Measuring the Gains from Trade with Product Variety, Imperfect Competition and Firm Heterogeneity

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Early literature:

Paul Krugman, 1979, "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics*.

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Paul Krugman, 1979, "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics*.

H.C. Eastman and S. Stykolt. 1967. *The Tariff and Competition in Canada.* Toronto: Macmillan.

Richard Harris 1984, "Applied General Equilibrium Analysis of Small Open Economies with Scale Economies and Imperfect Competition," *American Economic Review*.

Canada-U.S. Free Trade Agreement (1989)
North America Free Trade Agreement (1994)

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Richard Harris 1984, “Applied General Equilibrium Analysis of Small Open Economies with Scale Economies and Imperfect Competition,” *American Economic Review*.

Canada-U.S. Free Trade Agreement (1989)
North America Free Trade Agreement (1994)

Avinash K. Dixit; Joseph E. Stiglitz, 1977, Monopolistic Competition and Optimum Product Diversity,” *American Economic Review*.

10 years later:

Gene Grossman and Elhanan Helpman, 1991, *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.

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Erwin Diewert, 1976, "Exact and Superlative Index Numbers," *Journal of Econometrics.*

Quadratic mean of order r expenditure function:

$$e_r(\mathbf{p}) = \left[\sum_i \sum_j b_{ij} p_i^{r/2} p_j^{r/2} \right]^{1/r}, \quad r \neq 0,$$

If $b_{ij} = 0$, $i \neq j$, and $b_{ii} > 0$, then we get the CES function with r negative,

$$e_r(\mathbf{p}) = \left[\sum_i b_{ii} p_i^{1-\sigma} \right]^{1/(1-\sigma)}, \quad r = 1 - \sigma < 0$$

Exact price index for the quadratic mean of order r function is,

$$\frac{e_r(\mathbf{p}_t)}{e_r(\mathbf{p}_{t-1})} = \left\{ \frac{\sum_i s_{it-1}(p_{it} / p_{it-1})^{r/2}}{\sum_i s_{it}(p_{it-1} / p_{it})^{r/2}} \right\}^{1/r},$$

where s_{it} and s_{it-1} are consumption shares in the two periods.

Exact price index for the quadratic mean of order r function is,

$$\frac{e_r(\mathbf{p}_t)}{e_r(\mathbf{p}_{t-1})} = \left\{ \frac{s_{1t-1}(p_{1t} / p_{1t-1})^{r/2} + \sum_{i=2}^{N} s_{it-1}(p_{it} / p_{it-1})^{r/2}}{s_{1t}(p_{1t-1} / p_{1t})^{r/2} + \sum_{i=2}^{N} s_{it}(p_{it-1} / p_{it})^{r/2}} \right\}^{1/r},$$

where s_{it} and s_{it-1} are consumption shares in the two periods.

CES case with $r = 1 - \sigma < 0$:

Suppose that good 1 is not available in period t-1, with $p_{1t-1} \to \infty$.

Then in the numerator:

$p_{1t-1}^{-r/2} \to \infty$ but $s_{1t-1} \to 0$ and also that $p_{1t-1}^{-r/2} s_{1t-1} \to 0$ as $p_{1t-1} \to \infty$

In the denominator: we have $p_{1t-1}^{r/2} s_{1t} \to 0$, since $r = 1 - \sigma < 0$.

So all the terms involving the infinite price are zero, but $\sum_{i=2}^{N} s_{it} < 1$.

Re-define $\tilde{s}_{it} \equiv s_{it} / \sum_{i=2}^{N} s_{it}$ so that $\sum_{i=2}^{N} \tilde{s}_{it} = 1$ and then:

$$\lim_{p_{1t-1} \to \infty} \frac{e_r(\mathbf{p}_t)}{e_r(\mathbf{p}_{t-1})} = \left\{ \frac{\sum_{i=2}^{N} s_{it-1}(p_{it} / p_{it-1})^{r/2}}{\sum_{i=2}^{N} s_{it}(p_{it-1} / p_{it})^{r/2}} \right\}^{1/r}$$

$$= \underbrace{\left\{ \frac{\sum_{i=2}^{N} s_{it-1}(p_{it} / p_{it-1})^{r/2}}{\sum_{i=2}^{N} \tilde{s}_{it}(p_{it-1} / p_{it})^{r/2}} \right\}^{1/r}}_{\text{Exact index for goods 2,...,N}} \underbrace{\left[\sum_{i=2}^{N} s_{it} \right]^{-1/r}}_{[\lambda_t]^{1/r}}, \quad r = 1 - \sigma$$

λ_t = share of expenditure in period *t* on goods available both periods

= 1 –share of expenditure on the *new good.*

Robert Feenstra, 1994, “New Product Varieties and the Measurement of International Prices,” *American Economic Review*.

