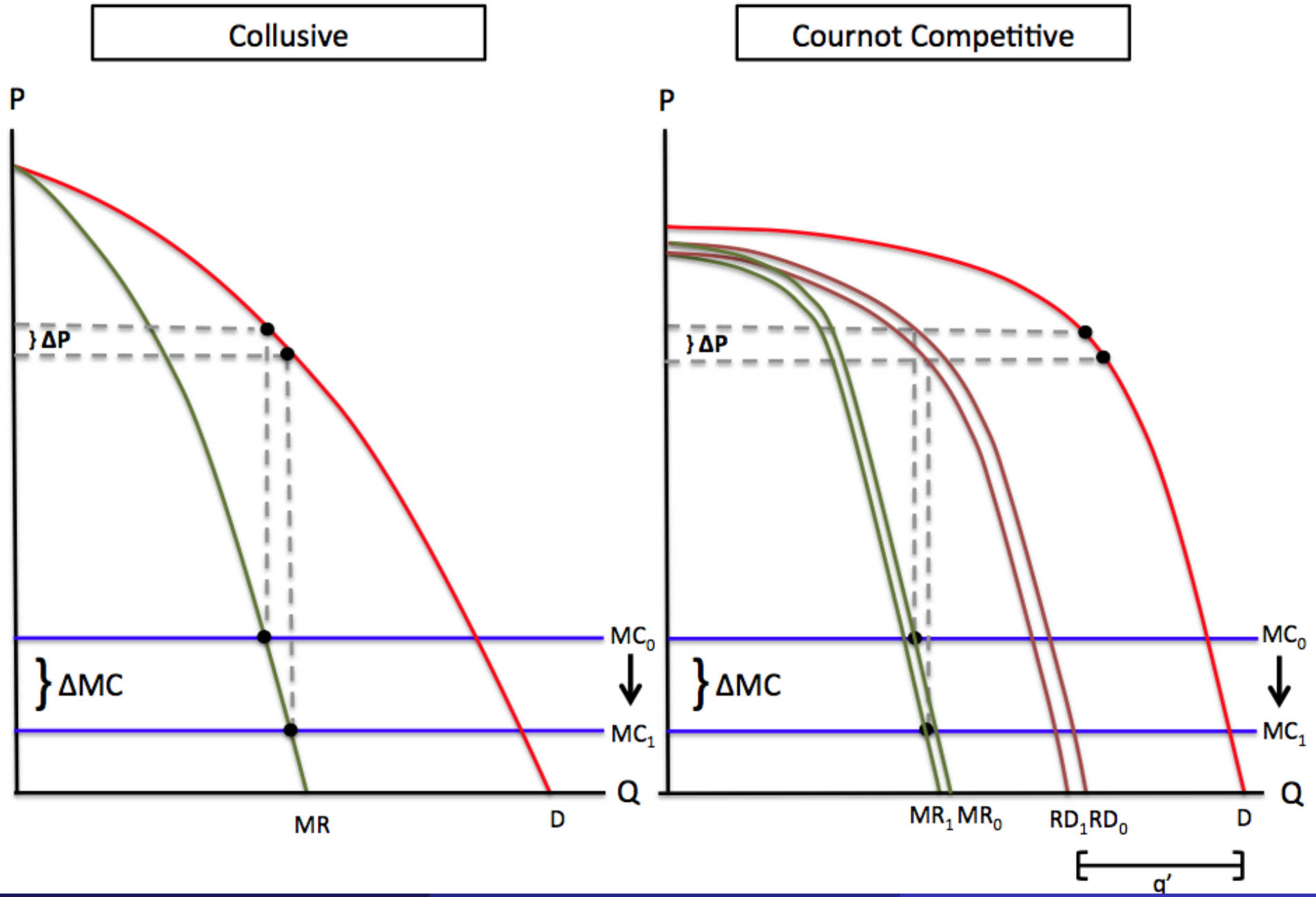

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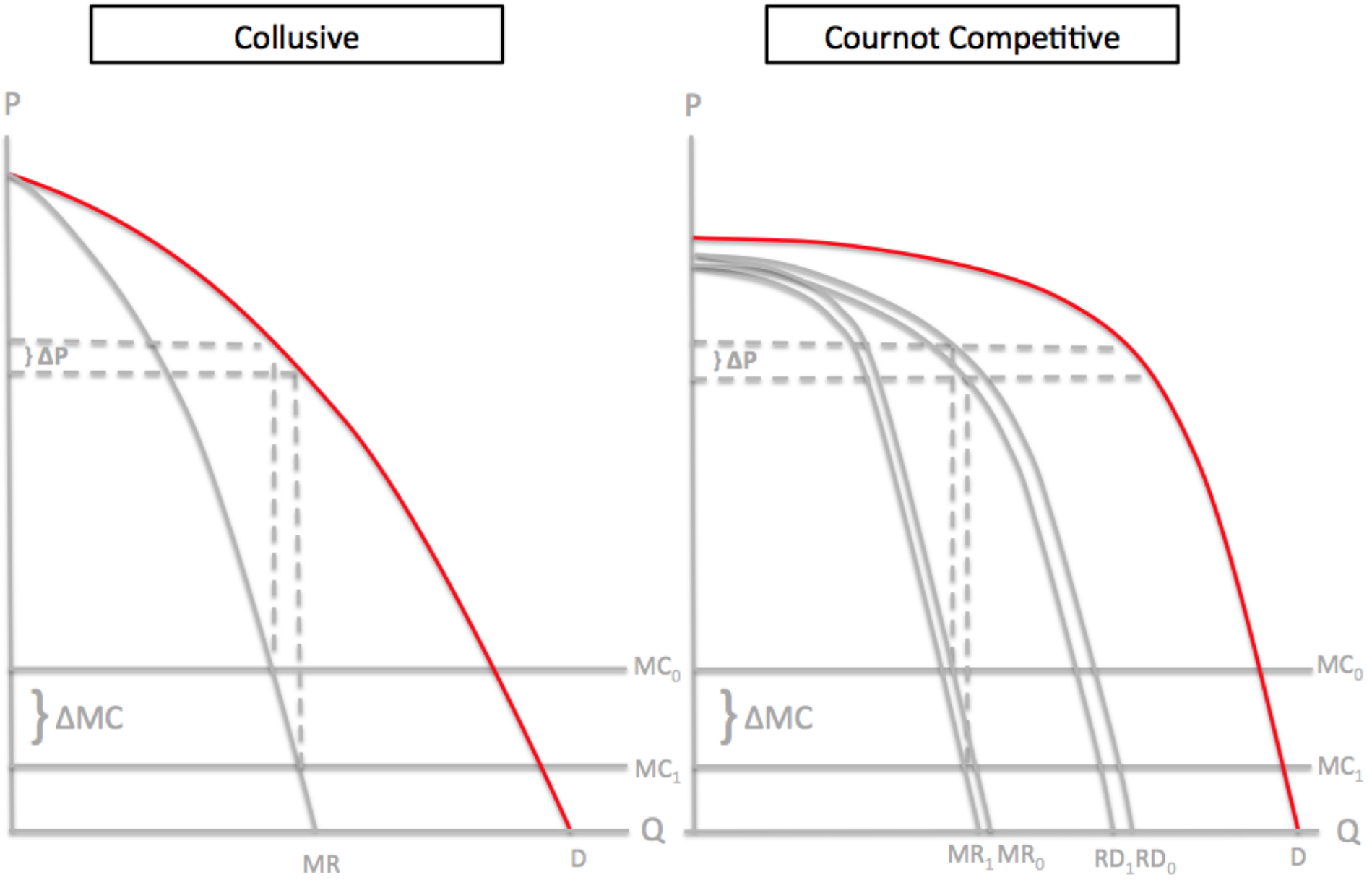
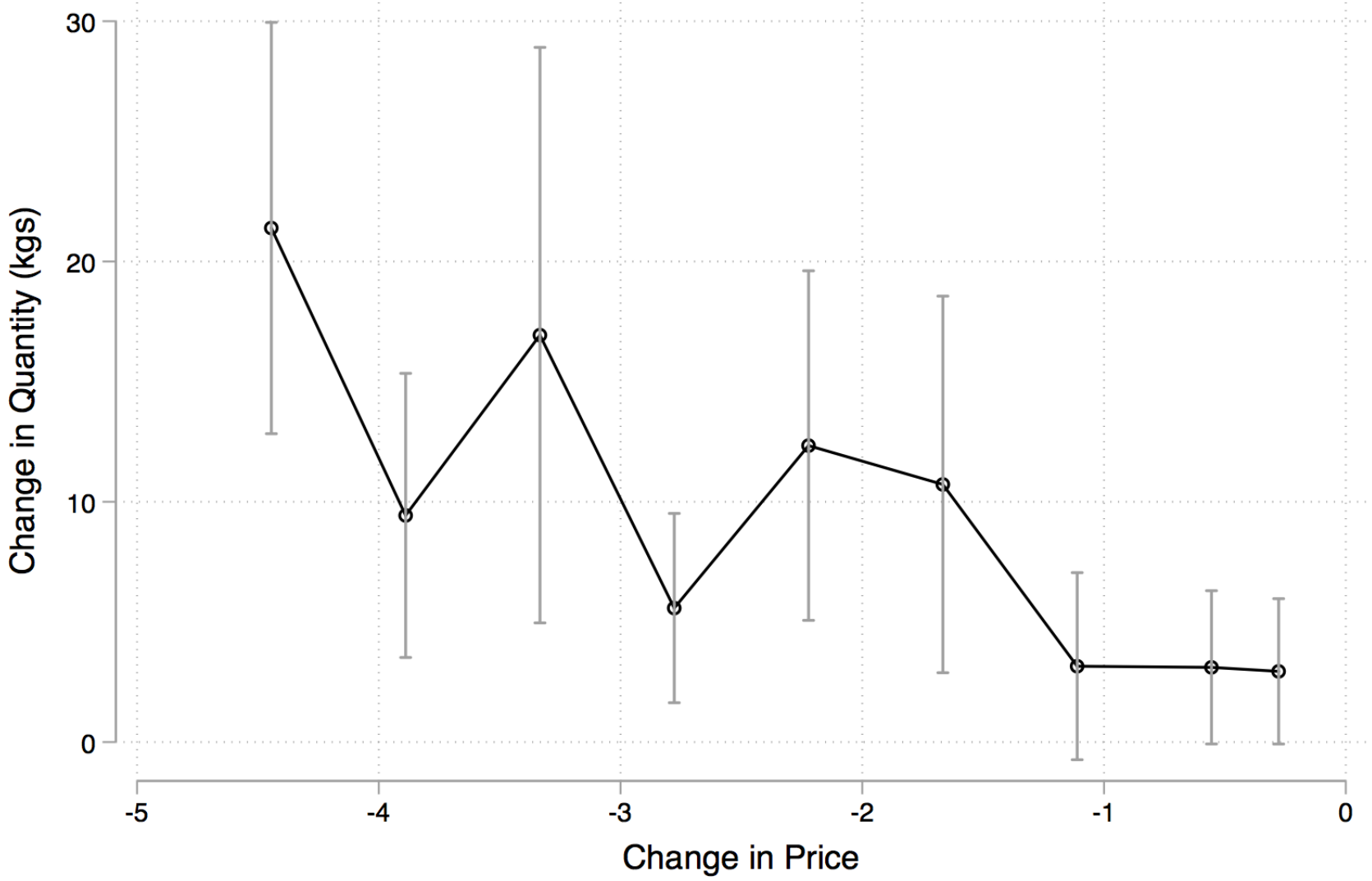


Demand experiment results



Demand model

Use experimental variation to estimate a general Bulow-Pfleiderer class of consumer demand functions:

$$q_{imt} = \begin{cases} \left(\frac{a - P_{imt}}{b_i} \right)^{\frac{1}{\delta}} \varepsilon_{imt} & \text{if } a > P_{imt} \\ 0 & \text{if } a \leq P_{imt} \end{cases}$$

Three nice features of this class of demand functions:

1. Flexible: Nests linear, quadratic, and isoelastic demand, among others
2. Parsimonious & tractable: Captures curvature with a small number of parameters (under homogenous demand, E simplifies to δ - 1)
3. Empirically consistent: For a given market structure σ, implies constant ρ

Demand estimation results

- Take logged first differences of the previous equation (b_i drops out)
- Estimate via GMM using random subsidy amounts as instruments for change in price

	Parameter Estimate	95% CI Lower Bound	95% CI Upper Bound
a	42.76	41.56	43.96
δ	4.0682	1.7060	6.4304

(An extension adds consumer heterogeneity is choke price (a_i), bringing in quantity response from PT experiment) More

Simple model – putting it together

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- Benchmarks for $\sigma(\omega)$ under various market structures:

$$\sigma(\omega) = \begin{cases} 1 & \text{if collusive} \\ N & \text{if Cournot competitive} \\ \infty & \text{if perfectly competitive} \end{cases}$$

