"Reallocation and Technology: the US Steel Industry"

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Study "creative destruction": how an innovation re-shaped an industry.

Major "Process" Innovation with both

- Social impacts; Pittsburgh goes from 604,000 in 1960 (16th largest), to 305,000 (59th) now,

- Productivity impacts; industry being displaced by imports became among the highest productivity growth industries (Can we see imports? Earlier productivity numbers?).

Process Innovation. Much the same products are produced (not much need to account for quality change).

Labor and capital per unit output fall dramatically; is it true materials per unit ($\approx$ 50% of sales) do not change as much? Nature of production?

MM comes in with 24% higher productivity. VI catches up so difference at the end is $\approx$ 4% and probably not significant.

MM and VI producers "look" more similar over time; by 2002 measures of; plant size,value added per worker,... indistinguishabe from each other after very significant differences initially.

Only difference that stays is the *wage premium* in VI plants. They have production function coefficients and could analyze the effect on: Profits? Capital/Labor ratio? Job loss? Maybe even exit (see below) with additional assumptions.

Modes of increased productivity:

- Improvements in the MM technology per se (especially in ability to produce higher quality steel and have larger plants). 100% of the 10% change in MM productivity.

- Exit of VI producers with poor VI technology, and reallocation of remaining VI output among firms. 67% of a 23.6% change in VI productivity.

- Shift of market share to MM (from 12 to 41%)

Some facts.

- Much of the exit of VI plants occurs during the downturn in demand and just thereafter (1972-77).

- It takes minimills some time before their increase in productivity begins (starts after 1977)

- Markups drop by 40%, while productivity increases by only 30%.

Generates more questions of interest to different parts of I.O.

- Link the markups with the extent of competition. Reduced form "correlation" (# of MMs and VI's, Foreign competitors)?

- Did the first entrants into MMs make more money than the followers? (You have profits)?

- Who was developing the technology for the new MM's, and what fraction of returns from it were they capturing?

Measurement Issues.

Complaint. We do not get;

- standard errors of productivity numbers, or perhaps more importantly,

- standard errors for differences either; (i) across technologies or (ii) over time.

- indeed we do not get the serial correlation properties of productivity of individual plants (and this is buried in their procedure somewhere).

This despite the fact that the aggregate numbers are very "jumpy".

Further measurement questions.

Increase in MM average productivity. To what extent is this because

- the technology improves over time (usual process with major innovations is they become adapted to a wider range of uses, ...)? Are their vintage effects that persist over time?

- It takes time to learn how to run the new plants effectively (l.b.d.)? Is the l.b.d. faster in later entrants (they learn from prior use by others)?

Should tell us something about externality generation.

Reallocation among VI producers. To what extent

- is this some firms investing in more modern technology that is more efficient?

- is this just a natural downsizing along the way to exit of the less productive firms?

- Who is exiting? Simple probits with productivity, market segment, aggregate demand,... on rhs.

- Who are the low productivity firms (anything to do with vintage, market segment...)?