Trading Away Wide Brands for Cheap Brands

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Motivation

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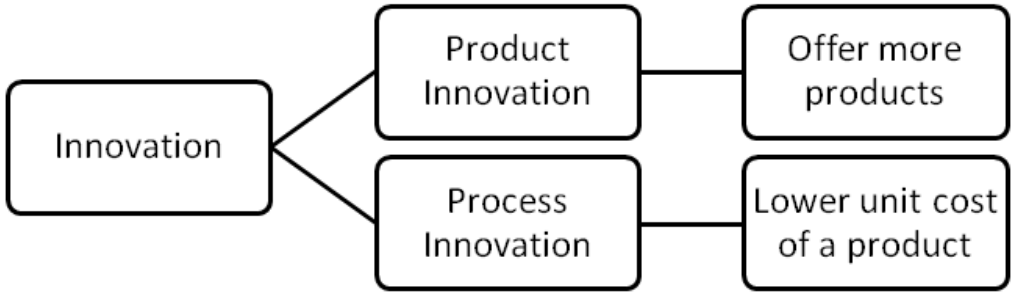
  - Half of new US products, 2/3rds of Spanish productivity.
- Trade liberalization affects firm investments in variety and productivity.
  - Canada, Argentina, Mexico.
- Standard trade models do not address the tradeoff of firm investments in variety and productivity.
  - Higher quantity (or better quality) at original production cost through economies of scale.

Unbundling Innovation

- I address this tradeoff by considering multiproduct firms with competing needs for product and process innovation.



- **Firm reorientation.** Product life cycle, firm and industry evolution, exporting.
- **Trade, competition and innovation.** Depends on dimension of innovation and firm.
- **Welfare and Policy.** Reveals new GFT from product innovation. Relates innovation policy to trade and competition.

Approach and Preview

- Krugman-type monopolistic competition model of product differentiation.
- Each firm chooses product variety and production processes.

- Linear demand system with brand differentiation, introduces cannibalization of products within firms.
  - **Distinction.** Product innovation cannibalizes, Process innovation does not.
  - **Channels for Innovation.** Economies of scale $\Longrightarrow \uparrow$ Process innovation. Tougher competition + Cannibalization $\Longrightarrow \downarrow$ Product innovation.
  - **Welfare and Policy.** $\downarrow$ Product innovation $\Longrightarrow$ GFT from low elasticity varieties. Trade increases the need to encourage process vs product innovation.

Outline

Outline

Related Work

Trade and Innovation

- Grossman and Helpman (1993), Yeaple (2005), Atkeson and Burstein (2007), Lileeva and Trefler (2007), Bustos (2009).

Multiproduct firms

- **?**, Agur (2007), Arkolakis and Muendler (2007).

- Nocke and Yeaple (2005), Mayer, Melitz, and Ottaviano (2009), Eckel and Neary (2010), **?**, Bernard, Redding, and Schott (2008).