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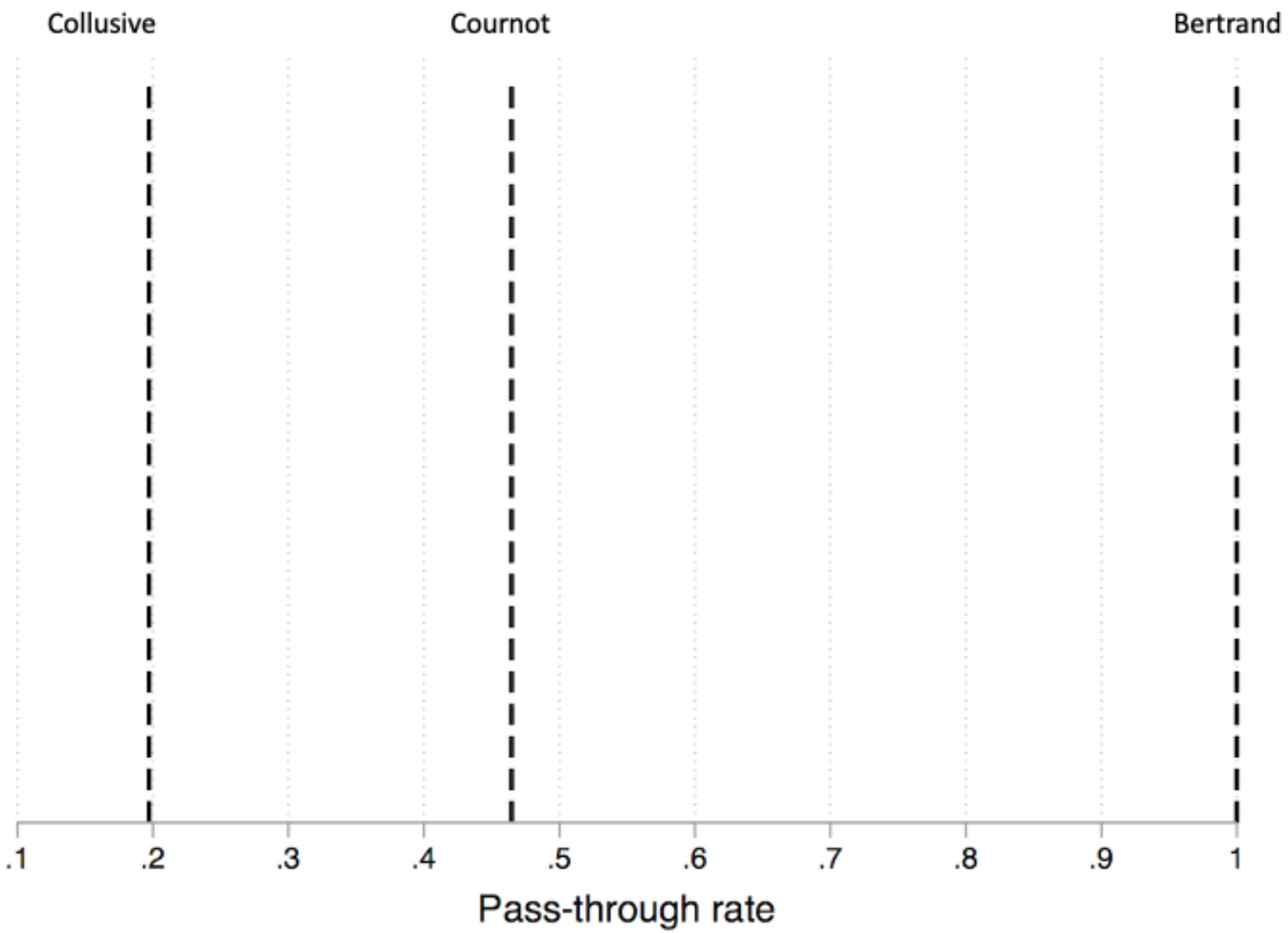
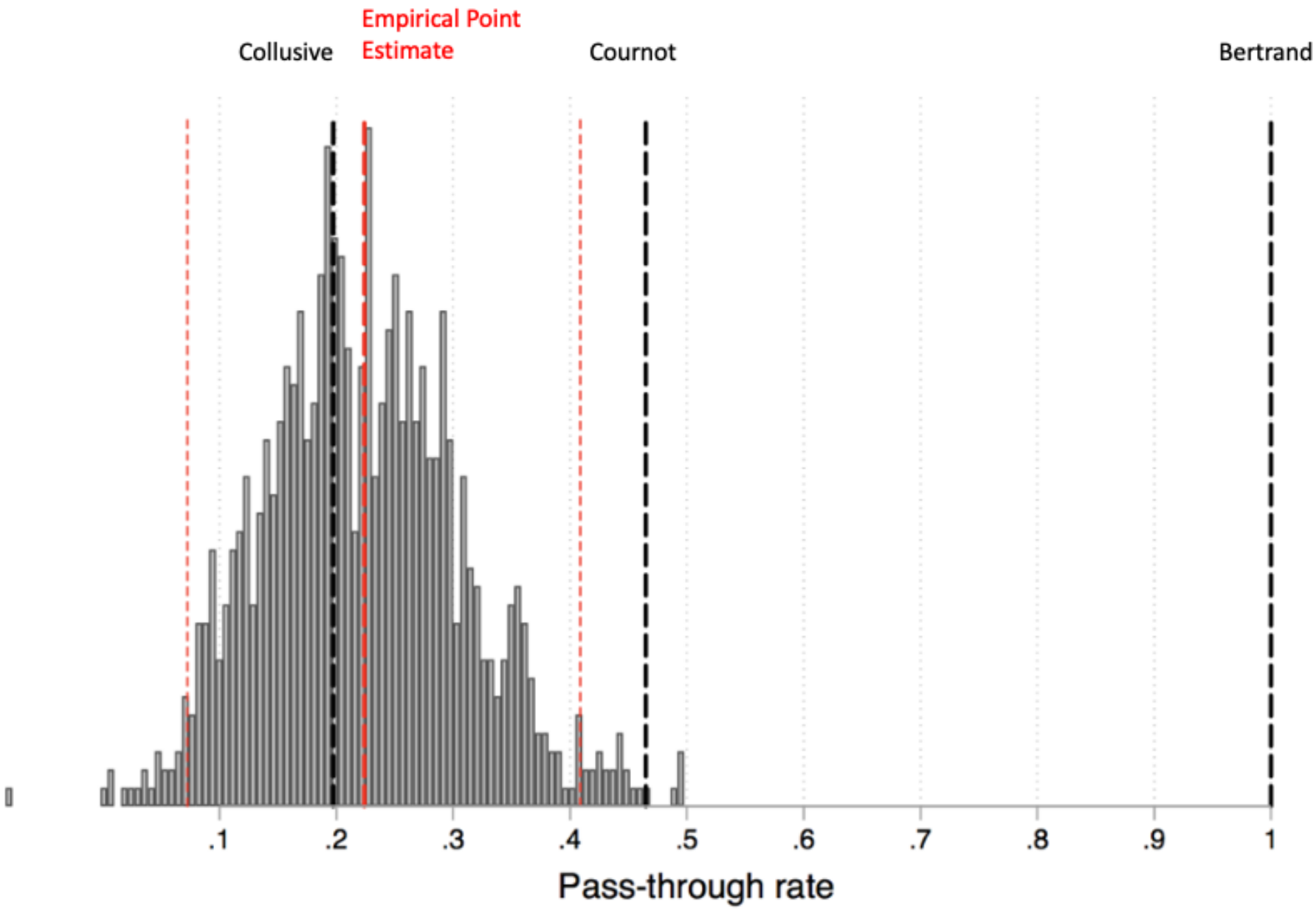
$\Rightarrow$ Can calculate what pass-through rate we should have expected if markets are operating under each market structure

Expected pass-through rate



Observed pass-through rate



Backing out competitiveness parameter $\sigma(\omega)$

We can solve for σ, taking into account all of the variation in our estimates of both δ and ρ:

