Multi-Product Firms at Home and Away: Cost- Versus Quality-Based Competence

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IGC Growth Week
London School of Economics
September 21, 2010

Margins of Adjustment to Globalization

- Sectors: general equilibrium adjustments
- Output of firms: the "intensive margin"
- Number of firms: the "inter-firm extensive margin"
- Number of products per firm: the "intra-firm extensive margin"
- Profile of outputs across a firm's products

What makes a successful exporting firm?

- Firm Productivity?
  - Evidence of firm selection into exporting
    - Clerides, Lach and Tybout (*QJE* 1998), Bernard and Jensen (*JIE* 1999)
  - Theory: Only the most productive firms can cover the extra costs of exporting
    - Melitz (*Em* 2003)

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But: Are these two views opposed?

- We show not, by focusing on the "intra-firm extensive margin":
  - Adjustments in the range of goods produced by multi-product firms

Our Contribution

1. We combine quality and multi-product firms
2. This allows us to model endogenous choice between *cost-based* and *quality-based* competition
3. We test this on Mexican data and confirm a key prediction of the model

Our Contribution II

- Theory: Builds on Eckel and Neary (2010):
  - Multi-product oligopoly with linear demand for differentiated products
  - "Flexible Manufacturing"
  - Extended to investment in quality

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  - "Flexible Manufacturing"
  - Extended to investment in quality
- Application: Uses Mexican data from Iacovone-Javorcik (*EJ* 2010):
  - Detailed plant-product-year data for *both* home and export sales
  - ... at the *same* level of disaggregation

Competition on:	Single-Product Firms	Multi-Product Firms
Cost	Melitz ...	(1)
Quality	(2)	This paper

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- IO: Products few and/or fixed, competition on scope and/or quality
  - Brander-Eaton (*AER* 1984), Klemperer (*AER* 1992), Baldwin-Ottaviano (*JIE* 2001), Johnson-Myatt (*AER* 2003)
- Symmetric demand and cost; diseconomies of scope
  - Ju (*RIE* 2003), Allanson-Montagna (*IJIO* 2005), Feenstra-Ma (2009), Nocke-Yeaple (2006), Dhingra (2009)
- Asymmetric demand: Bernard-Redding-Schott (*AER* 2010; 2009)
- "Flexible Manufacturing": Eckel-Neary (*REStud* 2010), Arkolakis-Muendler (2009), Mayer-Melitz-Ottaviano (2009)

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(2) Theoretical and empirical papers with quality:

- Antoniades (2009), Baldwin-Harrigan (2007), Crozet-Head-Mayer (2009), Hallak-Schott (2009), Hallak-Sivadasan (2009), Iacovone-Javorcik (2007), Johnson (2010), Khandelwal (*REStud* 2009), Kugler-Verhoogen (2008), Mandel (2008), Manova-Zhang (2009)

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(3) Models of investment by heterogeneous firms:

- Investment in process and product R&D: Bustos (2010), Dhingra (2010), Lileeva and Trefler (*QJE* 2010)
- Investment in quality, including market-specific perceived quality: Arkolakis (2007)

Outline of the Talk

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$\tilde{\Omega}$: The set of differentiated products
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Implied market demand functions $[x(i) = Lq(i)]$:

- $p(i) = a(i) - \tilde{b} \left[(1-e) x(i) + eX \right], \qquad i \in \Omega \subset \tilde{\Omega}$

$a(i)$: $a^0 + \beta \tilde{z}(i)$
$\tilde{b}$: b/L
X : $\int_{i \in \Omega} x(i) di$

Cost-Based Competence

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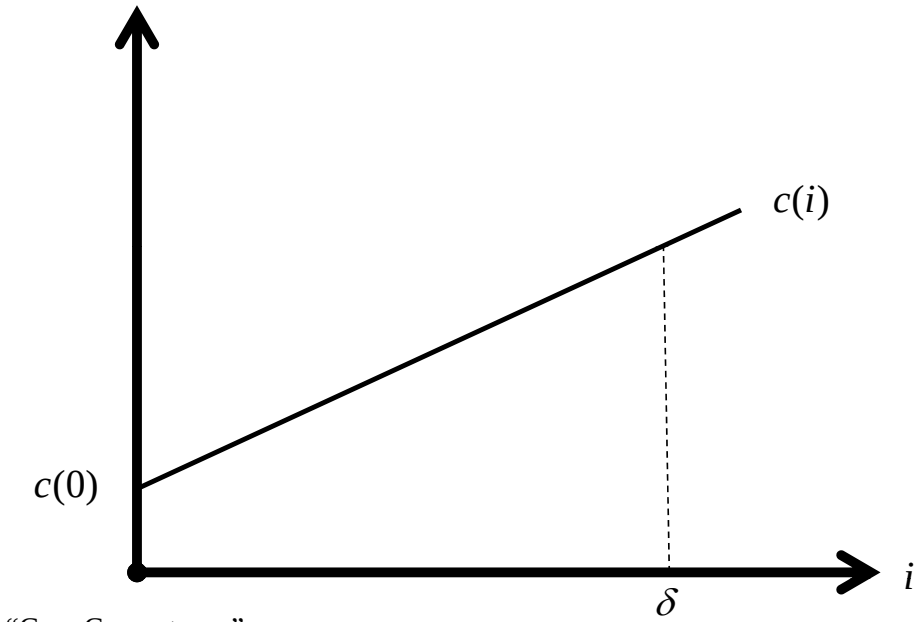
- "Flexible Manufacturing" technology, as in Eckel-Neary (2010)
- Marginal production costs are independent of output but differ across products: $c(i)$
- Firm has a "core competence" product which it produces at lowest cost: $c(0) = c^0$
- Adding more products incurs adaptation costs: $c'(i) > 0$

Flexible Manufacturing



"Core Competence"