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Benchmark Model

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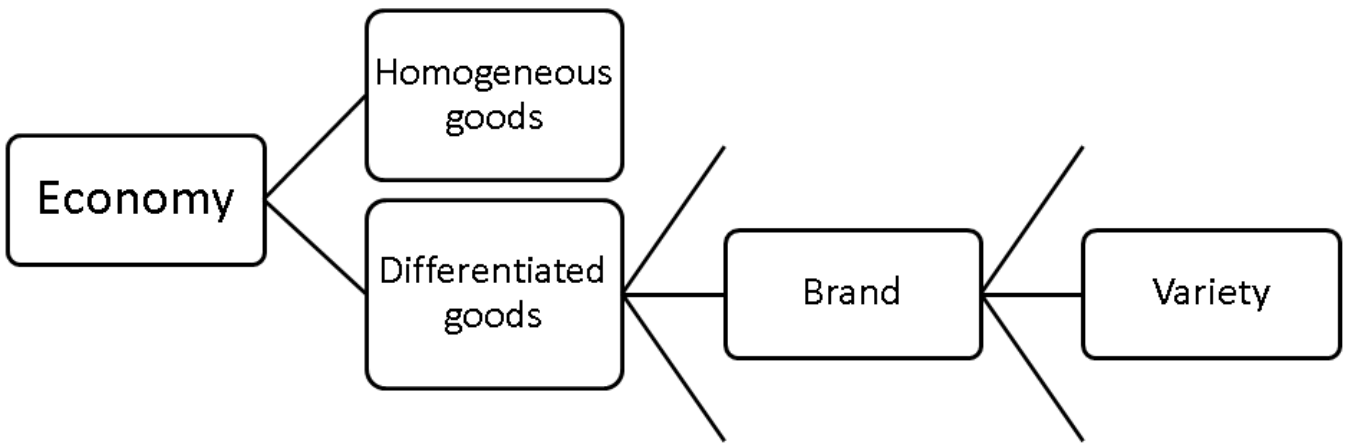
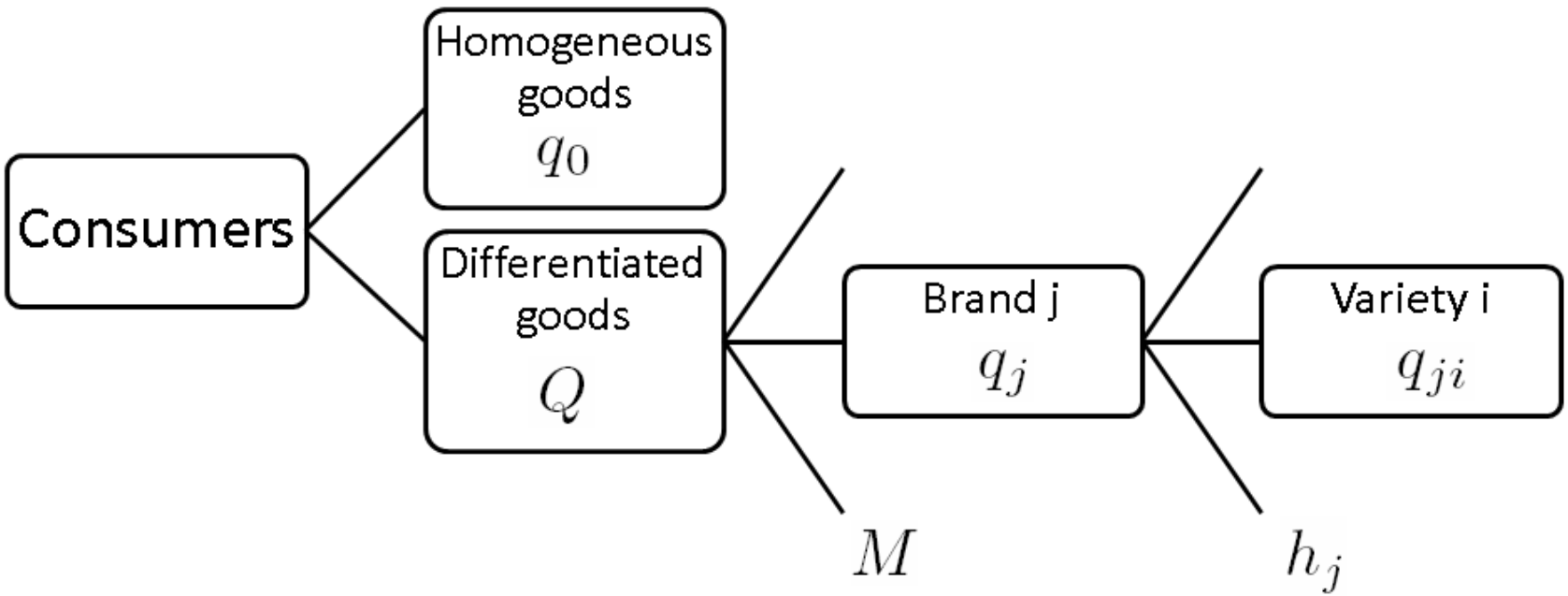
- Melitz and Ottaviano (2008) with Brand Differentiation.
- L agents, each endowed with a unit of labor. $w = 1$.



Consumers

Brand-wide consumption$= q_j = \int_0^{h_j} q_{ij} di$.

Industry-wide consumption$= Q = \int_0^{M} q_j dj$.