$$\sigma = \frac{\delta\rho}{1-\rho}$$

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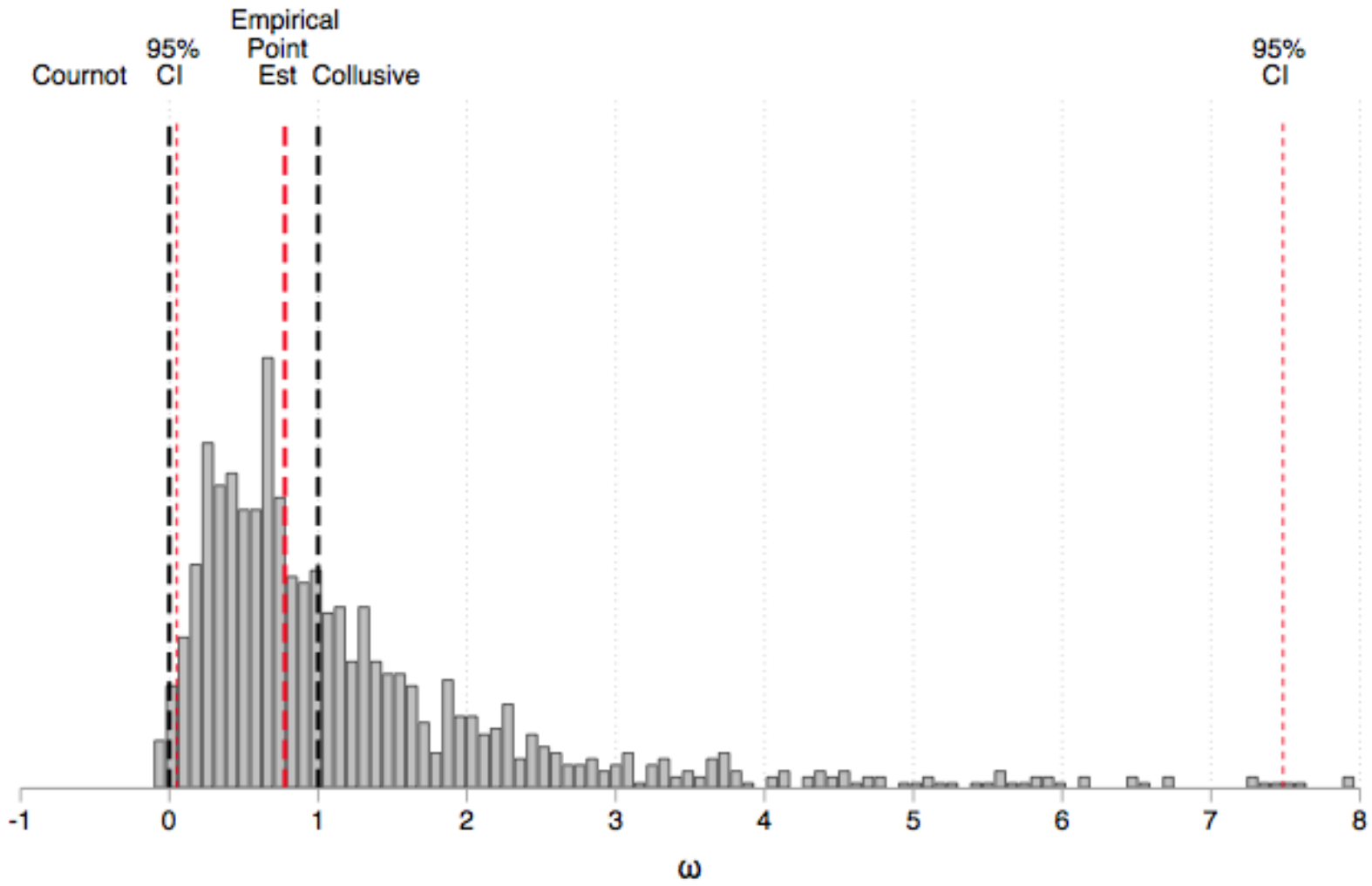
$$\sigma = \frac{\delta\rho}{1-\rho}$$

To interpret this as a profit weight, solve for ω using:

$$\sigma = \frac{N}{1+(N-1)\omega} \Rightarrow \omega = \begin{cases} 1 & \text{if collusive} \\ 0 & \text{if Cournot competitive} \end{cases}$$

Also nests Bertrand: $\omega = -\frac{1}{N-1}$

The bootstrapped distribution of ω



Point estimate is ω = 0.78, with a 95% CI of (0.05, 7.48)

Extensions and additional experiments

- Moving beyond the simple model, we allow for:
  - Non-constant marginal cost (using experimental variation from multi-market activity)
  - Trader cost heterogeneity
  - Demand heterogeneity in a_i (using additional moments from the cost shock experiment)

$\Rightarrow$ Doesn't change estimates much: $\omega = 1.07$ More

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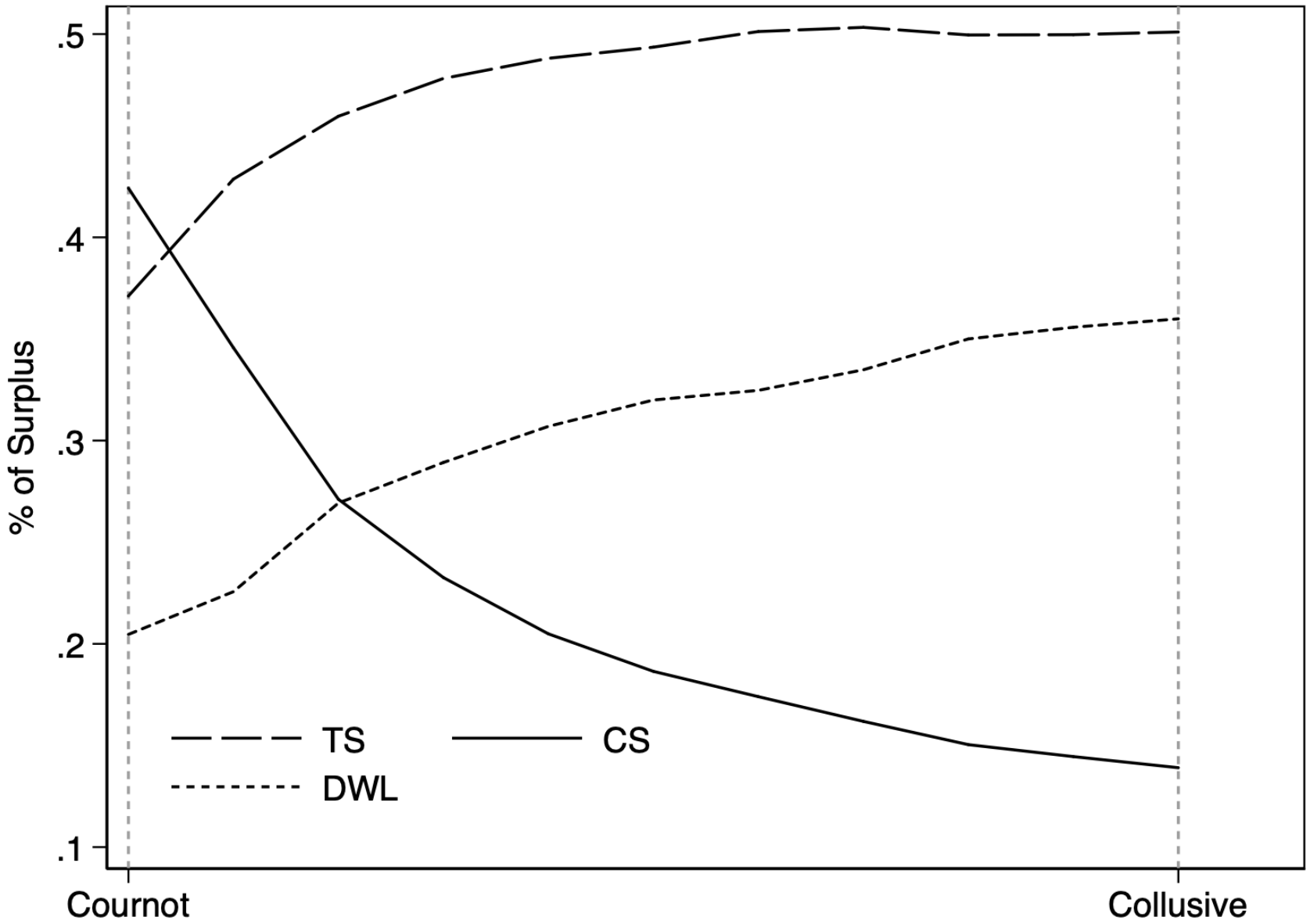
- Experimentally induce entry by new traders
  - Take-up of randomized subsidy amount allows estimation of the distribution of fixed costs
  - Entry by traders who already have contacts in markets doesn't increase competition much ($\omega = 0.95$), but entry by completely new traders does ($\omega = 0.44$)
  - But harder to get traders without contacts to enter (need to pay them more)