20 years later:

Costas Arkolakis, Arnaud Costinot and Andrés Rodriguez-Clare, 2012, "New Trade Models, Same Old Gains?" *American Economic Review*.

$$d\ln W = -\frac{d\ln\lambda}{\theta}, \qquad \theta = \begin{cases} \sigma - 1 \text{ in a model with homogeneous firms} \\ \text{Pareto parameter with heterogeneous firms} \end{cases}$$

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Marc Melitz, 2003, "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica.*

Thomas Chaney, 2008, "Distorted Gravity: The Intensive and Extensive Margins of International Trade," *American Economic Review*.

Q: With heterogeneous firms, *where are the gains from import variety?*

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Thomas Chaney, 2008, "Distorted Gravity: The Intensive and Extensive Margins of International Trade," *American Economic Review*.

Q: With heterogeneous firms, *where are the gains from import variety?*

A: These gains *cancel out in welfare* due to the reduction in domestic variety

Robert Feenstra, 2010, "Measuring the Gains from Trade under Monopolistic Competition," *Canadian Journal of Economics*.

Digress:

Christian Broda and David Weinstein, 2006, “Globalization and the Gains from Variety,” *Quarterly Journal of Economics*.

Robert Feenstra and David Weinstein, 2010, “Globalization, Competition, and the U.S. Price Level,” NBER Working Paper no. 15749.

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Robert Feenstra and David Weinstein, 2010, "Globalization, Competition, and the U.S. Price Level," NBER Working Paper no. 15749.

Today:

Costas Arkolakis, Arnaud Costinot, David Donaldson, Andrés Rodriguez-Clare, (ACDR), 2012, "The Elusive Pro-Competitive Effect of Trade"

$$d \ln W = -\frac{d \ln \lambda}{\theta}, \quad \theta = \text{Pareto parameter with heterogeneous firms}$$

Q: *Where are the gains from import variety and from reducing markups?*
A: These gains *are absent* when the Pareto distribution is *unbounded above*.

Intuition: For why pro-competitive effect vanishes with *unbounded* Pareto distribution:

Measure Markups as the ratio (not the difference) between price and MC:

- lowest productivity domestic firm has Markup ratio = 1
- highest productivity domestic firm has Markup ratio = ∞
- So range is $[1, +\infty)$, with distribution *within* this range being Pareto
- This also holds for foreign firms even though MC include trade costs!
- So the distribution of markups is identical for home and foreign firms, and is not affected by trade costs
- Changes in trade costs only affects the *extensive margin* of foreign firms, i.e. the mass of firms selling within the range $[1, +\infty)$
- Clearly not true with *bounded* Pareto, in which case this range has a finite and endogenous upper-bound; this bound changes on the *intensive margin*

Goals:

- Derive effects of trade liberalization in a Melitz-style model with bounded Pareto distribution of productivities

  Motivation: Helpman, Melitz and Rubenstein (2008)
  Sutton (2012) "you can't make something out of nothing"

- Use quadratic mean of order *r* (QMOR) preferences dues to Diewert

Results:

- Find that all three sources of gains from trade – product variety, pro-competitive effect on markups, and selection – operate *only if the Pareto distribution has a finite upper bound for productivities*

- But also shown that for the types of trade liberalization considered, the ACR formula continues to hold as an *upper bound* to the welfare gain

Consumers:

Quadratic mean of order r (QMOR) expenditure function:

$$e_r(\mathbf{p}) = \left[\sum_i \sum_j b_{ij} p_i^{r/2} p_j^{r/2} \right]^{1/r}, \quad r \neq 0,$$

Symmetric case where $b_{ii} = \alpha$, $b_{ij} = \beta$ for $i \neq j$, and a continuum of goods:

$$e_r(\mathbf{p}) = \left[\alpha \int p_\omega^r d\omega + \beta \left(\int p_\omega^{r/2} d\omega \right)^2 \right]^{1/r}, \quad r \neq 0, \ \tilde{N} \equiv \int d\omega$$

Cost of obtaining one unit of utility (homothetic preferences), Cost of living.