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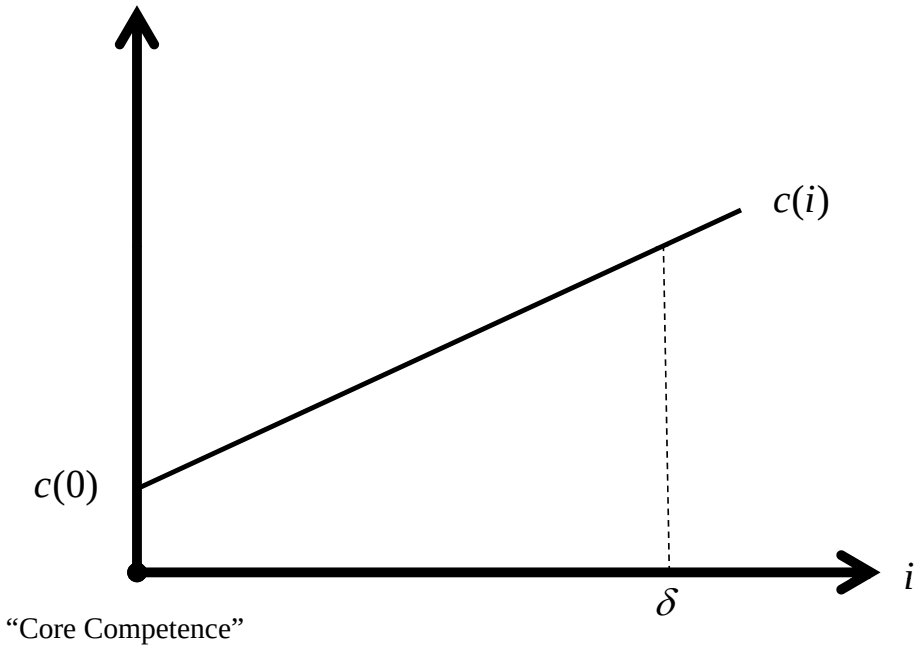

Ignoring quality, firm wants to maximise operating profits:

$$\pi = \int_{i \in \Omega} [p(i) - c(i) - t]\, x(i) di$$

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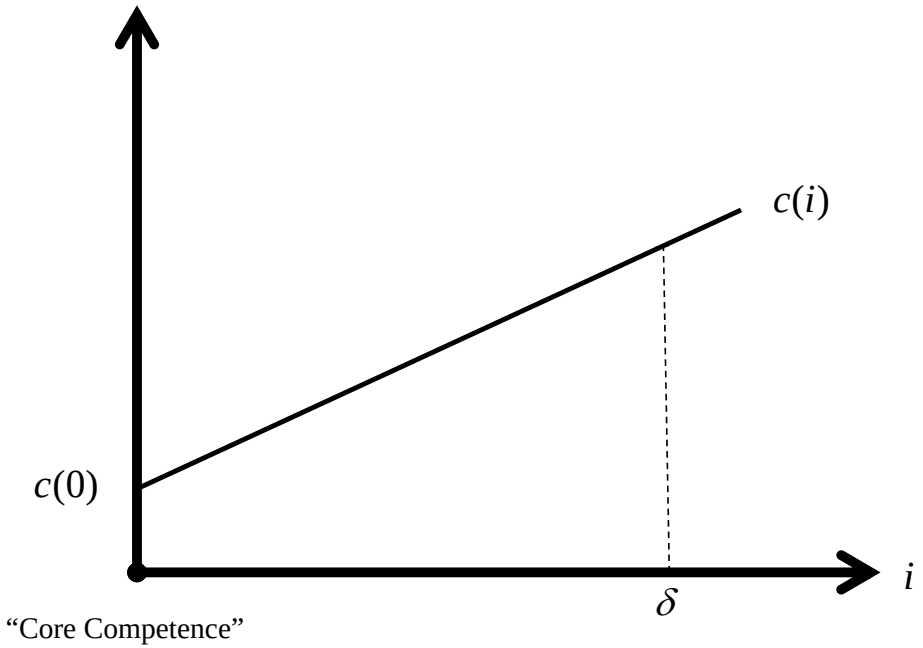

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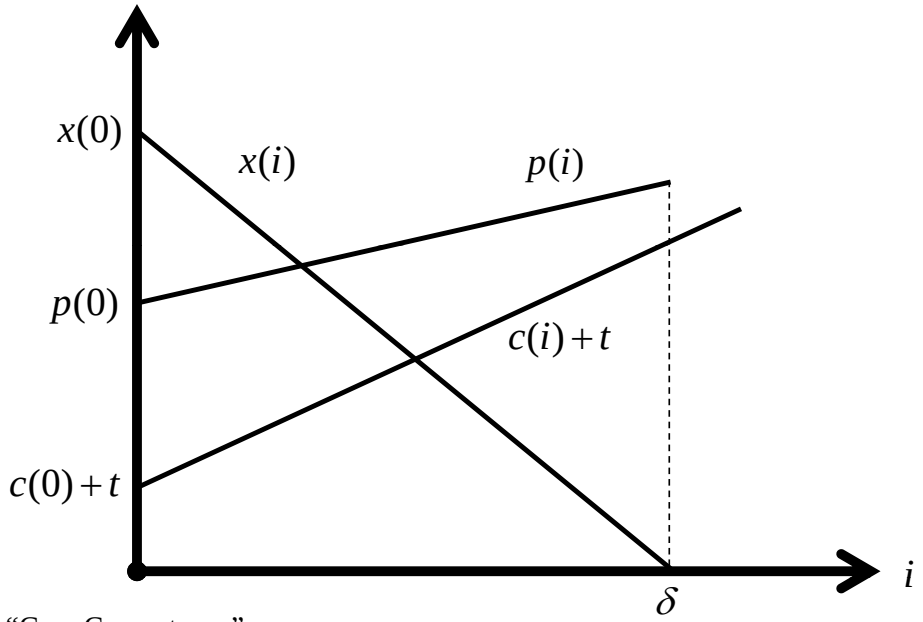
$\Rightarrow$ First-order conditions for scale $x(i)$ and scope δ: $\Omega = [0, \delta]$

- ▸ Details

Price and Sales Profiles with Cost-Based Competence



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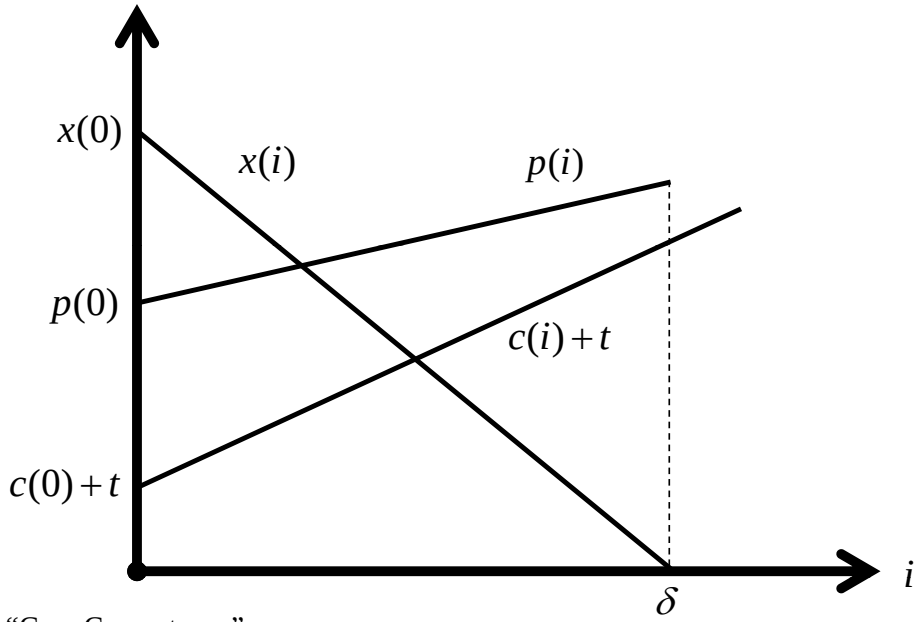