Brand Differentiation and Demand

- Consumer k's demand for brand j's product i is q_{ij}^k.
- $\alpha, \delta, \gamma, \eta > 0$. Brand consumption $= q_j^k$ and Industry consumption $= Q^k$.

$$U \equiv q_0^k + \alpha Q^k - \frac{\delta}{2}\int_j\int_i (q_{ij}^k)^2 didj - \frac{\gamma}{2}\int_j (q_j^k)^2 dj - \frac{\eta}{2}(Q^k)^2$$

- Demand for brand j's product i is $q_{ij} = Lq_{ij}^k$.

$$p_{ij} = \alpha - \delta q_{ij}/L - \gamma q_j/L - \eta Q/L$$

Within-Brand Cannibalization

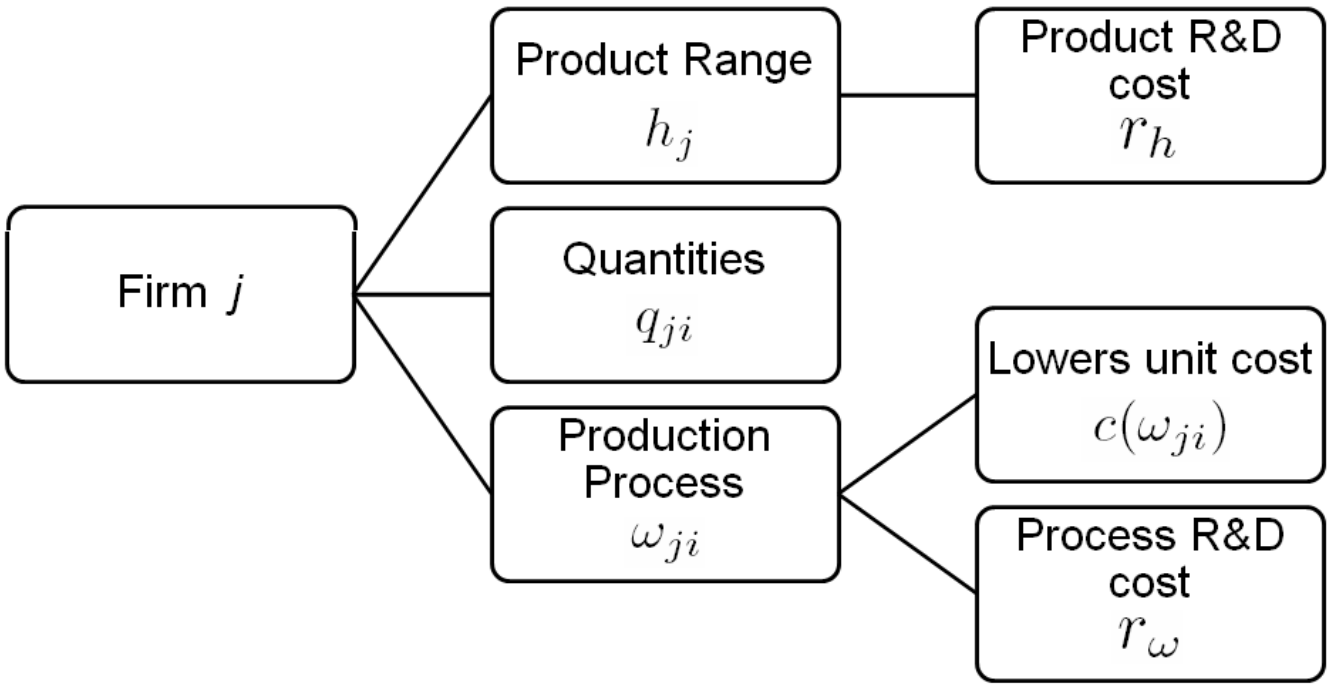
$$p_{ij} = \alpha - \delta q_{ij}/L - \gamma q_j/L - \eta Q/L$$

- Across-brand demand effect $= \partial p_{ij}/\partial q_{i'j'} = -\eta/L$.
- Within-brand demand effect $= \partial p_{ij}/\partial q_{ij} = -(\gamma+\eta)/L$.

- Within-brand cannibalization: Fall in inverse demand due to brand differentiation.
  - $\gamma > 0$ implies Within-Brand Price Fall$>$ Across-Brand Price Fall.
  - $\gamma = 0$: No cannibalization.

Firms

Differentiated goods industry: Pay entry cost f to produce with unit cost c.



Firms

$$\max_{\{\omega_{ij},q_{ij}\},h_j} \Pi_j = \int_0^{h_j} [(p_{ij} - c(\omega_{ij}))q_{ij} - r_\omega \omega_{ij} - r_h]di - f$$

- $c'(\omega_{ij}) < 0$ (and joint concavity). Higher ω implies lower unit cost. more

- Symmetric costs within firms $\implies \omega_{ij} = \omega$, $q_{ij} = q$.
- Firms choose process ω, quantity per product q and product range h.
- Assume Free entry of firms to determine equilirbium.