Cases:

(a) CES: $\alpha > 0$, $\beta = 0$, $r = 1 - \sigma < 0$

(b) Translog: $r \to 0$ $\ln e_0(\mathbf{p}) = \frac{1}{\tilde{N}} \int \ln p_\omega d\omega - \frac{\gamma}{2\tilde{N}} \int \int \ln p_\omega (\ln p_\omega - \ln p_{\omega'}) d\omega d\omega'$

(c) Generalized Leontief: $r = 1$

(d) Quadratic: $r = 2$

Assumption 1

(a) If $r < 0$ then $\alpha > 0,\ \beta < 0$ and $[\tilde{N} + (\alpha / \beta)] < 0$;

(b) If $r > 0$ then $\alpha < 0,\ \beta > 0$ and $0 < [\tilde{N} + (\alpha / \beta)] < N$;

(c) As $r \to 0$ then $\alpha = \left(\frac{1}{\tilde{N}} - \frac{2\gamma}{r} \right)$ and $\beta = \frac{2\gamma}{r\tilde{N}}$ for any $\gamma > 0$.

Only *available* goods with prices < p^* are purchased, $\Omega \equiv \{ \omega \mid p_\omega \le p^* \}$:

$$p^* = \underbrace{\left(\frac{N}{N - [\tilde{N} + (\alpha / \beta)]} \right)^{2/r}}_{>1,\text{ and } \downarrow \text{ in } N} \underbrace{\left(\int_\Omega \frac{1}{N} p_\omega^{r/2} d\omega \right)^{2/r}}_{\text{Mean of order r/2}}, \text{ with } 0 < \underbrace{N \equiv \int_\Omega d\omega}_{\text{Product variety}} < \tilde{N}$$

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(d) If $r < 0$ then $\alpha > 0$, $\beta < 0$ and $[\tilde{N} + (\alpha / \beta)] < 0$;

(e) If $r > 0$ then $\alpha < 0$, $\beta > 0$ and $0 < [\tilde{N} + (\alpha / \beta)] < N$;

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Proposition 1

Under Assumption 1, for $N > 0$ and $r \leq 2$ the QMOR expenditure function is globally positive, non-decreasing, homogeneous of degree one and concave in prices, with a finite reservation price.

Four properties of demand:

1. $q_\omega(\mathbf{p}) = \alpha u \left[\dfrac{p_\omega}{e_r(\mathbf{p})}\right]^{r-1}\left[1-\left(\dfrac{p^*}{p_\omega}\right)^{r/2}\right] \rightarrow$ *CES* as $p^* \rightarrow \infty$, $r = (1-\sigma) < 0$

2. $\eta_\omega \equiv -\dfrac{\partial \ln q_\omega}{\partial \ln p_\omega} = 1 - r + \underbrace{\dfrac{r}{2}\left\{\left(\dfrac{p^*}{p_\omega}\right)^{r/2} \Big/ \left[\left(\dfrac{p^*}{p_\omega}\right)^{r/2} - 1\right]\right\}}_{>0} \rightarrow (1-r) = \sigma$ as $p^* \rightarrow \infty$

3. $\dfrac{\partial \eta_\omega}{\partial \ln(p_\omega / p^*)} = \left(\eta_\omega - 1 + r\right)\left(\eta_\omega - 1 + \tfrac{r}{2}\right) > 0$ *Increasing in price*

4. $s_\omega(\mathbf{p}) \equiv \dfrac{p_\omega q_\omega(\mathbf{p})}{w} = \dfrac{d(p_\omega / p^*)}{D(\mathbf{p})}$, with $\begin{cases} d\left(\dfrac{p_\omega}{p^*}\right) \equiv \alpha\left(\dfrac{p_\omega}{p^*}\right)^{r}\left[1-\left(\dfrac{p^*}{p_\omega}\right)^{r/2}\right] \\ D(\mathbf{p}) \equiv \int_\Omega d(p_\omega / p^*)\, d\omega \end{cases}$

Final property:

Replacing prices for goods not available by their reservation price:

$$e_r(\mathbf{p}) = p^* \times D(\mathbf{p})^{1/r}$$

Define the "adjusted" demand shares:

$$z_\omega(\mathbf{p}) \equiv \frac{s_\omega(\mathbf{p})(p^*/p_\omega)^{r/2}}{\int_\Omega s_{\omega'}(\mathbf{p})(p^*/p_{\omega'})^{r/2} d\omega'}, \text{ and } H \equiv \int_\Omega z_\omega(\mathbf{p})^2 d\omega$$