More

Trader markups, profits, and surplus

- Markups
  - We estimate median (mean) markups of 39% (48%)
  - Wide dispersion: s.d. of 35%
- Variable profits
  - We estimate median (mean) trader-market-week variable profits of 3,400 Ksh (14,000 Ksh)
- Fixed costs and total profits
  - Incumbents have median (mean) fixed costs of 1,800 Ksh (4,200 Ksh)
  - Dissipates 71% of variable profits for median trader
  - Median trader has 1,200 Ksh in daily total profit
- Surplus split
  - Traders capture 82%
  - Consumers capture 18%

Competitiveness counterfactuals



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Motivating question

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  - Here, focus on *information frictions*: it is difficult for consumers to learn about the existence and quality of firms across markets
- As a result, consumers often buy exclusively from a local producer, and producers sell mostly to local consumers. This means:
  - A limited consumer base may inhibit good firms from growing and exploiting economies of scale
  - Limited competition may allow bad firms to survive, lowering aggregate productivity and allowing cross-firm productivity dispersion to persist

Jensen and Miller (2018)

- Flipping the question: when a technology that facilitates search is introduced, do we see:
  - Better market integration
  - Increased market integration/competition “discipline” industry, reallocating profits and market share towards good firms and driving bad firms to exit (Melitz 2003)

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- Use same cell phone shock explored in Jensen (2007)

Rollout of cellphone towers

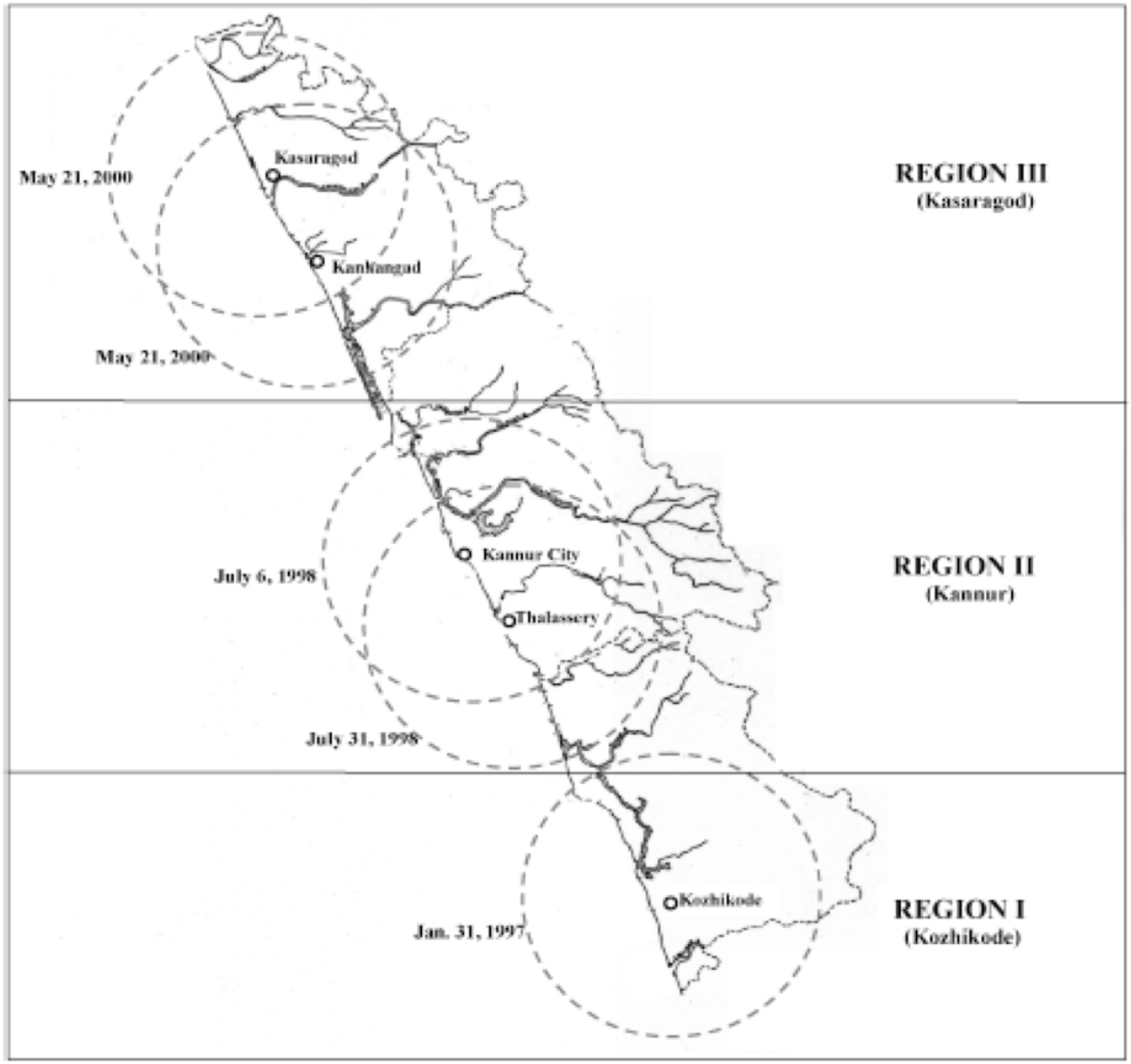

FIGURE II
Spread of Mobile Phone Coverage in Kasaragod, Kannur, and Kozhikode Districts