Optimal Process

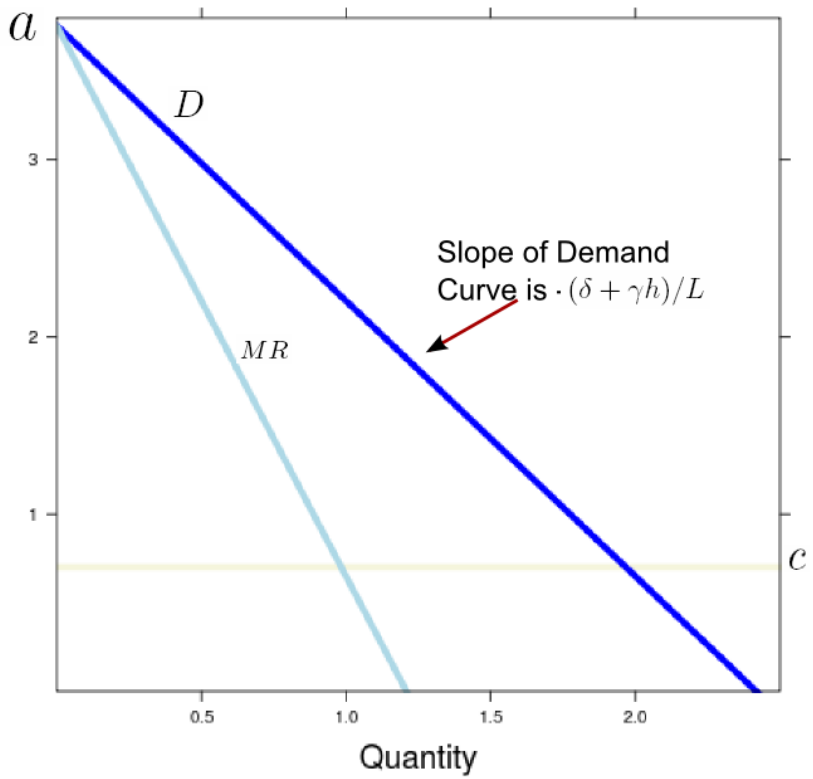
$$\underbrace{-c'(\omega)q}_{\text{Unit cost savings}} - r_\omega = 0$$

- Economies of scale through q.
- No direct cannibalization: $\partial\omega(q,\gamma)/\partial\gamma = 0$.
- $c(\omega) = c(1-\omega^{1/2})$ for $\omega \in [0,1]$.

Optimal Quantities

Inverse Demand: $p = a - \delta q/L - \gamma h q/L$ where $a \equiv \alpha - \eta Q/L$.

$$[p - c(\omega)] - (\delta + \gamma h)q/L = 0$$



Optimal Products

- Profit from new product: $\pi = [p - c(\omega)]q - r_\omega \omega - r_h$.
- Cannibalization from new product: Price falls by $\gamma q / L$.

$$\pi - h(\gamma q / L)q = 0$$

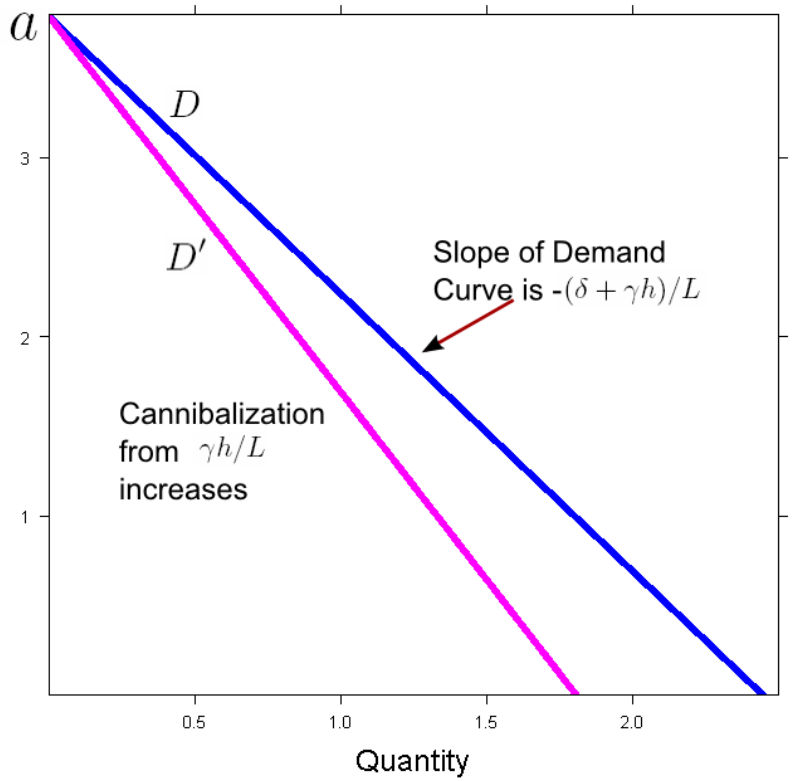
- **Direct Cannibalization:** $\partial h(q, \omega, \gamma)/\partial \gamma < 0$**.**