"Core Competence"

$$x(i) = \frac{a^0 - c(i) - t - 2\tilde{b}eX}{2\tilde{b}(1-e)} \qquad i \in [0, \delta]; \qquad x(\delta) = 0.$$

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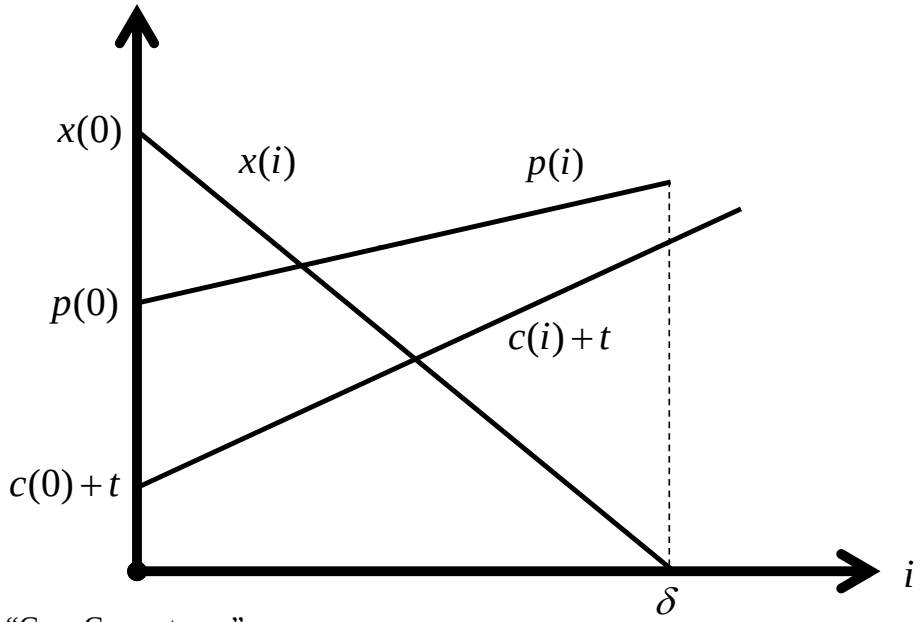

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$$p(i) = \frac{1}{2}\left[a^0 + c(i) + t\right]$$

Quality-Based Competence

- Recall: $u = u_1 + \beta u_2$, $u_2 = \int_{i \in \tilde{\Omega}} q(i)\tilde{z}(i)di$
- Now: $\beta > 0$
- Perceived quality of variety i: $\tilde{z}(i) = (1-e)z(i) + e\bar{Z}$

$z(i)$: Variety-specific perceived quality

$\bar{Z}$: Perceived quality of the firm's brand; $\bar{Z} \neq \int_{i \in \Omega} z(i)di$

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$$z(i) = 2\theta k(i)^{0.5}, \quad \bar{Z} = 2\Theta \bar{K}^{0.5}$$

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  - FOCs for scale $\{x(i)\}$ and scope δ unchanged
  - FOCs for investment:

$$\text{(i) } \gamma k(i)^{0.5} = \beta(1-e)\theta x(i), \quad i \in [0, \delta]; \qquad \text{(ii) } \Gamma \bar{K}^{0.5} = \beta e \Theta X$$

Implications for Output Profile

- Output profile with endogenous investment in quality:

$$x(i) = \frac{a^0 - c(i) - t - 2(\tilde{b} - \bar{\eta}e)eX}{2[\tilde{b} - \eta(1-e)](1-e)}, \quad i \in [0, \delta] \quad \eta \equiv \frac{\beta^2\theta^2}{\gamma} \quad \bar{\eta} \equiv \frac{\beta^2\Theta^2}{\Gamma}$$

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  - η, $\bar{\eta}$: the "marginal effectiveness of investment" in the quality of individual varieties and of the firm's brand respectively.
    - d'Aspremont and Jacquemin (*AER* 1988), Leahy and Neary (*AER* 1997), Antoniades (2009), Bustos (*AER* 2010), Dhingra (2009).
    - Second-order conditions: $\tilde{b} - \eta(1-e) > 0$ and $\tilde{b} - \bar{\eta}e > 0$
  - Implication: Output profile is steeper the higher is η

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  - $\tilde{b} > 2\eta(1-e)$: Cost-based competence dominates, price rises with i
    - Benchmark case of $\eta = 0$: $\frac{dp(i)}{di} = \frac{1}{2}\frac{dc(i)}{di}$
  - $\tilde{b} < 2\eta(1-e)$: Quality-based competence dominates, price falls with i

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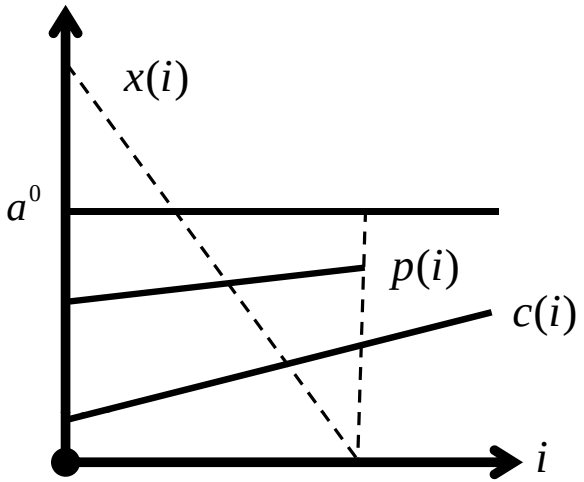
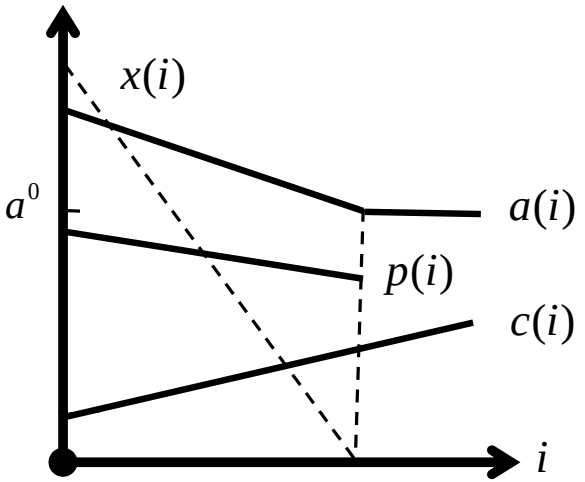


