Castings and Forgings Struggle with the National Defense Industrial Strategy

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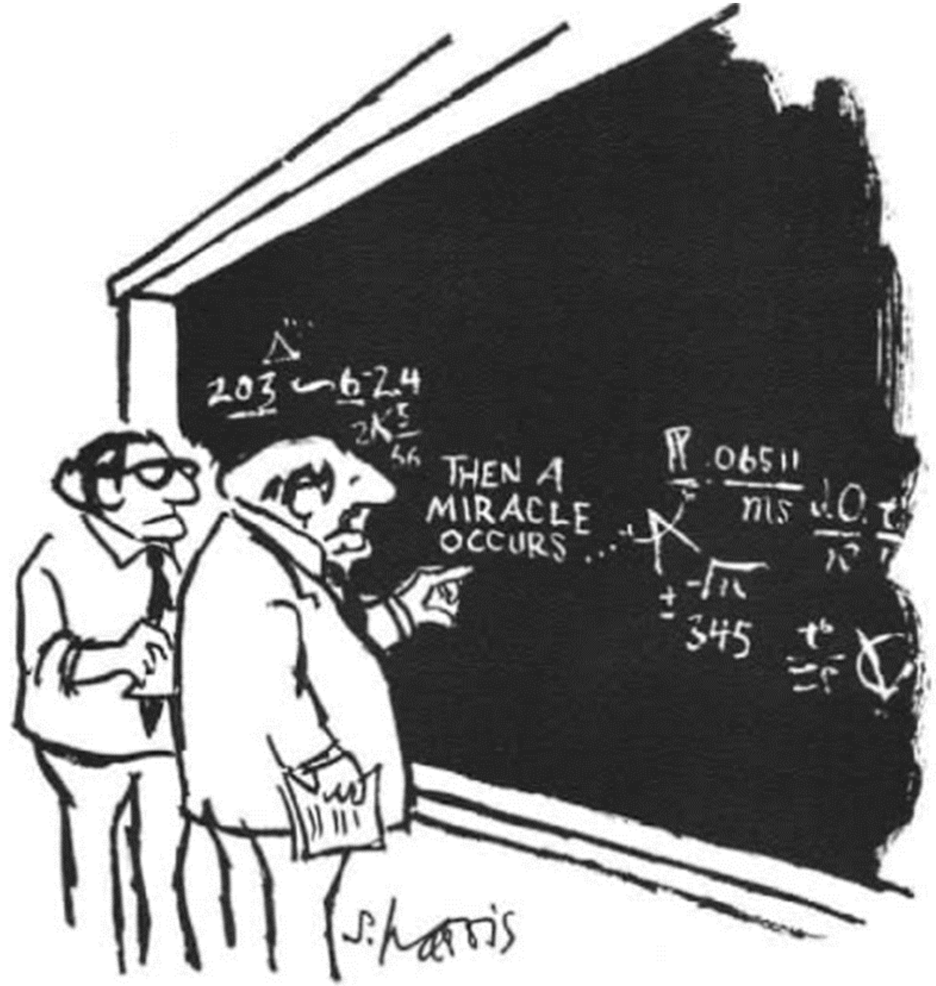
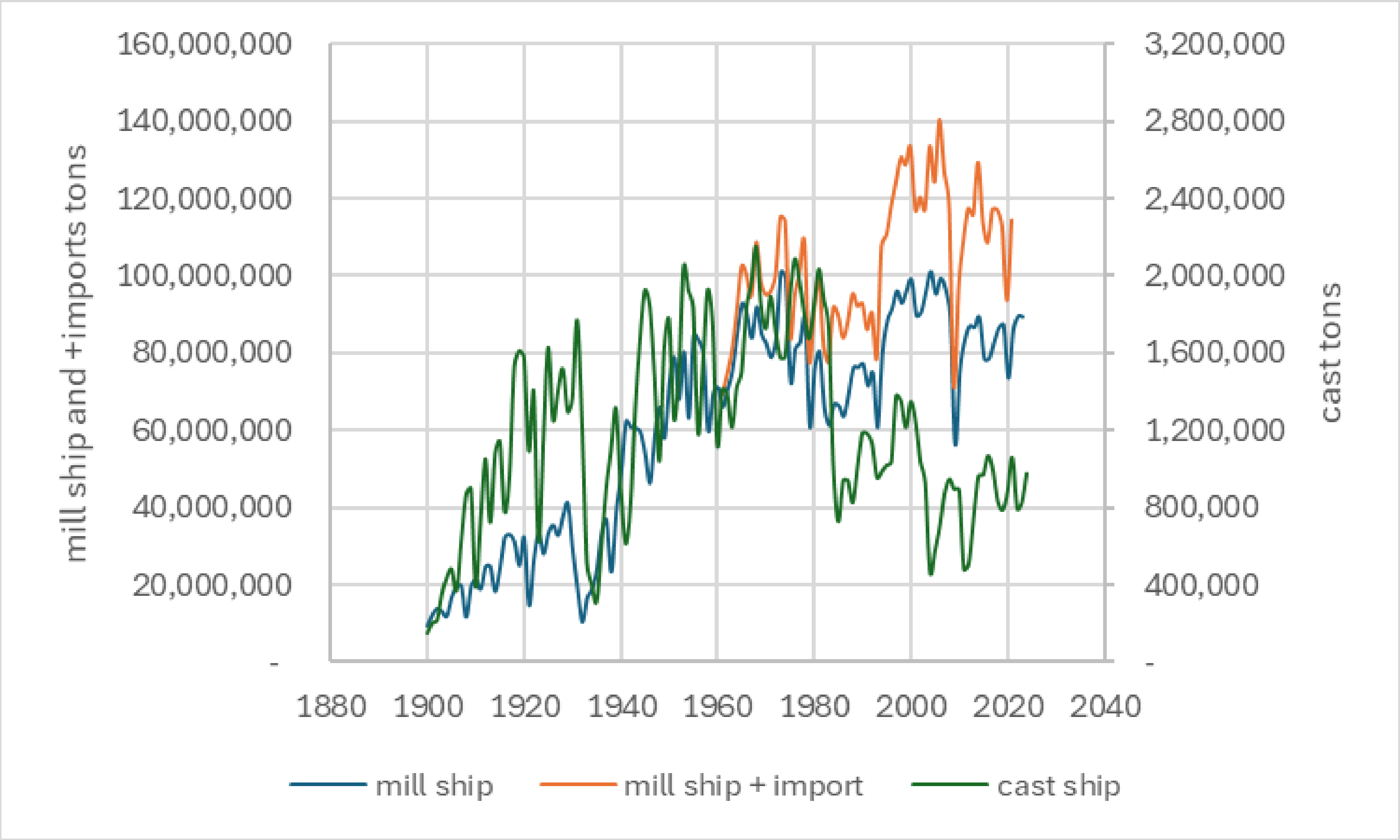