Optimal Products

- Products h enable firms to adjust price elasticity of demand ε.

$$\pi - h\pi'(\varepsilon)\partial\varepsilon/\partial h = 0$$

- New product $\uparrow h \Longrightarrow \downarrow$ demand for existing products $\Longrightarrow$ With linear demand, $\varepsilon \uparrow$ for existing products.



Brand Differentiation: Innovation and Welfare

Innovation

- *Product innovation cannibalizes while process innovation does not.*
  - $dh/d\gamma < 0$ and $d\omega/d\gamma = dq/d\gamma = 0$. more
  - q depends on MR $=$ MC.
  - h depends on π =Cannibalization and hence on p.

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Welfare

- *Unbundling innovation shows welfare gains from product innovation.*
- Indirect utility is $V^k = 1 + Mh(\alpha - p)/2(\delta + \gamma h + \eta Mh)$.
  - Rises with Lower Prices $p = c(\omega)$+Markup.
  - Rises with Total Variety Mh.
  - Falls with Within-Brand Variety γh, given total variety. *Access to low-elasticity varieties.*

Free Trade

- Think of two identical countries with segmented markets for differentiated goods and free trade in the homogeneous good.
- Free Trade acts like an increase in market size, from L to $2L$.

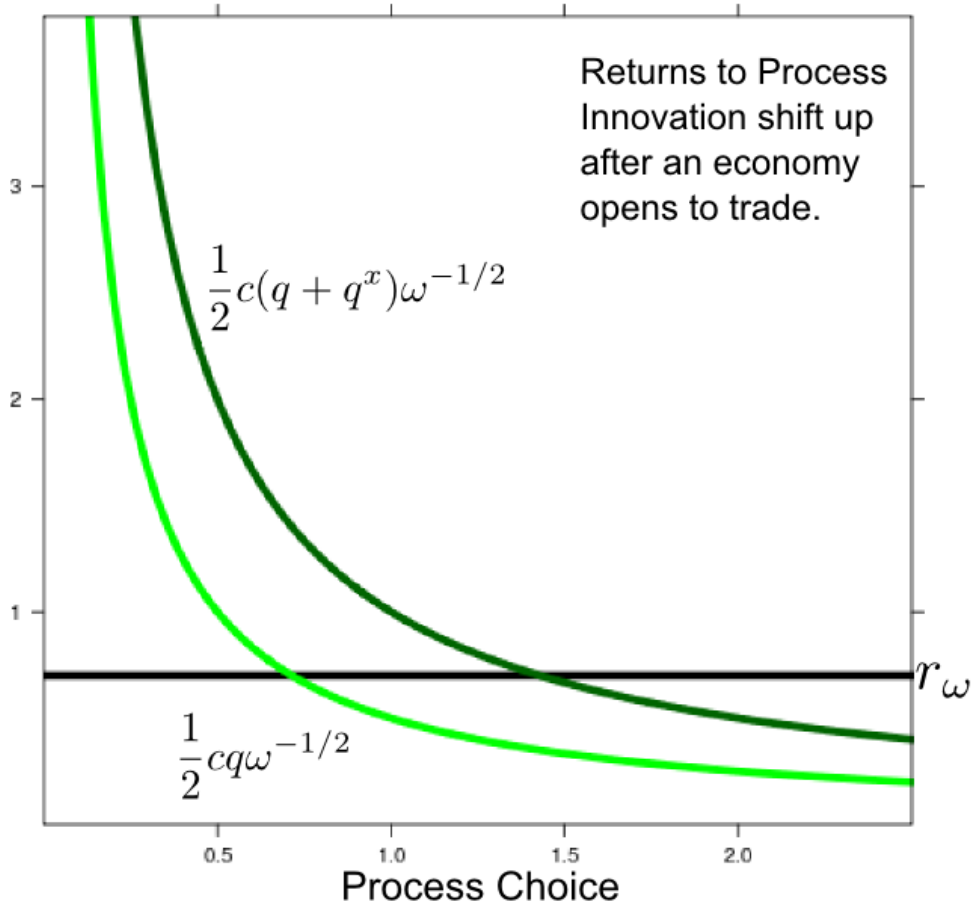
Proposition

Moving from autarky to free trade increases process innovation but reduces product innovation.