Then, $$D(\mathbf{p})^{1/r} = \underbrace{\left[-\alpha\left(\tilde{N} + \frac{\alpha}{\beta}\right)\right]^{1/r}}_{\text{constant}>0} \underbrace{\left[1 - \left(\tilde{N} + \frac{\alpha}{\beta}\right)H\right]^{1/r}}_{\downarrow \text{ in } H}$$

An increase in variety leads to a fall in H but a *rise* in the cost of living due to "crowding" in product space (Feenstra and Weinstein, 2010).

- *Later decompose p* into variety, and firms' average markups and costs*

Firms:

Labor is the only input, so with zero expected profits, Welfare = $w / e_r(\mathbf{p})$.

As in Melitz (2003), firms receive a random draw of productivity denoted by φ, so marginal costs are a / φ, a = *labor requirement*.

Assumption 2

(a) The productivity distribution is Pareto, $G(\varphi) = (1 - \varphi^{-\theta}) / (1 - b^{-\theta})$, $1 \le \varphi \le b$, where the upper bound is $b \in (1, +\infty]$ (bounded or unbounded), $\theta > \max\{0, -r\}$;

(b) There is a sunk cost F of obtaining a productivity draw, but no fixed cost of production.

We follow ACDR and let $\mu \equiv p / (a / \varphi)$ denote the ratio of price to MC, while $\nu \equiv p^* / (a / \varphi)$ denotes the ratio of the reservation price to MC.

Markups μ are solved uniquely from demand elasticity as:

$$\mu = \frac{\eta(\mu / v)}{\eta(\mu / v) - 1} \Rightarrow \text{ Sol'n } \mu(v) \text{ with } 0 < \frac{v\mu'(v)}{\mu(v)} < 1 \quad \textit{Partial pass-through}$$

The change in variables from φ to v, $v \equiv p^* / (a / \varphi)$, leads to the decomposition:

Lemma

The reservation price in the closed economy is:

$$p^* = \underbrace{\left(\frac{N}{N - [\tilde{N} + (\alpha / \beta)]} \right)^{2/r}}_{\downarrow \text{ in variety } N} \underbrace{\left[\int_1^{v^*} \mu(v)^{r/2} \frac{\tilde{g}(v)}{\tilde{G}(v^*)} \right]^{2/r}}_{\text{Average markup}} \underbrace{\left[\int_1^{v^*} \left(\frac{p^*}{v} \right)^{r/2} \frac{g(v)}{G(v^*)} dv \right]^{2/r}}_{\text{Average of costs}}$$

where $\tilde{g}(v) \equiv g(v) / v^{r/2}$ is an "adjusted" density and the upper bound for v, denoted by v^*, for most productive firm, is:

$$v^* = \underbrace{bp^* / a}_{\substack{\text{Intensive} \\ \text{margin}}} \rightarrow \underbrace{\infty \text{ as } b \rightarrow \infty}_{\substack{\text{No intensive} \\ \text{margin}}}$$

Autarky Equilibrium conditions:

1. Free entry/zero expected profit:

$$F = \int_1^{v^*} \left[\frac{\mu(v)-1}{\mu(v)} \right] \underbrace{\frac{Ld\left(\frac{\mu(v)}{v}\right)}{D(\mathbf{p})}}_{\text{Demand}} \left(\frac{p^*}{a} \right)^{\theta} g(v)dv = \frac{L \int_1^{v^*} \left[\frac{\mu(v)-1}{\mu(v)} \right] d\left(\frac{\mu(v)}{v} \right) \left(\frac{p^*}{a} \right)^{\theta} g(v)dv}{N_e \int_1^{v^*} d\left(\frac{\mu(v)}{v} \right) \left(\frac{p^*}{a} \right)^{\theta} g(v)dv}$$

2. Surviving firms: $$N = N_e \int_1^{v^*} \left(\frac{p^*}{a} \right)^{\theta} g(v)dv = N_e \left(\frac{p^*}{a} \right)^{\theta} G(v^*),$$

3. Reservation price: $$N - \left(\tilde{N} + \frac{\alpha}{\beta} \right) = \left(N_e \int_1^{v^*} \left(\frac{\mu(v)}{v} \right)^{r/2} \left(\frac{p^*}{a} \right)^{\theta} g(v)dv \right).$$