Effect on price dispersion

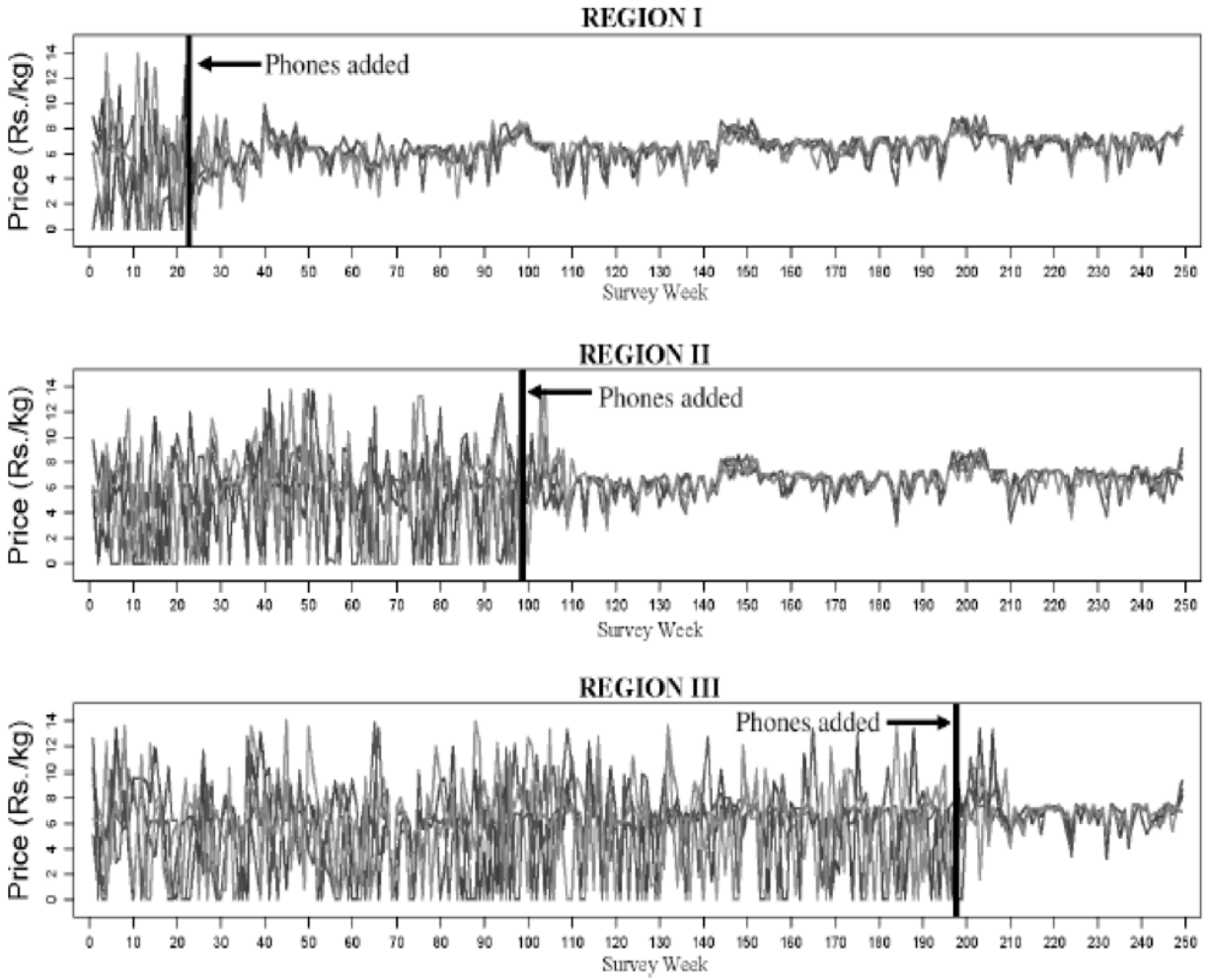

FIGURE IV

Prices and Mobile Phone Service in Kerala

Data from the Kerala Fisherman Survey conducted by the author. The price series represent the average 7:30–8:00 A.M. beach price for average sardines. All prices in 2001 Rs.

Effect on boat builder quality and firm selection

- At baseline, fishermen bought their boats almost exclusively (97%) from a local producer
- Roughly one boat builder in each village
- Lots of variation in quality across boat builders

Natural experiment: cell phone tower roll out

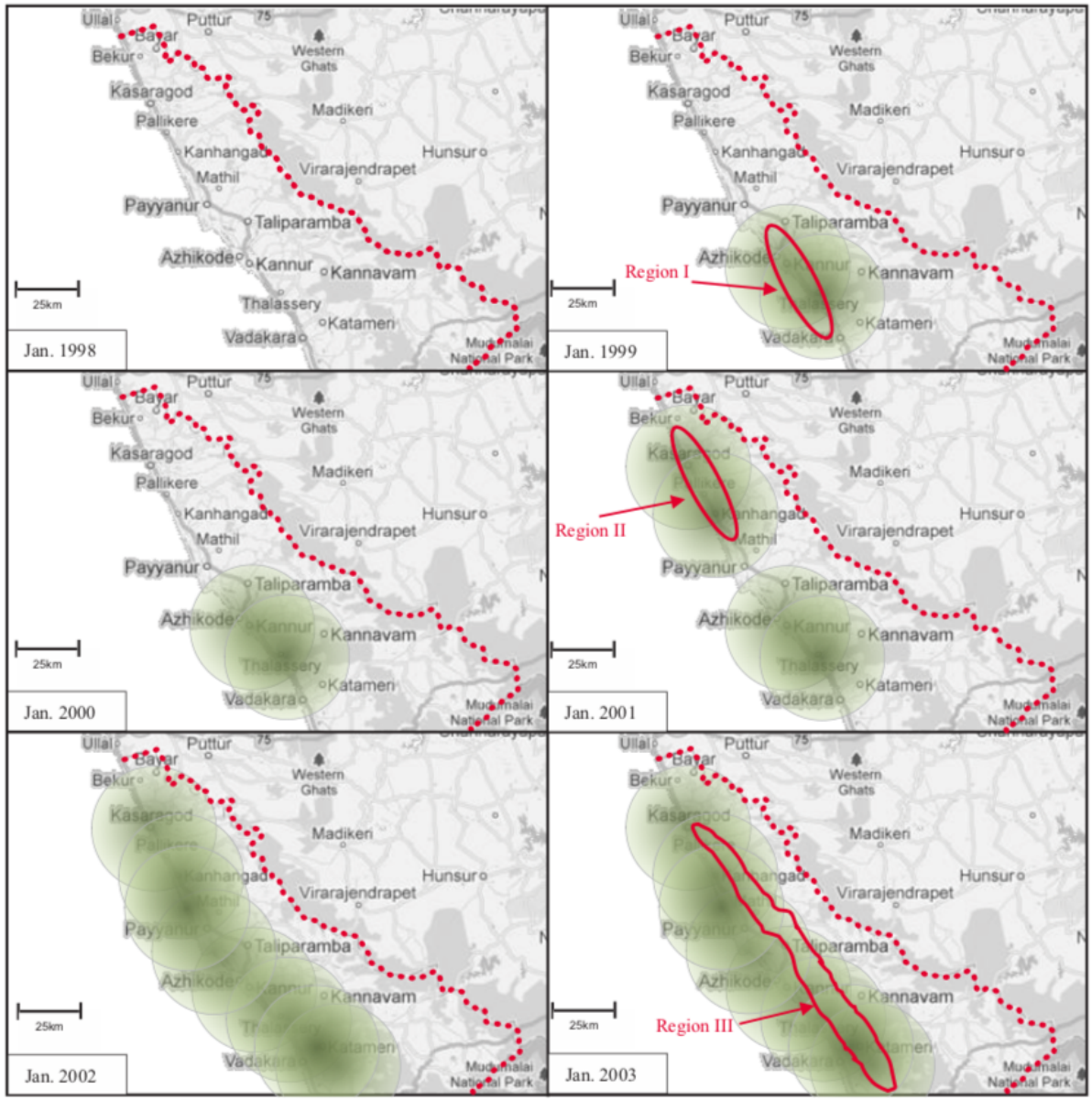

FIGURE 1. SPREAD OF MOBILE PHONES, JANUARY 1998–JANUARY 2003

Predicted causal chain

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4. Results in expansion for good builders and contraction/exit for bad builders
5. This improves aggregate productivity of the industry and (perhaps) improves outcomes for consumers

