# Research Question

- Effects of enforcing existing regulation in India
- Currently a bunch of firms flout international patent law; what happens if we enforce the law?
- Reduced competition: Patent protection gives firms market power
- What will the firms do with this market power?
- Will it hurt consumers?

# Approach

- Estimate Demand system for Quinalones (class of drugs) in India; need to estimate demand elasticities for this

- Product approach: define drugs along two dimensions
  1. Molecule
  2. Producer nationality (foreign vs. domestic)

- Bound counterfactuals with two extreme cases
  1. Perfect competition; $c_i^U = p_i$
  2. Perfect collusion; $c_i^L = p_i \cdot \left(1 + \frac{1}{\varepsilon_{ii}(p_i p_j)}\right)$

# Demand (Upper Stage)

- AIDS model of demand; two-step choice

- In the first stage, allocate spending across categories of drugs:

$$\omega_{Grt} = \alpha_G + \alpha_{Gr} + \sum_H \gamma_{GH} \ln P_{Hrt} + \beta_G \ln \left( \frac{X_{rt}}{P_{rt}} \right) + \varepsilon_{Grt}$$

(Upper Stage)

- Authors include $r$ subscripts to allow different prices in each region

# Demand (Lower Level)

- In the second step, consumers choose a product, and each product is defined by its molecule and its manufacturer (foreign vs domestic.

$$\omega_{irt} = \alpha_i + \alpha_{ir}$$
$$+ \underbrace{\gamma_{ii} \ln p_{irt}}_{\text{own price}} + \overbrace{\gamma_{i,10} \ln p_{jrt,j=D_i^{10}}}^{\text{same molecule; different country}}$$
$$+ \underbrace{\sum_{j \in D_i^{01}} [\gamma_{i,01} \ln p_{jrt}]}_{\text{different molecule; same country}} + \underbrace{\sum_{j \in D_i^{00}} [\gamma_{i,00} \ln p_{jrt}]}_{\text{different molecule, different country}}$$
$$+ \beta_i \ln \left( \frac{X_{Qrt}}{P_{Qrt}} \right) + \varepsilon_{irt}$$

# Estimation

- The authors can't use OLS
  1. *Not* worried about endogeneity (because price controls screw up the firm's FOCs anyway)
  2. *Are* worried about measurement error

- Construct an "approximate" price index (with measurement error)

- Instruments must be
  1. Correlated with the true price index, $p_j^A$
  2. Uncorrelated with error term $\varepsilon_i$

# Instruments

- Authors use SKU prices as instruments for the price index
- I'm not sure if I believe them... They even mention that, if new SKUs indicate improving quality, etc. then their instruments might be correlated with the error term (thoughts?)
- List of instruments:
  1. Number of SKUs in each group
  2. Prices of the five largest SKUs in each group
  3. All exogenous variables

# Counterfactual

- Remove different numbers of domestic drugs
- Assume the foreign firm(s) have monopoly power
  - Either full monopolists, or facing price constraints, depending on scenario
- Calculate the price the new monopolist would charge (potentially subject to constraints)
- Welfare analysis

# Findings

- Full model helps with counterfactual substitution patterns
- "Welfare" is Consumer Surplus + Firm Profits
- Welfare changes measured as Compensating Variation
- Three driving forces
  1. Lost variety
  2. Expenditure switching
  3. Reduced competition

# Findings

- Domestic products are very good substitutes for each other
- Most of the welfare changes ($> 80\%$) are due to lost consumer welfare
- Authors claim that this is likely due to lost "variety"
  - Domestic products have more different types (dosage/pill, pills/bottle, etc.)
  - Domestic products also have better distribution networks; more readily available at local pharmacies

# Critique

- The competition on the supply side seems a bit suspect
- If "variety" or "distribution network" is an important aspect of consumer choice, those product attributes should be in the model somewhere
- I don't think that "foreign vs. domestic" does a good enough job capturing this

# Proposed Counterfactual

- Firms have two choice variables:
  1. Price
  2. Quality

- In addition to a $p_i$ estimate, firms have another parameter in their decision, $v_i$
  - This is the price of producing "variety"; think of it as the cost of establishing a distribution network
    - (Naturally domestic firms would be able to establish a widespread distribution network more cheaply)

- Firms now choose a pair $\{p_i, N_i\}$, where $N_i$ is the size of their distribution network, produced at a cost of $N(v_i)$

# What might happen?

- Given the existing competition, foreign firms might not find it profitable to invest in their (expensive) distribution network
- However, given the regulation, they may then find it profitable to invest in a large distribution network, potentially as large or larger than the existing domestic networks (economies of scale)
- This dynamic supply-side response will restore a lot of the "variety" driving the welfare losses in the original counterfactual
- I saw this dynamic supply-side model in *Neilson, Allende and Gallego* (2019)