$$\frac{b}{L} > 2\eta(1-e)$$



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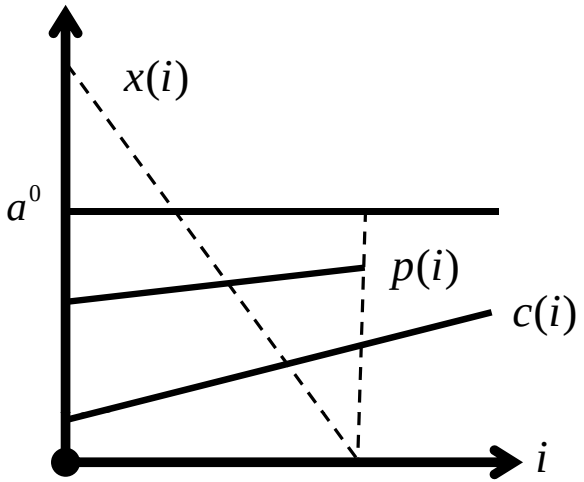

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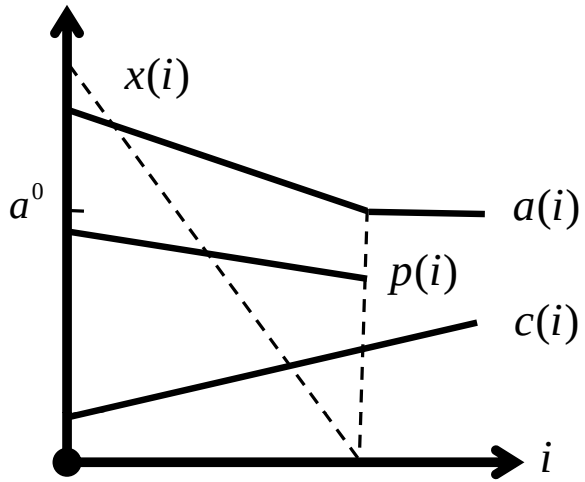

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- Quality-based competence more likely:
  - When investment in quality is more effective: η is larger
  - When market size L is larger
  - When products are more differentiated: e is smaller
- Though in all cases, production costs are primitive

Details

Comparative Statics

- Recall: $x(i) = \frac{a^0 - c(i) - t - 2(\tilde{b} - \bar{\eta}e)eX}{2[\tilde{b} - \eta(1-e)](1-e)}$ - Solve for two equations in X and δ

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- Evaluate at $i = \delta$: $c(\delta) = a^0 - t - 2(\tilde{b} - \bar{\eta}e)eX$
- Integrate over i: $X = \frac{\delta}{2\Delta}\left(a^0 - \mu_c' - t\right)$
  - $\Delta \equiv \left[\tilde{b} - \eta(1-e)\right](1-e) + \left(\tilde{b} - \bar{\eta}e\right)e\delta$
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$$\frac{d\delta}{dL} \propto \bar{\eta}e - \eta(1-e)$$

- More varieties sold in a larger market: (i) the less products are differentiated, and (ii) the more important is investment in brand quality.

Outline of the Talk

The Data

Mexican survey giving plant-product-level data:

- *Encuesta Industrial Mensual* (EIM): home and foreign sales
- Monthly survey, aggregated to annual observations 1994-2004
- Coverage: c. 85% of Mexican industrial output (exc. "maquiladoras")
- From 6,291 (1994) to 4,424 (2004) plants
- ... of which, 1,579 to 2,137 engaged in exporting
- Information on 3,183 unique products, in 205 *clases*
  - Similar to 6-digit Harmonized System ▸ Examples
- (+) Detailed plant-product-year data for home and export sales
- (−) Plants, not firms; total exports not broken down by country
  - Complementary to: Bernard, Redding and Schott (2009), Arkolakis and Muendler (2009), Berthou and Fontagné (2009), Mayer, Melitz and Ottaviano (2009); and Goldberg, Khandelwal, Pavcnik, Topolova (*REStats* 2010)

Number of Plants and Products

Year	Number of plants					Number of products	
	Total	Owned by MPFs[1]	Other	Exporters		Produced	Exported
				Total	Adjusted[2]		
1994	6,291	1,259	5,032	1,582	1,579	19,154	2,844
1995	6,011	1,245	4,766	1,844	1,842	18,568	3,406
1996	5,747	1,256	4,491	2,024	2,023	17,662	3,881
1997	5,538	1,256	4,282	2,138	2,137	16,938	4,092
1998	5,380	1,268	4,112	2,095	2,094	16,419	4,193
1999	5,230	1,279	3,951	1,951	1,950	15,885	3,889
2000	5,100	1,280	3,820	1,901	1,899	15,279	3,737
2001	4,927	1,258	3,669	1,770	1,766	14,714	3,509
2002	4,765	1,237	3,528	1,686	1,684	14,182	3,321
2003	4,603	1,193	3,410	1,678	1,675	13,507	3,282
2004	4,424	1,159	3,265	1,602	1,599	12,887	3,118
Total	58,016	13,690	44,326	20,271	20,248	175,195	39,272

(1) MPFs: Multi-plant firms; information on the number of plants owned by a single firm is available for 2003 only.
(2) The adjusted data exclude plants not reporting production in the year in question.

Sales Profiles

Evidence on sales profiles:

- Exporting plants are larger
- Larger plants produce more products
- Profile of sales across products is highly non-uniform
- Ranking of varieties is similar in home and foreign markets
- Plants sell more products at home
- Most exported products are also sold at home

All broadly in line with other studies

Outline of the Talk

Empirical Strategy

- Theoretical prediction:
  - Quality-based competence (prices *fall* with distance from core competence) prevails in destination market d when: $\frac{b}{L_d} < 2\eta_d (1 - e_d)$
  - In particular, more likely if products are more differentiated (lower e_d).