Changes in fishermen's behavior and info

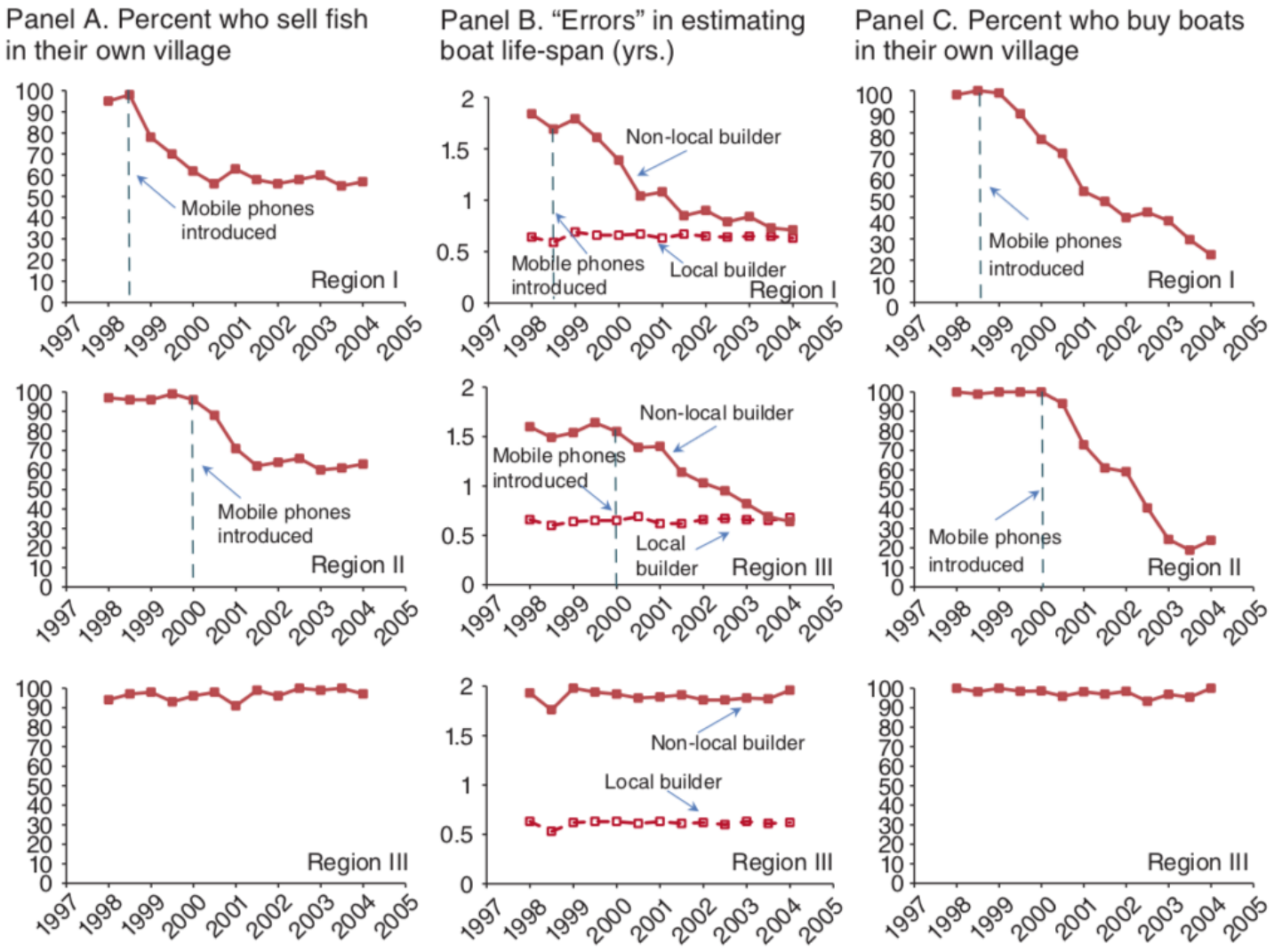

FIGURE 2. MOBILE PHONES AND FISHERMEN'S BEHAVIOR AND INFORMATION

Changes in exit, by firm productivity

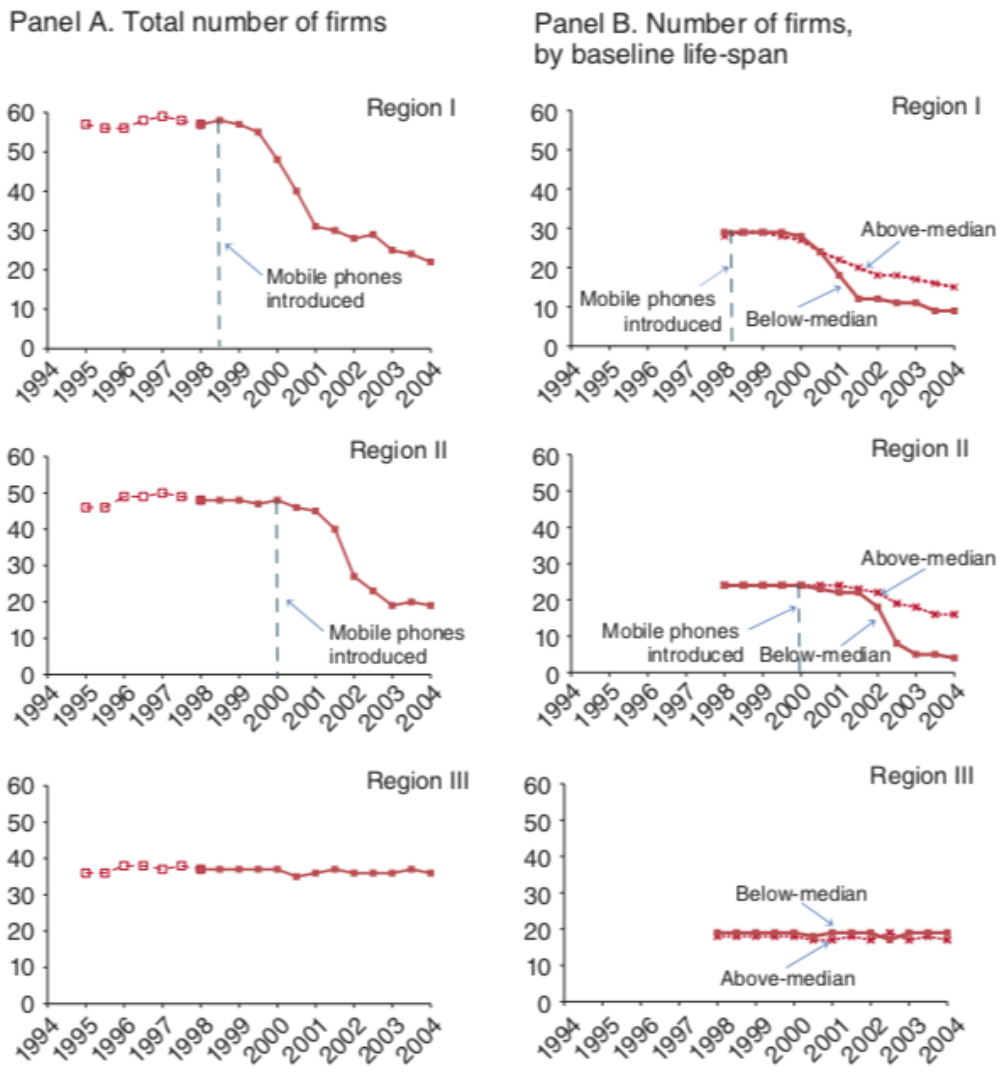

FIGURE 3. MOBILE PHONES AND THE NUMBER OF FIRMS

Aggregate productivity gains

- Do we see any aggregate productivity gains, as a result of these reallocations?
- Look at aggregate production: production by all firms, aggregated at the regional level
- Two measure of output:
  - Number of boats
  - Number of boat-years (quality adjusted)