- Gains from Lower Prices because $c(\omega)$ and markups fall.
- Gains from Variety because Mh rises and h falls.

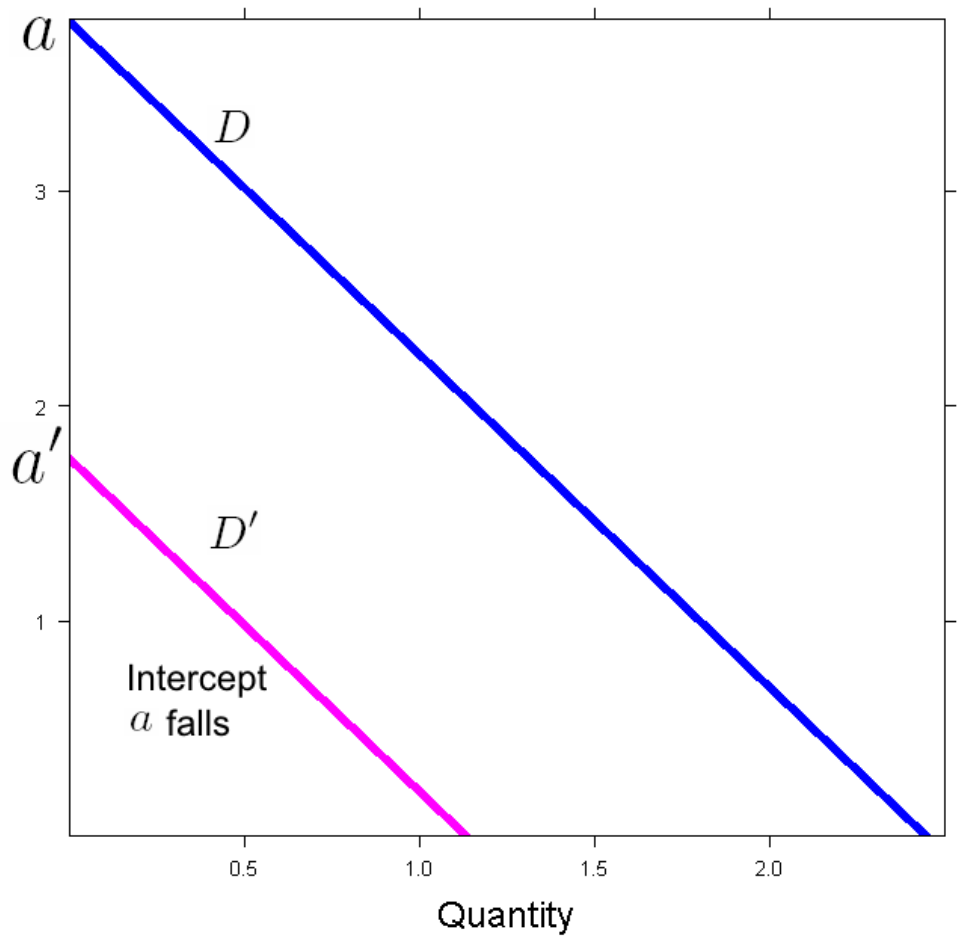
Impact of Trade: Economies of Scale

Trade $\Longrightarrow$ Market expansion (q^x sold in foreign market) $\Longrightarrow$ For any home quantity, Process innovation ω becomes more viable.



Impact of Trade: Competition

Trade $\Longrightarrow$ Competition rises (a falls) $\Longrightarrow$ Demand elasticities rise $\Longrightarrow$ Narrow product range $\Longrightarrow$ Ease within-brand cannibalization $\downarrow \gamma h/L$.



