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CATALOGUE
No
110

Scale and Scope

Outline

- Back to Coase
- Technical change and scale?
 - Example Steel
- Economies of scope?
 - Bio-tech and the larger drug firms
- External economies
 - Silicon Valley and Industrial clusters

Back to Coase

- Size of the firm depends on whether it can do things better than the market.
- Economies of scale are often associated with technical indivisibilities—at a given level of production
- Economies of scope are often associated with an indivisibility but it does not have to be technical.
- Other economies may actually come from markets

Economies

- A cost function features economies of scale if over some range of quantities average cost falls as quantity increases.
 - Connection to production function
- A cost function features economies of scope if the cost of producing a certain quantity of two goods together is less than the cost of producing them separately.
 - Connection to production function (complements in output)
- Cost function feature external economies if the cost of producing a good is less when the firm is located near other firms producing the same kind of output
 - This is going to be a statistical relationship.
- For each case where there are economies there are also dis-economies.

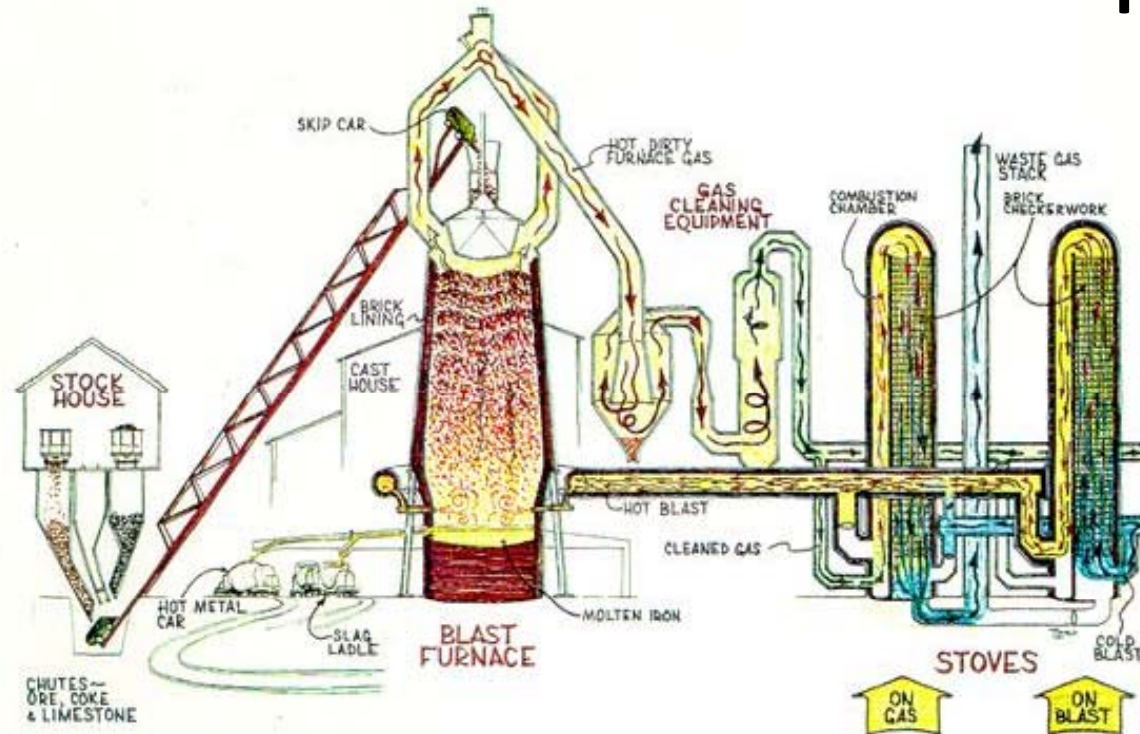
Economies

- Example 1: transport.
- Once the road is built transport has a constant marginal cost until congestion sets in. So average cost must decline early on at least.
- If you use jumbo jets to ferry people from Los Angeles to Tokyo you can use part of the Cargo hold for freight. That may be less than the cost of operating the two services together.