Recap on Theory

Empirical Strategy

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- How to measure distance from core competence?
  - Sales volume?
  - BUT: different units of measurement in the data?
  - We use sales value instead: $s(i) = p(i)x(i)$
  - $\frac{ds(i)}{di} = p(i)\frac{dx(i)}{di} + x(i)\frac{dp(i)}{di} < 0$

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  - $\frac{ds(i)}{di} = p(i)\frac{dx(i)}{di} + x(i)\frac{dp(i)}{di} < 0$
- How to measure prices?
  - We use unit values: $Unit\ Value_{ijt} = \frac{Value\ of\ sales_{ijt}}{Quantity\ of\ sales_{ijt}}$

Recap on Theory

Empirical Strategy (cont.)

- Prices relative to what?
  - We consider the price of each variety relative to the average price of all varieties of the same product.
  - In all regressions, dependent variable is the log of the unit value of product i from plant j at time t
  - ... relative to the average unit value of *all* J_i varieties of product i produced in or exported from Mexico at time t:

$$ln\ Price\ Premium_{ijt} \equiv ln\ \frac{Unit\ Value_{ijt}}{\sum_{j=1}^{J_i} \omega_{ijt}\ Unit\ Value_{ijt}}$$

    - The weights ω_{ijt} are either $1/J_i$ or shares in domestic sales or exports

Empirical Strategy (cont.)

- Estimating equation:

$$ln\ Price\ Premium_{ijt} = \beta_0 + \sum_{r=1}^{R} \beta_r D_{ijt}^r + X + \varepsilon_{ijt}$$

D_{ijt}^r : $= 1$ if product i is ranked r in the production/exports of plant j in year t
X : Vector of plant fixed effects in *all* equations
ε_{ijt} : Disturbance term

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- How do we measure product differentiation?
  - We use the Rauch (*JIE* 1999) classification.
  - Group *clases* by whether they correspond to differentiated or non-differentiated products:
    - "Undifferentiated": "Traded on organised exchanges" plus "reference priced"
    - We use Rauch's "liberal" classification: when in doubt, undifferentiated
    - Examples: here

Price Profiles for Plants with At Least Two Products

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.042^{***}					
	(0.004)					
r^2	0.441					
N	$128,493$					

(All regressions have plant fixed effects.)

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  - Differentiated coefficient is significantly larger - as predicted by theory

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r^2	0.441	0.447	0.381	0.365	0.378	0.303
N	128,493	81,708	46,785	23,227	14,975	8,252

(All regressions have plant fixed effects.)

Conclusions:

- Home market: Prices fall with distance from core competence
  - i.e., strong evidence of quality-based competence
  - Holds for both differentiated and non-differentiated products
  - Differentiated coefficient is significantly larger - as predicted by theory
- Export market: Same holds in aggregate
- BUT: Not for non-differentiated products
  - Prices *rise* with distance from core competence
  - i.e., strong evidence against quality-based competence
  - ... clear evidence of cost-based competence

Price Profiles for Plants with More than Two Products

- Similar results hold for plants with more than two products
  - Loss of degrees of freedom as we consider plants with more products
  - Nevertheless the results are qualitatively identical ▸ Skip details

Price Profiles at Home

Price Premium on Home Sales Regressed on Product Ranks for Production

Plants with:	2+ products	3+ products	4+ products	5+ products
Top Product:	0.042 ***	0.054 ***	0.066 ***	0.080 ***
	(0.004)	(0.005)	(0.006)	(0.007)
Top 2nd:		0.037 ***	0.056 ***	0.073 ***
		(0.005)	(0.006)	(0.007)
Top 3rd:			0.048 ***	0.064 ***
			(0.006)	(0.007)
Top 4th:				0.053 ***
				(0.007)
r^2	0.441	0.416	0.412	0.414
N	128,493	110,368	92,154	75,808

(All regressions have plant fixed effects.)

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Conclusion: Prices fall with distance from core competence; strong evidence of quality-based competence.

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Conclusion: Prices fall with distance from core competence; strong evidence of quality-based competence.

This holds for both differentiated and non-differentiated products.

Price Profiles Away: Differentiated Products

Price Premium Regressed on Product Ranks for Differentiated Exports

Plants with:	2+ products	3+ products	4+ products	5+ products
Top Product:	0.081 ***	0.128 ***	0.139 ***	0.149 ***
	(0.012)	(0.015)	(0.019)	(0.024)
Top 2nd:		0.072 ***	0.115 ***	0.145 ***
		(0.015)	(0.020)	(0.025)
Top 3rd:			0.107 ***	0.151 ***
			(0.020)	(0.025)
Top 4th:				0.041 *
				(0.024)
r^2	0.378	0.348	0.341	0.349
N	14,975	11,528	8,812	6,720

(All regressions have plant fixed effects.)

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Price Profiles Away: Non-Differentiated Products

Price Premium Regressed on Product Ranks for Non-Differentiated Exports

Plants with:	2+ products	3+ products	4+ products	5+ products
Top Product:	-0.031^{**}	-0.033^{**}	-0.053^{**}	-0.075^{**}
	(0.010)	(0.014)	(0.019)	(0.027)
Top 2nd:		0.003	0.006	−0.016
		(0.014)	(0.019)	(0.027)
Top 3rd:			0.010	−0.024
			(0.019)	(0.027)
Top 4th:				−0.012
				(0.027)
r^2	0.303	0.251	0.191	0.187
N	8,252	5,738	3,847	2,550

(All regressions have plant fixed effects.)

Price Profiles Away: Non-Differentiated Products

Price Premium Regressed on Product Ranks for Non-Differentiated Exports

Plants with:	2+ products	3+ products	4+ products	5+ products
Top Product:	-0.031^{**}	-0.033^{**}	-0.053^{**}	-0.075^{**}
	(0.010)	(0.014)	(0.019)	(0.027)
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		(0.014)	(0.019)	(0.027)
Top 3rd:			0.010	−0.024
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strong evidence against quality-based competence;
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Robustness Checks

1. Sample sizes at home and away are different
   - We reestimate for varieties that are *both* sold at home and exported:
   - Results turn out to be robust ▸ Details

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3. Correct for plant ownership:
   - Theory relates to firms, data to plants
   - Data on plant ownership available for 2003 only
   - We reestimate for single-plant firms only (as of 2003) in all years
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   - Again, results are robust ▸ Details
4. Clustered standard errors: by plant-year
5. Check that results hold year-by-year
6. Check that results hold for domestically-owned plants only