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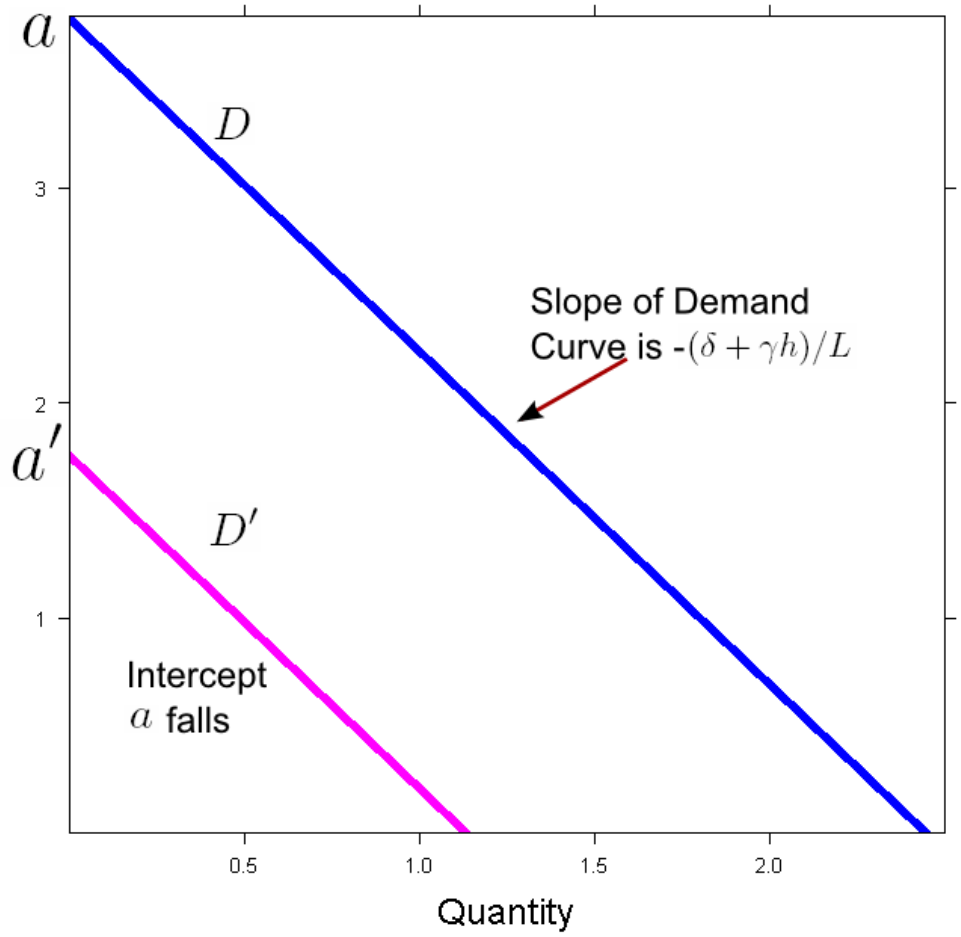

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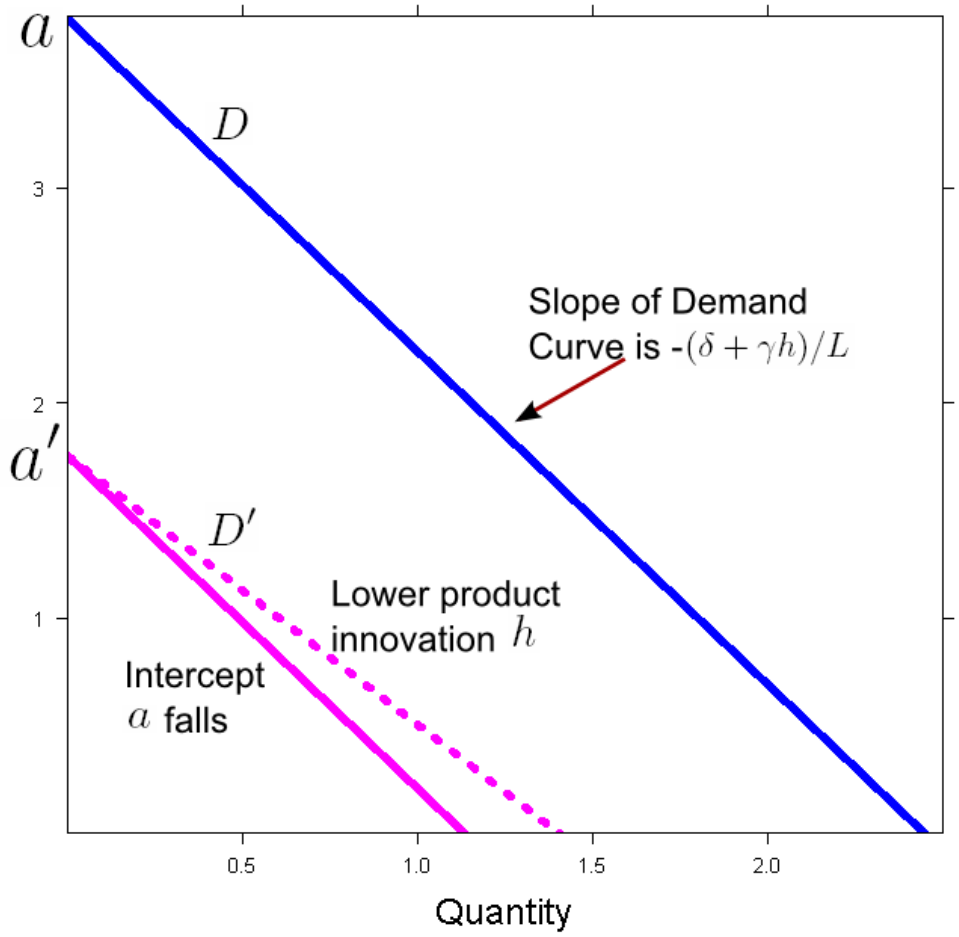