Economies of scale

- Classic examples of economies of scale comes from Manufacturing. Three hundred years ago few firms had more than two dozen employees. Most production was made to order.
- Today most manufacturing jobs are in firms with more than 5,000 workers. Most production is made for inventory (producer does not know who the ultimate consumer will be)

Iron and Steel



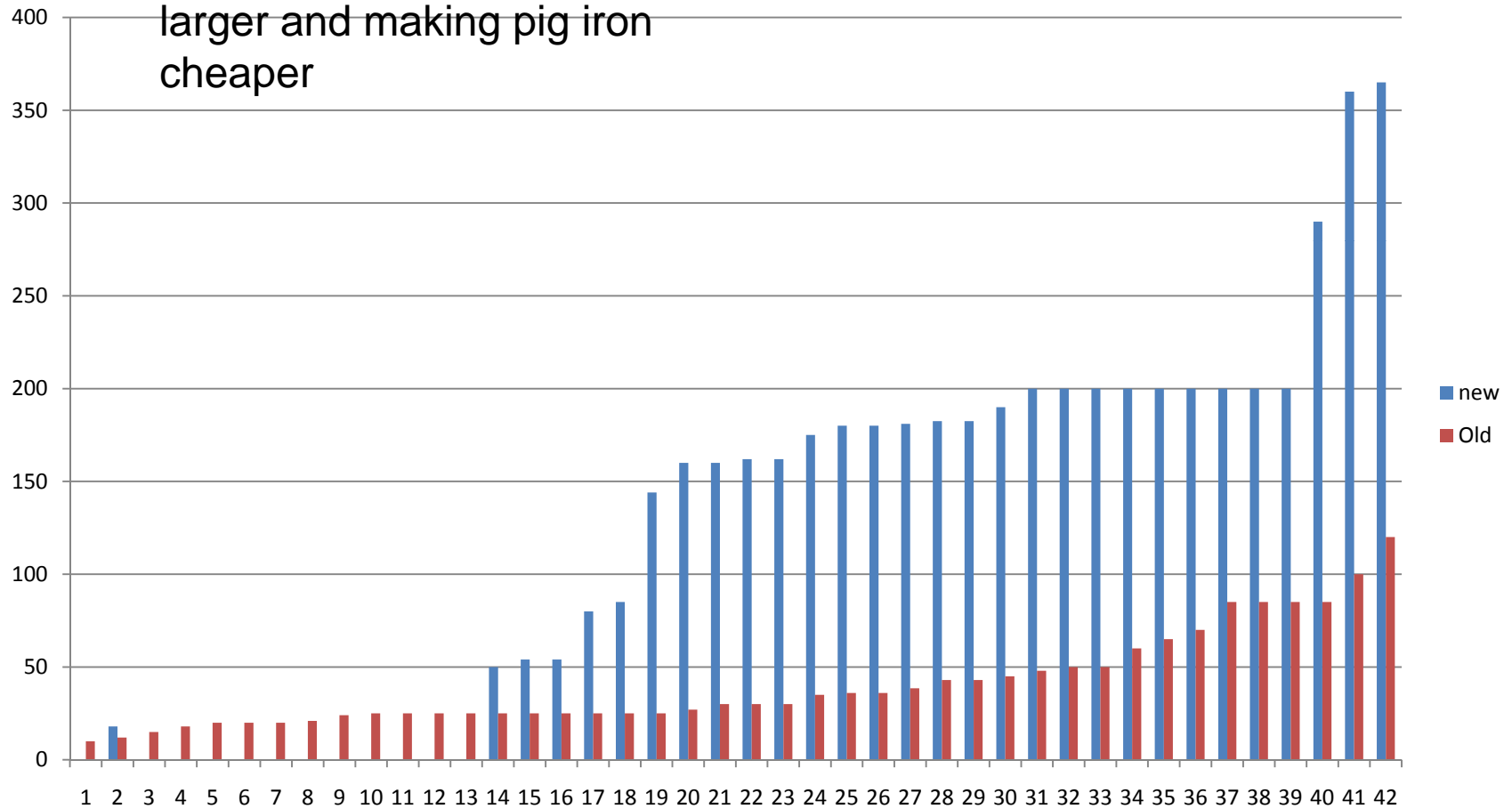
- Economies of scale come from reducing heating costs.
 - Size of stack reduces heating costs.
 - Recycling gases reduces heating costs.
 - Continuous production reduces heating costs.
 - Then integrating the refining into steel and the shaping of the molten metal also reduces costs

Problem how to measure economies of scale

- Its very risky to build bigger if you are not sure its going to work
- So you need good engineering data.
 - Complicated because there other dimensions to costs..
- The evidence is that although some design work better than others, from 1700 to 1970 bigger was better.