Aggregate productivity gains

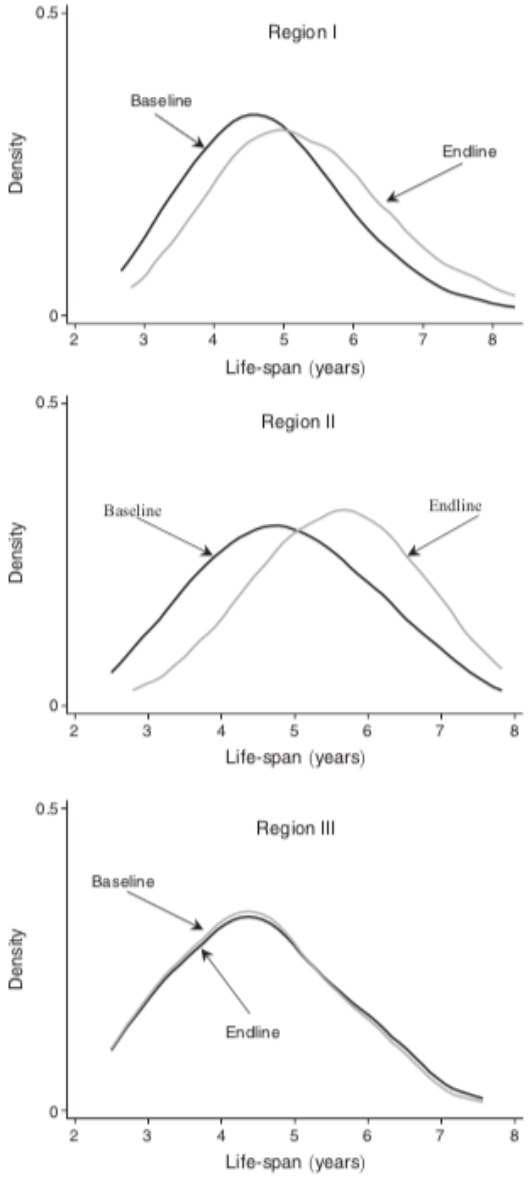

FIGURE 4. DISTRIBUTION OF BUILDER QUALITY

Additional results

- Increase in average quality due to reallocation to firms with higher baseline quality, rather than improvements within a firm
  - Specification with FE yields small and not sig. effects More
- Average variable costs fell
  - Mostly due to lower labor costs More
  - This is drive by both reallocation to firms with lower baseline costs (50%) and reductions in costs *within* firm (50%); tested again with firm FE More
  - Economies of scale: fall in tasks per worker More

Consumer gains

TABLE 5—POOLED TREATMENT REGRESSIONS: CONSUMERS

				With builder fixed effects		
	Price (1)	Assessed life expectancy (2)	Price per boat-year (3)	Price (4)	Assessed life expectancy (5)	Price per boat-year (6)
Region has phone	173.3	1.354	−207.3	146.3	−0.0325	34.56
	(54.95)	(0.330)	(51.10)	(67.18)	(0.0345)	(17.85)
Constant	4,034	4.039	1,062	4,098	4.753	950.9
	(38.48)	(0.113)	(25.09)	(43.30)	(0.0277)	(11.62)
Builder fixed effects	No	No	No	Yes	Yes	Yes
Observations	3,001	3,001	3,001	3,001	3,001	3,001

Notes: Dependent variable listed at the top of each column. Prices are in 1999 rupees, life expectancy measured in years. Data drawn from the fishermen survey. The sample is restricted fishermen who bought a boat in the six months prior to each round's survey. Regressions also include round fixed effects. Builder fixed effects in columns 4–6 are for the identity of the purchased boat's builder. Standard errors, clustered at the village level, in parentheses.

- Slight increase in price of boats (4%)
- But big increase in average quality in terms of boat life-span (32%)
- On net, the price per year of boat-life fell by 23% (short term?)

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Busso and Galiana (2019)

- CCT program in the Dominican Republic provides transfers to poor HHs that can only be used at grocery stores affiliated with the program
- Randomly increased the number of retailers eligible to be affiliated
  - Induced new “entry” by 61 small retail shops
  - RCT across 72 districts (“markets”)
  - In each district, 0-3 new stores
- Entry led to reduction in prices by 2-6% (more in areas with more entrants)
- Significant improvements in self-reported service quality

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Bjorkman Nyqvist, Svensson, and Yanagizawa-Drott (2022)

- Counterfeit medication a big problem among pharmacies in LMICs
- Randomly assigned entry of an (NGO) retailer of antimalarial drugs in Uganda
- Entrant provides superior product: authentic drug priced below market
- Incumbent prices dropped by 16%
- The share of incumbent firms selling fake drugs dropped by more than 50%
- Overall use of antimalarial drugs increased

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Macchiavello and Morjaria (2021)

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  - Before the harvest, mills provide inputs, extension services, and cash loans to farmers
  - Expectation is the farmers will sell back to the mills after harvest

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  - Before the harvest, mills provide inputs, extension services, and cash loans to farmers
  - Expectation is the farmers will sell back to the mills after harvest
- Greater competition among mills means farmers can renege more easily post-harvest, making relational contracting harder to sustain

Macchiavello and Morjaria (2021)

- Use a “donut IV” based on geographic variation in competition
  - Conditional on the suitability for mills’ placement in the catchment area (based on an engineering model)...
  - ...mills *surrounded by* more suitable areas face more competition from other mills

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  - Conditional on the suitability for mills’ placement in the catchment area (based on an engineering model)...
  - ...mills *surrounded by* more suitable areas face more competition from other mills
- Find that mills facing more competition:
  - Offer fewer relational contracts with farmers
  - Have worse performance: higher unit costs, lower volumes, lower cherry quality
- In aggregate, in catchment areas with more competition:
  - Lower aggregate quantity of coffee supplied to mills by farmers
  - Farmers are worse off: do see small increase in prices when sell to mill, but sell less overall to mill and do more home-processing (lower quality, prices), lower revenues overall

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Opportunities for future research on competition

- We discussed some of the challenges to studying competition in LMICs:
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  - History of distinct methodological approaches

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  - HH-run enterprises make it hard to separate supply/demand shocks
  - History of distinct methodological approaches

- But there are also opportunities unique to studying competition in LMICs:
  - Can experimentally estimate key features of standard IO approaches to avoid typical strong identification assumptions (e.g. experimentally estimate demand)
  - Can get exogenous – sometimes even randomized! – variation in entry, competition, etc. *at a market level* when markets are small/isolated

Opportunities for future research on markets

- Broader plug for market-level experimentation:
  - Useful not just for studying competition, but also policies affecting trade costs, migration, etc.
  - Relevant to this course: the impact of any intervention targeted at firms will be shaped by the market environment and how firms interact (e.g. even the classic cases of business training, microcredit, etc.)

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- Some other examples of market-level experimentation:
  - Akram et al (2025): randomized saturation of migration incentives
  - Bergquist et al (2025): randomized reduction in search costs
  - Burke et al (2019): randomized saturation of farmer loans
  - Cai and Szeidl (2024): randomized saturation of biz loans
  - Egger at al (2022): randomized saturation of cash transfers
  - McKenzie and Puerto (2021): randomized saturation of biz training
  - **Your paper next!**

Conclusion

Thank you!