Outline of the Talk

Summary and Conclusion

- Theory:
  - Integrate flexible manufacturing with investment in quality
- Mexican data set:
  - Highly disaggregated data on both home and foreign sales
- Empirical results on price profiles:
  - Evidence for quality selection within firms
  - Competence based more on quality when products are more differentiated, especially for exports

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  - Size matters: Larger firms produce more products and are more likely to export
  - But higher productivity manifests itself differently in different sectors and markets
  - Only differentiated-product firms compete in export markets on quality

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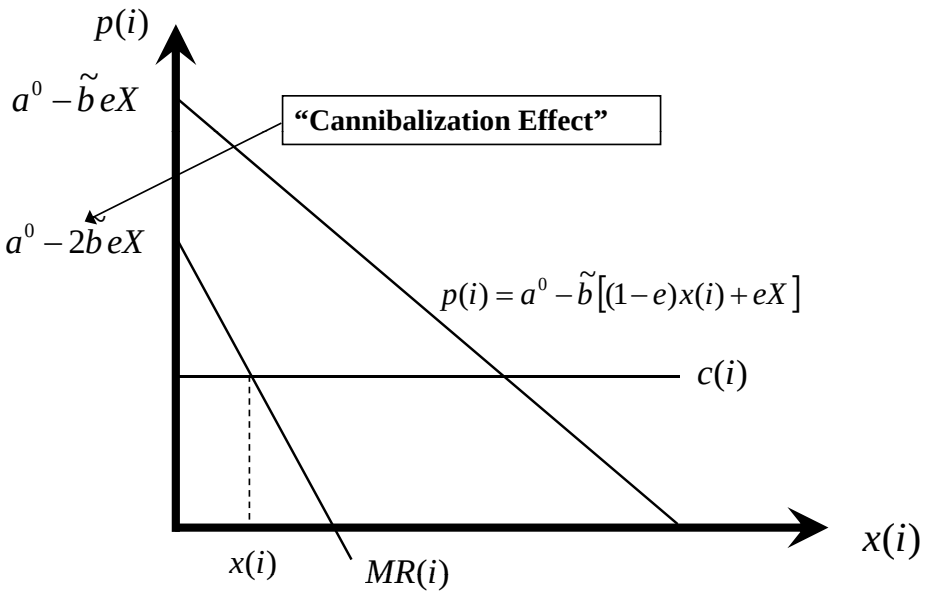
  - But higher productivity manifests itself differently in different sectors and markets
  - Only differentiated-product firms compete in export markets on quality
- Policy implications: What should export promotion focus on?
  - Differentiated product sectors: Improving perceived product quality
  - Non-differentiated good sectors: Helping lower production costs

Summary and Conclusion (cont.)

Thank you!

Outline of the Talk

First-Order Condition for Scale



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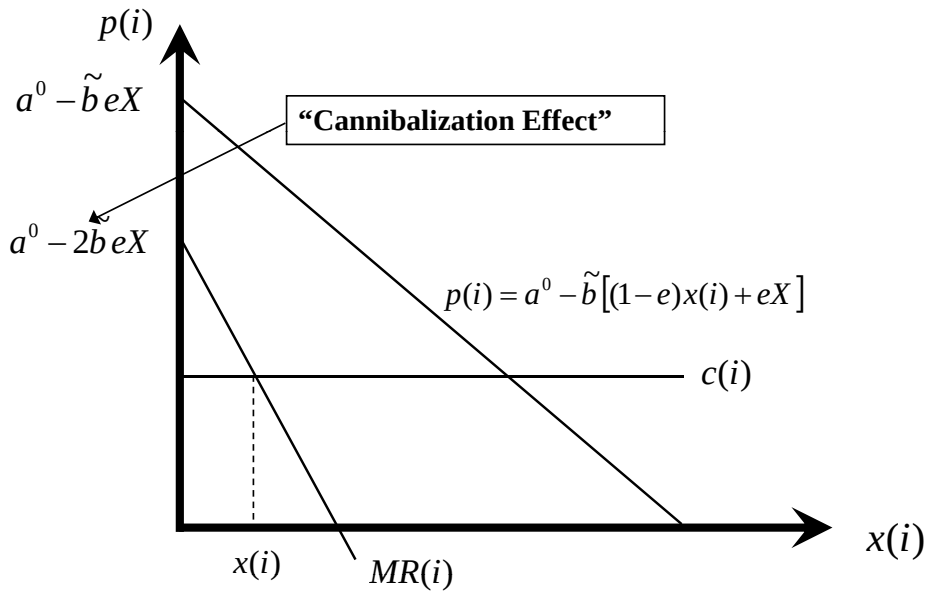
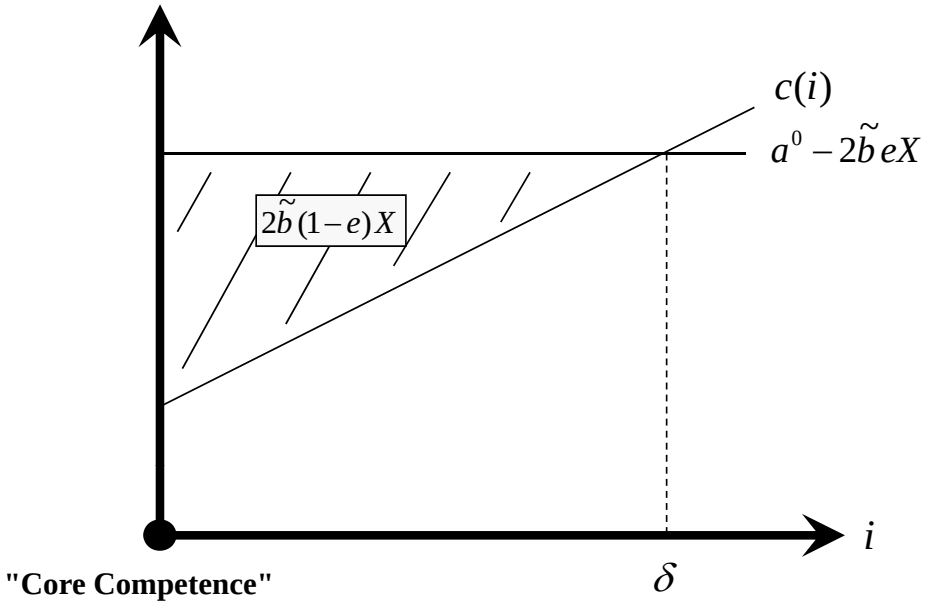


- Cannibalisation effect shifts the MR curve downwards
- Produce where MC=MR
- ▸ Back