"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Castings and Forgings are Identified as a Supply Chain Concern by DoD in Response to E.O. 14017

Steel products were essential to the industrialization required for modern life. Steel was the primary material for infrastructure and manufacturing. Steel castings, forgings, and mill products production increased with population and development until 1980. What happened after 1980 that limited increase in domestic mill and reduced casting production?



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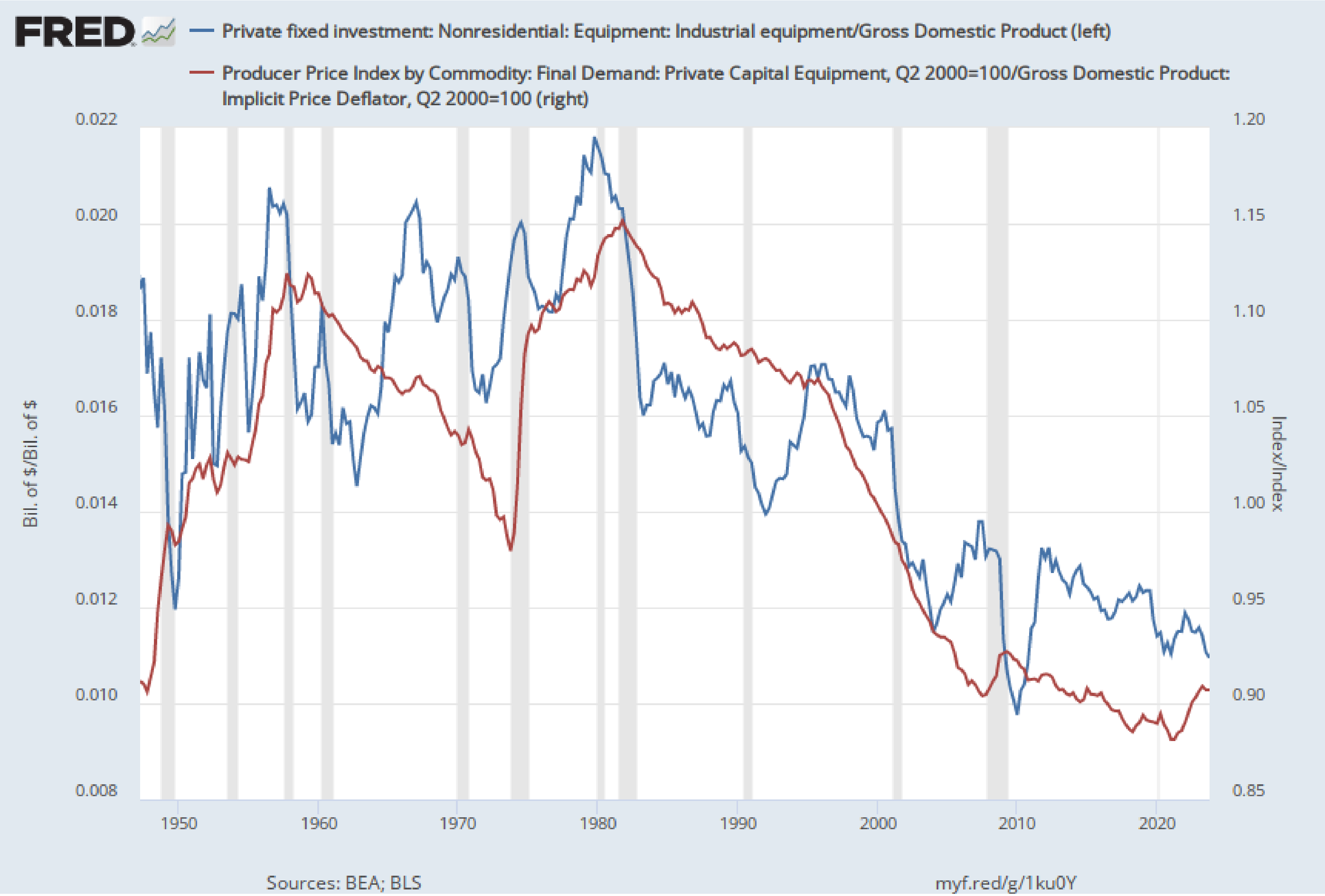
Public Policy and Macro-economic shifts led to a significant drop in demand and domestic production.

Profitability is the driving force behind investment and growth.

The value of products can be estimated from the change in dollar prices (the PPI) divided by the change in the value of the dollar.

Capital investment in equipment has a cycle of decades, 30 years approximately, with a peak in 1928, 1958, 1980.

At the bottom, the capacity is too small and demand pushes up the value and the investment for expansion, modernization, and innovation.