- *Examine these in the unbounded Pareto case:*

Autarky Equilibrium conditions with unbounded Pareto:

1. Free entry/zero expected profit:

$$F = \int_1^\infty \left[\frac{\mu(v)-1}{\mu(v)}\right] \underbrace{\frac{Ld\left(\frac{\mu(v)}{v}\right)}{D(\mathbf{p})}}_{\text{Demand}} \left(\frac{p^*}{a}\right)^\theta g(v)dv = \frac{L\int_1^\infty \left[\frac{\mu(v)-1}{\mu(v)}\right] d\left(\frac{\mu(v)}{v}\right)\left(\frac{p^*}{a}\right)^\theta g(v)dv}{N_e \int_1^\infty d\left(\frac{\mu(v)}{v}\right)\left(\frac{p^*}{a}\right)^\theta g(v)dv}$$

- *Solve for N_e as linear in L*

$$\textbf{2, 3.}\ \frac{\textbf{Surviving firms}}{\textbf{Reservation Price}}: \quad \frac{N}{N - \left(\tilde{N} + \frac{\alpha}{\beta}\right)} = \frac{N_e \left(\frac{p^*}{a}\right)^\theta G(\infty)}{\left(N_e \int_1^\infty \left(\frac{\mu(v)}{v}\right)^{r/2} \left(\frac{p^*}{a}\right)^\theta g(v)dv\right)}$$

- *Solve for N independent of L (due to <u>strong</u> selection of firms)!*

Frictionless Trade (between similar countries):

Proposition 2

Under Assumptions 1 and 2, an increase in country size *L* due to frictionless trade leads to: (a) *when* $\boldsymbol{b = \infty}$, *then p* falls only due to the drop in the average of firm costs, with average markups, variety N and the Herfindahl index H fixed;*

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With bounded Pareto:

$$d\ln N_e = \left(\frac{1+A}{1+A+B}\right) d\ln L \quad \text{and} \quad d\ln p^* = \frac{-d\ln L}{\theta(1+A+B)}$$

$$A \equiv \frac{N_e}{[\tilde{N}+(\alpha/\beta)]}\left(\frac{b^{-\theta}}{1-b^{-\theta}}\right)\left[1-\left(\frac{\mu(v^*)}{v^*}\right)^{r/2}\right] = 0 \text{ for } b=\infty, > 0 \text{ for } b<\infty$$

$$B \equiv \left[\frac{L}{F}\left(\frac{\mu(v^*)-1}{\mu(v^*)}\right) - N_e\right]\frac{d[\mu(v^*)/v^*]b^{-\theta}}{D(\mathbf{p})(1-b^{-\theta})} = 0 \text{ for } b=\infty, > 0 \text{ for } b<\infty$$

$$d\ln N_e = \left(\frac{1+A}{1+A+B}\right) d\ln L < d\ln L \text{ and } d\ln p^* = \frac{-d\ln L}{\theta(1+A+B)} > -\frac{d\ln L}{\theta}$$

Less entry but less selection, so opposing effects on N; turns out that *N*↑ and *H*↓

Proposition 2

Under Assumptions 1 and 2, an increase in L under frictionless trade leads to:

(b) *when* ***b < ∞,*** *then variety N rises, the Herfindahl falls, and the average of firm costs and markups fall;*

Average markup is falling because we are excluding the highest markup in:

$$\underbrace{\left[\int_1^{v^*} \mu(v)^{r/2} \frac{\tilde{g}(v)}{\widetilde{G}(v^*)}\right]^{2/r}}_{\text{Average markup}} \text{ as } v^* = \underbrace{bp^*/a}_{\text{Intensive margin}} \text{ falls (but not when } v^* = \infty)$$

But because *variety N increases*, the Herfindahl falls (crowding) so the cost of living falls by *less than* the fall in the reservation price:

$$e_r(\mathbf{p}) = \underbrace{p^*}_{\downarrow} \times \underbrace{D(\mathbf{p})^{1/r}}_{\uparrow} = \underbrace{\text{Variety}}_{\downarrow} \times \underbrace{\text{Markup}}_{\downarrow} \times \underbrace{\text{Costs}}_{\downarrow} \times \underbrace{\text{Herfindahl}}_{\uparrow}$$

Proposition 2

Under Assumptions 1 and 2, an increase in L under frictionless trade leads to:

(c) the proportional welfare gain when $\mathbf{b} < \infty$ *is less than that with* $\mathbf{b} = \infty$.