First-Order Condition for Scope



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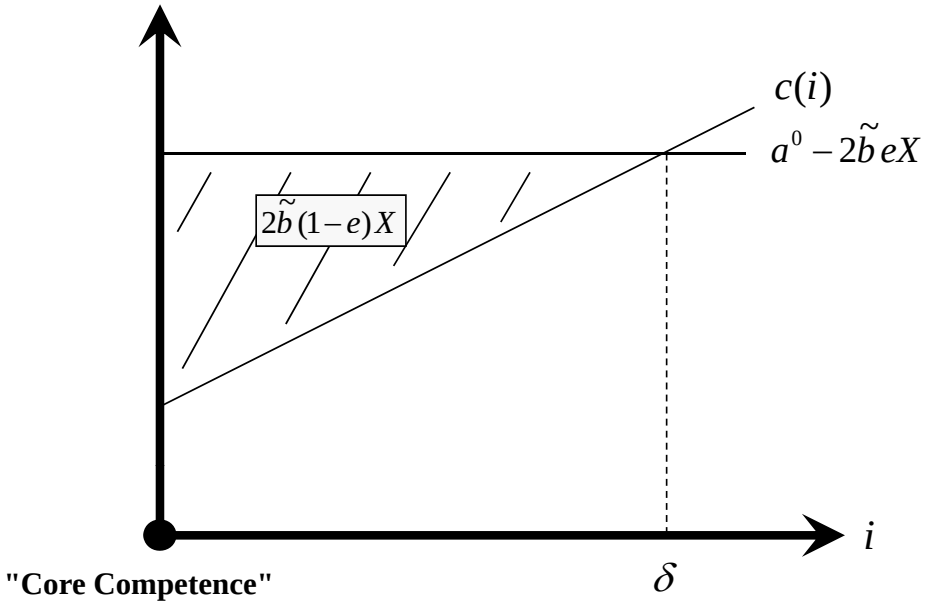

- Produce a positive amount of a variety as long as its marginal cost ...
- ... $\leq$ the marginal revenue of the first unit consumed: $a^0 - 2\tilde{b}eX$
- ▸ Back

Full Marginal Costs

- Core competence always derives from production costs Back
- We can also consider "full" marginal costs:

$$c(i) + \gamma \frac{k(i)}{x(i)} = \frac{2\tilde{b} - 3\eta(1-e)}{2[\tilde{b} - \eta(1-e)]} c(i) + \frac{\eta(1-e)}{2[\tilde{b} - \eta(1-e)]} c(\delta)$$

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$$c(i) + \gamma \frac{k(i)}{x(i)} = \frac{2\tilde{b} - 3\eta(1-e)}{2[\tilde{b} - \eta(1-e)]} c(i) + \frac{\eta(1-e)}{2[\tilde{b} - \eta(1-e)]} c(\delta)$$

- Neither production costs nor full marginal costs predict the profile of prices across varieties:
  - **(i)** $\eta(1-e) < \frac{1}{2}\tilde{b}$: Cost-based competence dominates; both prices and full marginal costs rise with i.
  - **(ii)** $\frac{1}{2}\tilde{b} < \eta(1-e) < \frac{2}{3}\tilde{b}$: Quality-based competence dominates, but mildly; prices fall with i but full marginal costs rise with i.
  - **(iii)** $\frac{2}{3}\tilde{b} < \eta(1-e) < \tilde{b}$: Quality-based competence strongly dominates; *both* prices and full marginal costs fall with i.

Note that in (ii), both measures of cost rise with i, despite which prices fall with i.

Examples of Product Classification into Clases

Back

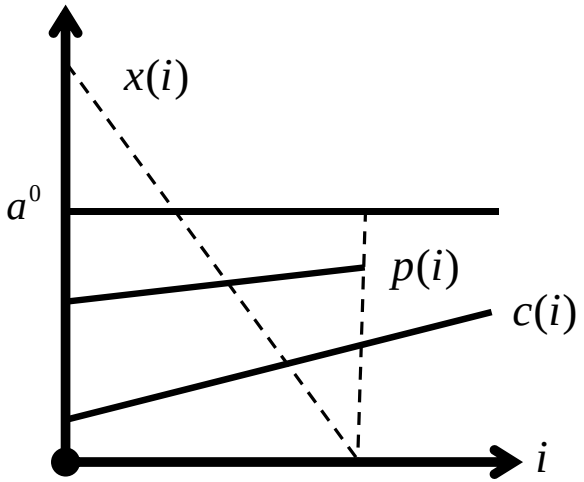
- 313014: "Distilled Alcoholic Beverages" :
  - Gin
  - Vodka
  - Whisky
  - Other distilled alcoholic beverages
  - Coffee liqueurs
  - "Habanero" liqueurs
  - "Rompope"
  - Prepared cocktails
  - Hydroalcoholic extract
  - Other alcoholic beverages prepared from agave,
  - or brandy,
  - or rum,
  - or table wine

Examples of Classification into Clases (cont.)

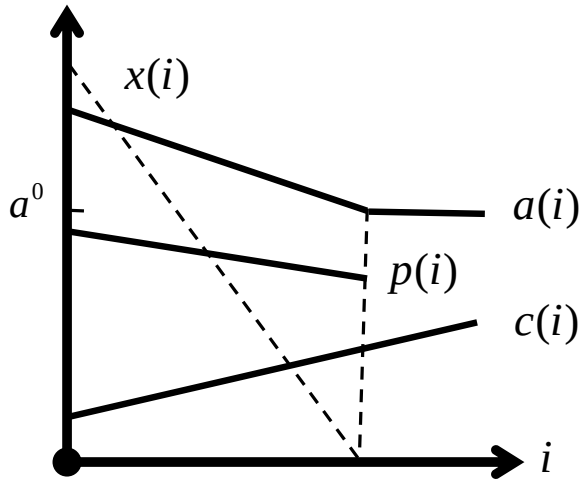
- 313011: "Produccion De Tequila Y Mezcal":
  - Tequila
  - Mezcal
  - Sangrita
  - Otras Bebidas Preparadas (Especificar) [Other Prepared Beverages (to be Specified)]
  - Otras Bebidas Alcoholicas (Especificar) [Other Alcoholic Beverages (to be Specified)]
  - Otros Desechos Y Subproductos [Other Subproducts and Waste]
  - Otros Productos No Genericos [Other Non-Generic Products]

Back

Recap: Price and Sales Profiles with Cost- and Quality-Based Competence



$$\frac{b}{L} > 2\eta(1-e)$$



$$\frac{b}{L} < 2\eta(1-e)$$

- Quality-based competence more likely:
  - When investment in quality is more effective: η is larger
  - When market size L is larger
  - When products are more differentiated: e is smaller
  - Back to empirical strategy

