

A few thoughts on competitiveness from a trade economist's perspective¹

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¹ Remarks for the EPA Science Advisory Board meeting on Economy-wide Analysis of Air Regulations, July 19/20, 2016

Impacts of environmental regulations on sectoral output

- Likely modest in the aggregate (White Paper suggests average of -3%)**
- This does not obviate the need for quantitative estimates; indeed they become even more important if the industry believes otherwise**
- Impacts are also likely quite heterogeneous across firms, depending on emissions intensity of output**

Armington approach

- **Assumes that domestic goods within an industry are identical, but fundamentally differentiated from imported goods – which, in turn, are differentiated by country of origin**
- **Typically treat import-import substitution (higher) differently from import-domestic substitution (lower); this means that impact on US exporters will be more severe, as US faces import-import substitution in export markets**
- **While import-domestic substitution plays an important role in determination of output impacts of domestic environmental regulations, most econometric estimates pertain to import-import substitution due to (trade) data availability**

International trade in manufactures is increasingly dominated by a relatively small group of very large firms producing differentiated products: *Armington model is less applicable in this context*

Exporting By U.S. Manufacturing Firms, 2002

NAICS industry	Percent of firms	Percent of firms that export	Mean exports as a percent of total shipments
311 Food Manufacturing	6.8	12	15
312 Beverage and Tobacco Product	0.7	23	7
313 Textile Mills	1.0	25	13
314 Textile Product Mills	1.9	12	12
315 Apparel Manufacturing	3.2	8	14
316 Leather and Allied Product	0.4	24	13
321 Wood Product Manufacturing	5.5	8	19
322 Paper Manufacturing	1.4	24	9
323 Printing and Related Support	11.9	5	14
324 Petroleum and Coal Products	0.4	18	12
325 Chemical Manufacturing	3.1	36	14
326 Plastics and Rubber Products	4.4	28	10
327 Nonmetallic Mineral Product	4.0	9	12
331 Primary Metal Manufacturing	1.5	30	10
332 Fabricated Metal Product	19.9	14	12
333 Machinery Manufacturing	9.0	33	16
334 Computer and Electronic Product	4.5	38	21
335 Electrical Equipment, Appliance	1.7	38	13
336 Transportation Equipment	3.4	28	13
337 Furniture and Related Product	6.4	7	10
339 Miscellaneous Manufacturing	9.1	9	15
Aggregate manufacturing	100	18	14

- Exporting is rare; most firms do not export
- Exporting tends to be dominated by larger firms
- Statistics are similar in other developed economies

Sources: Data are from the 2002 U.S. Census of Manufactures.

Notes: The first column of numbers summarizes the distribution of manufacturing firms across three-digit NAICS manufacturing industries. The second reports the share of firms in each industry that export. The final column reports mean exports as a percent of total shipments across all firms that export in the noted industry.

Source: Bernard, Jensen, Redding, and Schott (2007)

Firm level product differentiation

- Adds the extensive margin to industrial output change (i.e. firm entry/exit)**
- Under oligopoly, potential for ‘procompetitive effects’ – i.e., markups may absorb some of the rise in costs**
- Opens avenue for consideration of heterogeneous firms within industry (Melitz)**
- However, empirically consistent trade elasticities will be smaller in Melitz model; if use Armington elasticities with Melitz, CGE will greatly overstate trade and output responses**

Capturing firm heterogeneity within a CGE model is very appealing

- However, what matters for regulation is not variation in overall productivity--rather emissions intensity of output is what counts
- Consider distribution of Nitrogen fertilizer application rates in corn production: huge variation even after controlling for biophysical variation and natural sources
- When incorporate into CGE model, N-tax generates churning within the industry & significant reduction in fertilizer use (Hertel, Vroomen and Stiegert, 1996)

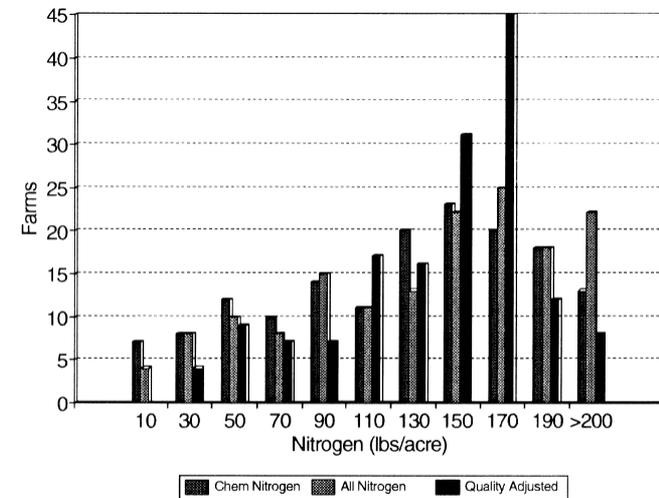


Figure 1. Distribution of per acre nitrogen application rates: Indiana corn production, 1989