Corollary

The gain from frictionless trade equals $-d\ln p^* = -d\ln\lambda/\theta > 0$ with an unbounded Pareto distribution, but is *strictly less than this amount* with a bounded Pareto distribution for productivity.

Marc Metliz and Stephen Redding, 2013, "Firm Heterogeneity and Aggregate Welfare"

Variable Trade Costs

- Restrict attention to *symmetric* equilibria
- Write down the equilibrium conditions that allow for zeros in trade
- Each country trades with c = 1 (itself), c = 2 (closest neighbor), ….

Assumption 3

Numbering countries by their proximity to an exporter, delivering one unit to country c means $\tau(c) = \tau_0 c^{\rho} \geq 1$ units must be sent, $\tau_0 \geq 1$, $\rho \geq 0$, $1 < c \leq \widetilde{C}$.

Note that $\tau \equiv 1$ for trading with own country.

But the *comparative statics of a change* τ_0 are too difficult except in two cases:

- Unbounded Pareto
- Bounded Pareto for small changes in τ_0 around the *frictionless* equilibrium

Proposition 3

Under Assumptions 1–3, a small reduction in trade costs implies the following whether productivity is unbounded OR is bounded with the change evaluated at the frictionless equilibrium: *(a) no change in the mass of entrants M_e, the mass of varieties N, or the Herfindahl index H; (b) the same proportionate fall in the reservation price and rise in welfare of* $-(1-\lambda)d\ln\tau_0$*, due to selection only*.

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So does anything differ when productivities are bounded?

- *For* ***large change in trade costs*** *(from autarky), Proposition 2 applies.*
- *Also the drop in domestic variety is* ***more severe*** *in the bounded case:*

Surviving firms: $$M = M_e \int_1^{v^*} \left(\frac{p^*}{a}\right)^{\theta} g(v)dv = \underbrace{M_e}_{\text{fixed}} \underbrace{\left(\frac{p^*}{a}\right)^{\theta}}_{\downarrow} G(\underbrace{v^*}_{\downarrow})$$

So looking at the drop in λ will *overstate the gains* from reducing τ_0.

Conclusions:

Three sources of gains from trade in monopolistic competition model:

1) Expansion in product variety

- but only if the imported varieties *do not eliminate a commensurate amount of domestic varieties*: this **is** the case in Melitz-Chaney and ACDR models
- But once we bound productivity (and move away from the frictionless equilibria) then product variety for consumers will *rise in a larger market or with a fall in trade costs*
- Using translog, Feenstra and Weinstein (2010) find gains from increased variety in the U.S. (balancing import gains and domestic losses) that are about *½ of the CES import variety gains* in Broda and Weinstein (2006)
- The gains from product variety are larger when we allow for intermediate inputs that are *differentiated* and *traded* (Handbook chapter by CR)

2) Pro-competitive effect due to reduction in markups

- This is a social gain since reduced markups leads firms to expand scale, since P/MC = AC/MC
- Using translog, Feenstra and Weinstein (2010) find pro-competitive gains in the U.S. (from reduction in domestic and import markups) that are also about *½ of the CES import variety gains* in Broda and Weinstein (2006)
- But when we add traded intermediate inputs, tariffs reductions can lead to *increased* markups (De Loecker, Goldberg, Khandelwal, Pavcnik, 2012)

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3) Selection of more efficient firms into exporting

- Reduced gains from selection, and in total, in the bounded Pareto case
- But the ACR/ACDR formula for the gains from trade acts as a *upper bound* to the *total gains from trade* obtained in the bounded Pareto case (e.g. FW could use this upper bound to calculate the gains due to selection)

Directions for further work:

- Have not really exploited **zeros** in trade

  Since all countries trade using unbounded Pareto or around the frictionless eq.

- Have not allowed for **fixed costs** of production or exporting

  That would be enough to restore role for product variety and markups, because lower-bound of integration is endogenous. This is simplified in the CES and translog cases. It would be of interest to allow these fixed costs to fall, leading to more trade.

- Have not explored any productivity distribution other than **Pareto**

  Expect that the unbounded Pareto is the ***only*** *distribution with the special feature that selection becomes the only operative force in the gains from trade.*

- Have not explored the gains from ***tariff vs. iceberg trade cost*** *reductions*

  Recent literature shows that the gains from tariff reductions are greater than that obtained from reductions in iceberg trade costs.