Examples of Differentiated vs. Non-Differentiated Clases

Back

- Differentiated:
  - 311901: Produccion de chocolate y golosinas a partir de cocoa o chocolate
    - Production of chocolate and candy from cocoa or chocolate
  - 323003: Produccion de maletas, bolsas de mano y similares
    - Production of suitcases, handbags and similar
  - 322005: Confeccion de camisas
    - Ready-to-wear shirts
- Non-Differentiated:
  - 311201: Pasteurizacion de leche
    - Pasteurization of milk
  - 311404: Produccion de harina de trigo
    - Production of wheat flour
  - 341021: Produccion de papel
    - Production of paper

Observations on Varieties Sold Both At Home and Away Only

A. Price Profiles for Plants with Two or More Products

Back

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.045 *** (0.009)	0.056 *** (0.013)	0.027 ** (0.013)	0.037 *** (0.009)	0.079 *** (0.012)	−0.033** (0.010)
r^2	0.412	0.421	0.376	0.350	0.361	0.292
N	20,646	13,382	7,264	20,646	13,382	7,264

B. For Reference: Including all observations in each category

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.042 *** (0.004)	0.048 *** (0.006)	0.033 *** (0.005)	0.038 *** (0.008)	0.081 *** (0.012)	−0.031** (0.010)
r^2	0.441	0.447	0.381	0.365	0.378	0.303
N	128,493	81,708	46,785	23,227	14,975	8,252

(All regressions have plant fixed effects.)

Price Profiles for Plants with Five or More Products

A. Including only observations on goods both exported and sold at home

Back

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.112^{***} (0.022)	0.162^{***} (0.027)	-0.036 (0.039)	0.092^{***} (0.021)	0.173^{***} (0.040)	-0.070^{***} (0.014)
Top 2nd:	0.099^{***} (0.022)	0.148^{***} (0.027)	-0.048 (0.039)	0.119^{***} (0.022)	0.108^{**} (0.027)	-0.016 (0.027)
Top 3rd:	0.092^{**} (0.022)	0.130^{***} (0.027)	-0.024 (0.039)	0.108^{***} (0.022)	0.102^{**} (0.040)	-0.024 (0.027)
Top 4th:	0.022 (0.022)	0.040 (0.027)	-0.039 (0.039)	0.038^{*} (0.021)	0.005 (0.040)	-0.012 (0.027)
r^2	0.321	0.337	0.265	0.329	0.400	0.380
N	7,636	5,679	1,957	7,636	5,679	1,957
p value:	0.00^{***}	0.00^{***}	0.96	0.01^{***}	0.00^{***}	0.02^{***}

(The p value tests that all the coefficients are equal; all regressions have plant fixed effects.)

Price Profiles for Plants with Five or More Products

B. For Reference: Including all observations in each category

Back

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.080^{***} (0.007)	0.095^{***} (0.009)	0.047^{***} (0.009)	0.087^{***} (0.019)	0.149^{***} (0.024)	-0.075^{**} (0.027)
Top 2nd:	0.073^{***} (0.007)	0.087^{***} (0.009)	0.041^{***} (0.009)	0.102^{***} (0.019)	0.145^{***} (0.025)	-0.016 (0.027)
Top 3rd:	0.064^{***} (0.007)	0.080^{***} (0.009)	0.029^{**} (0.009)	0.104^{***} (0.019)	0.151^{***} (0.025)	-0.024 (0.027)
Top 4th:	0.053^{***} (0.007)	0.057^{***} (0.009)	0.041^{***} (0.009)	0.030 (0.019)	0.041^{*} (0.024)	-0.012 (0.027)
r^2	0.414	0.425	0.313	0.329	0.349	0.187
N	75,808	52,251	23,557	9,270	6,720	2,550

Observations on Exporting Plants Only

Price Premium on Home Sales Regressed on Product Ranks for Production Plants exporting in time t only

Back

Varieties:	Differentiated				Non-Differentiated			
# Prods.:	2+	3+	4+	5+	2+	3+	4+	5+
Top Prod.:	0.039^{***} (0.009)	0.054^{***} (0.010)	0.086^{***} (0.012)	0.095^{***} (0.014)	0.039^{***} (0.008)	0.034^{**} (0.010)	0.032^{**} (0.014)	0.052^{**} (0.018)
Top 2nd:		0.052^{***} (0.010)	0.075^{***} (0.012)	0.100^{***} (0.014)		0.026^{**} (0.011)	0.040^{**} (0.014)	0.058^{**} (0.018)
Top 3rd:			0.079^{***} (0.012)	0.105^{***} (0.014)			0.035^{**} (0.014)	0.020 (0.018)
Top 4th:				0.089^{***} (0.014)				0.035^{*} (0.018)
r^2	0.423	0.400	0.391	0.392	0.348	0.322	0.300	0.280
N	39,718	34,538	29,502	24,893	21,697	17,136	13,189	9,621

(All regressions have plant fixed effects.)

Observations on Single-Plant Firms Only

A. Plants with two or more products Back

Market:	Home			Export		
Varieties:	All	Diff.	Non-Diff.	All	Diff.	Non-Diff.
Top Product:	0.049 *** (0.005)	0.057 *** (0.007)	0.035 *** (0.006)	0.050 *** (0.011)	0.086 *** (0.014)	−0.013 (0.014)
r^2	0.439	0.444	0.389	0.384	0.401	0.306
N	95,881	64,720	31,161	14,690	9,896	4,794

B. Plants with five or more products

Top Product:	0.093 *** (0.008)	0.102 *** (0.011)	0.071 *** (0.012)	0.121 *** (0.025)	0.146 *** (0.031)	0.035 (0.036)
Top 2nd:	0.083 *** (0.008)	0.091 *** (0.010)	0.062 *** (0.012)	0.160 *** (0.025)	0.205 *** (0.031)	0.028 (0.036)
Top 3rd:	0.081 *** (0.008)	0.087 *** (0.010)	0.065 *** (0.012)	0.126 *** (0.025)	0.176 *** (0.032)	−0.021 (0.037)
Top 4th:	0.066 *** (0.008)	0.067 *** (0.010)	0.062 *** (0.012)	0.055 ** (0.025)	0.053 * (0.031)	0.042 (0.037)
r^2	0.403	0.413	0.318	0.343	0.359	0.203
N	57,579	41,576	16,003	5,600	4,229	1,371