What is going on?

Blast Furnaces are getting larger and making pig iron cheaper



Savings

<i><u>Year</u></i>	<i>Capital</i>	<i>Workers</i>	<i>Output 1000s tons</i>
1849	56	65	1.5
1869	145	71	5
1879	262	122	10
1889	426	110	29
1899	643	176	65

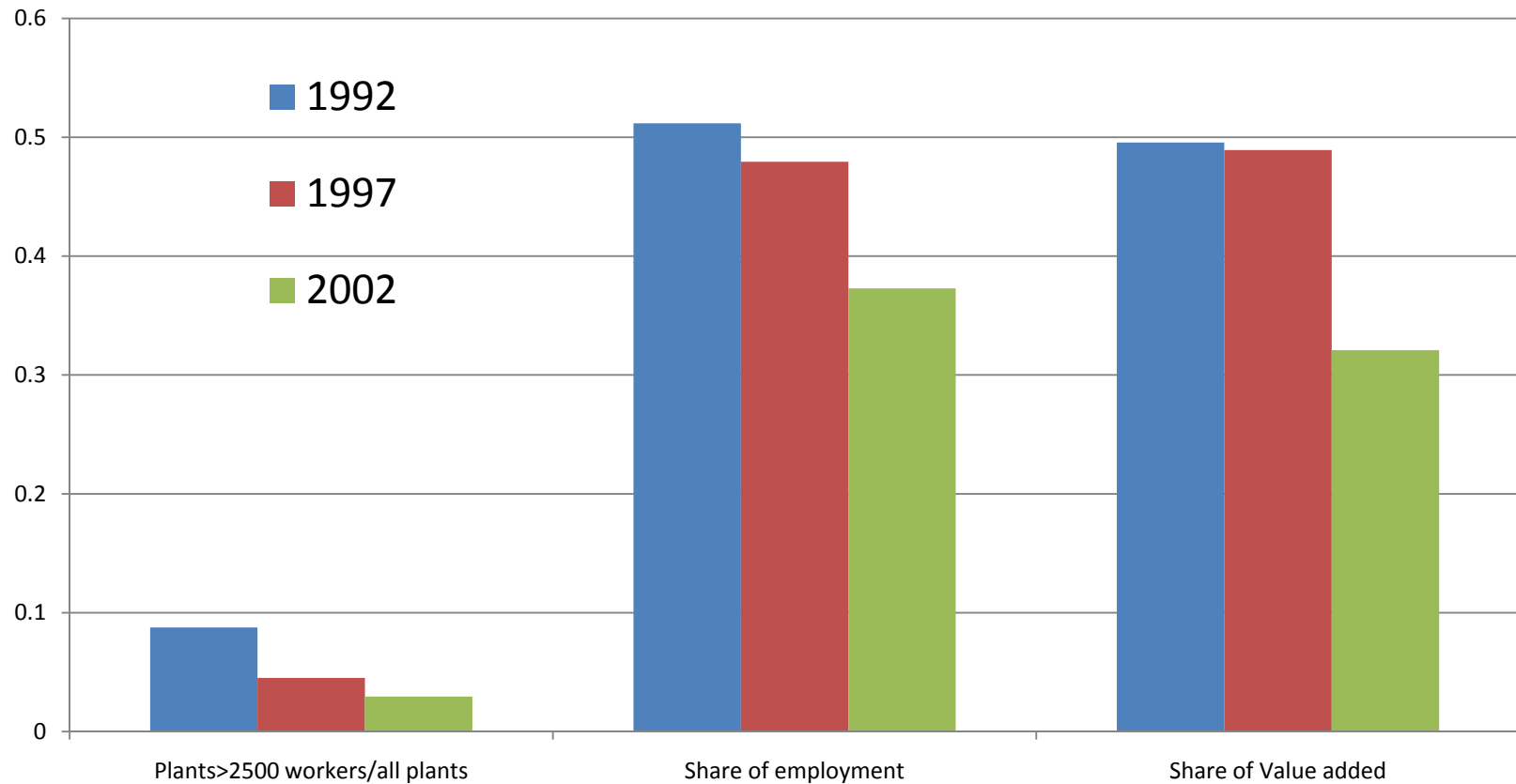
In 50 years output grows by 42
output per worker by 16
output per unit of capital 3.7