Welfare and Policy Effects of Unbundling Innovation

- *Gains from Product Innovation absent in models without within-brand cannibalization or process innovation.*
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  - Differential impact of trade on returns to product and process.

- *Trade makes inadequate process innovation more costly.*
  - Innovation policy: $(1-\tau_\omega)r_\omega$ vs. $(1-\tau_h)r_h$.
  - Relative Benefit of Process vs. Product: $RB_{\omega h} = (dU/d\tau_\omega)/Mhr_\omega\omega - (dU/d\tau_h)/Mhr_h$.

- Encourage process innovation. Even more after trade.
  - Same effect of τ_ω and τ_h on prices.
  - Process also reduces c so direct impact on fall in markups.
  - Economies of scale in reducing c so higher τ_ω after trade.

Outline

Within-Brand and Across-Brand Competition

- Assumed Within-brand price fall $>$ Across-brand price fall.
- Interaction between within-brand and across-brand competition.

$$p_{ij} = \alpha - \frac{\delta}{L} q_{ij} - \frac{\gamma}{L} q_j - \frac{\eta}{L} Q_i - \frac{\kappa}{L} q_j Q_i$$

- Within-brand price effect $= \partial p_{ij} / \partial q_j = -(\gamma + \kappa Q_i)/L < 0$.
- Across-brand price effect $= \partial p_{ij} / \partial Q_i = -(\eta + \kappa q_j)/L < 0$.
- Product characteristics: i competes with similar products Q_i. Within$>$Across if $Q_i = Q$.
- $\kappa \geq 0$: Benchmark model. $\kappa < 0$: Prefer market visibility of variety.

Innovation and Across-Brand Competition

- High Visibility: Process innovation same as earlier. Trade $\Longrightarrow \uparrow$Process innovation.
- But now Trade $\Longrightarrow \uparrow$Product innovation.
- Why? Visiblity effect $>$ Cannibalization effect.

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- *Trade provides welfare gains from higher variety, lower prices and product innovation (given total variety).*
  - Within-brand cross-elasticity falls.
- Policy: Process vs. Product innovation similar.
  - Need to encourage entry vs. product innovation with trade.
  - Trade increases brand size so lowers need for entry subsidy.

Heterogeneous Firms

- Single cost draw per firm. $c \sim G(c)$ on $[0, c_{\max}]$.
- Discrete Process Choice: Can upgrade process from c to $c - \omega(c)$ by paying r_ω. Assume $\omega'(c) < 0$.

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- Bilateral trade liberalization:
  - Exporters are more likely to undertake process innovation.
  - Low-productivity exporters and non-exporters reduce product innovation.
  - High-productivity exporters engage in higher product innovation.
- Opposite effects with unilateral home tariff liberalization.

Outline

Conclusion

Tybout and Westbrook (1995): "bulk of production gains" within firms.
Initial steps to unbundle the relationship between trade and innovation.

1. Distinguishes product and process innovation.
2. Explains how trade and competition affect product and process innovation.
3. New channel for the effect of trade on innovation.
4. Innovation policy related to trade and nature of competition.

Future work: New Innovation surveys.

HSE

Thank you!

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