- By the 1970s
- Japan develops mega mills
 - 4 million tons or more
 - Most of the output comes from Furnaces with capacity 1.2 million tons
- US has much older plants and only 5 that large
 - So many firms shut down
- Industry will reappear as mini mills producing specialty steel
- Source: Crandal US Steel Industry 1981

Economies of scale

- Notice the role of the Blast furnace as an indivisible investment.
- Notice also that this works best if you want only one quality of pig iron
- If you want to make different kinds of steel then bigger may not be better-→ mini mills

By the 1980s American steel has a resurgence: but the economies of scale are gone



Economies of scale

- By historical standards we still have a lot of processes that operate at very large scale
- In many areas concentration has actually increased (Airlines, Banks, retail, Airplane manufacturers, stock exchanges, shopping malls)
- Because of technology? Not really its also because of economies of management and distribution.
- This can cause some problems : eg flu vaccine pbs

Economies of scope

- These can come from complements in production
 - Grain and Hay (Beef and Hides)
- But that is actually relatively rare, most often economies of scope have to do with organizational issues.
- Marketing, advertising, insurance....

Economies of scope

- Define a cost function as a multi-product cost function $C(Q_1, Q_2)$ You have economies of scope if there exist some Q_1, Q_2 such that
- $C(Q_1, Q_2) < C(0, Q_2) + C(Q_1, 0)$
- Or if differentiable $\partial^2 C / \partial Q_1 \partial Q_2 < 0$
 - Contrast with
 - $C(aQ) < aC(Q)$
 - $\partial^2 C / \partial Q^2 < 0$

Economies of Scope

- Brand Names
 - Take Johnson and Johnson or Nabisco or any other of the large consumer products firms.
 - Why do they produce so many different products?
 - Economies of scale?
 - Advantages in introducing new products.
 - Is it cheaper (easier) for Kelloggs to introduce a new Cereal or for the start up Rosenthal and Co?
 - why

Economies of Scope failures

- City Bank-Travelers
 - What are the costs savings
 - What are the increases in demand
- Time Warner-AOL
- Vivendi-Universal
- Daimler-Benz Chrysler?
 - What is it economies of scale or
 - Economies of scale?

Key example Drug companies

- Most new drugs found by start ups are actually taken to market by large well established firm. Why?
- Is it the technology? Are there large increasing returns to drug manufacturing?
- Is it the market?
 - If so are the economies of scope coming from interaction with input markets
 - Or outputs?

Economies of scope in the drug industry

- Capital market imperfection
 - Development is very risky, small firms with no current product are credit constrained
- Knowledge about how to go through FDA approval
 - FDA approval is an input
- Marketing relationships with doctors
 - Output market
- Patients more willing to adopt if it comes with a well know brand
 - Output market
- Capital at risk in case something goes wrong
- And the list goes on.

Has the internet increased or reduced economies of scope

- Is it good or bad for malls
- Is it good or bad for small retailers
- Market share for online retailers
 - Amazon
 - Dell
 - Netflix
- Where is the economy of scope?

Amazon

- From Amazon's perspective
 - Books
 - Other stuff it sells directly
 - Use of the portal for things it does not sell
- From the other vendors that sell through Amazon
 - Why not just let search engines find you
 - Economies of scale, scope or external economies

External economies

- So far we measures these economies/diseconomies within the firm.
 - Firm profits go up or down because it expands production, or range of products.
 - Key strategic decisions
- But there can be economies between firms
 - Industry clusters
 - Tight relationships between suppliers and final producer

Industry clusters

- Old Industries were clustered and vertically integrated. Detroit (cars), Pittsburgh (steel), Chicago (meat packing), NY (finance), Los Angeles (Movies), Machine tools (Connecticut river Valley)
- Intermediate set of industries Airplanes, Mainframes Chemicals. Not clustered
- Then resurgence of clusters in high tech (Silicon Valley, Boston,) but these are not vertically integrated.

What does all this imply

- Housing, wages, real estate are higher in an industry cluster than elsewhere.
- So why clusters
 - Back to Competitive equilibrium:
 - $P=MC$
 - $W=p(\partial F/ \partial L)$
 - Productivity analysis
 - If W is high Marginal product is high
 - But you will want to only do it for those steps of production where it is really important.