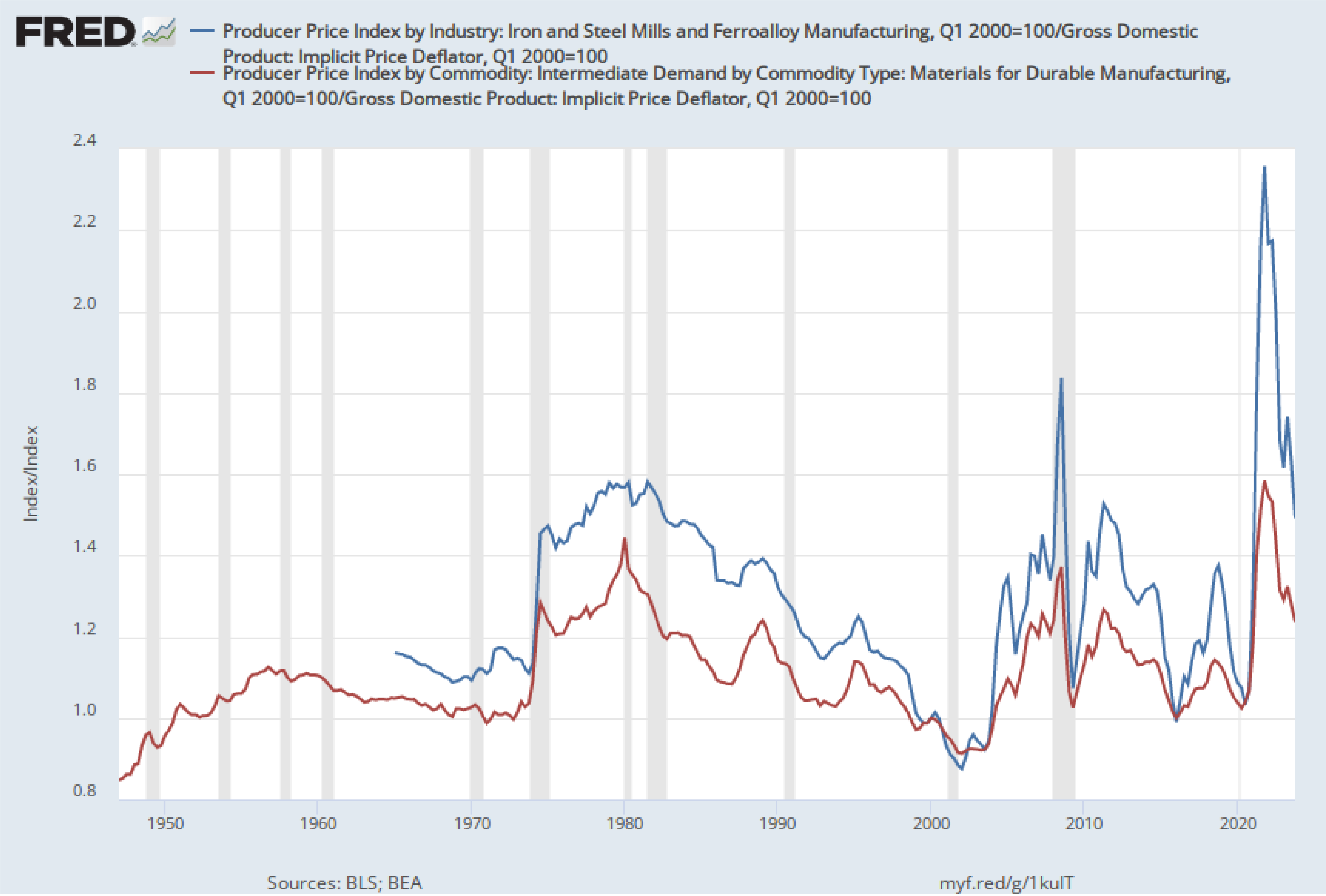


Capital Equipment Investment Re-industrialization should have happened after 2004.

The continued decline in the value of capital equipment in the prior slide was not seen in the value of materials or steel products after 2004. Values increased as global growth overwhelmed industry capacity.

The prior slide shows that investment in industrial equipment fell from over 2% of the GDP to less than 1%. Why did we not see the investment in capital investment?

Globalization created a global supply chain and the investment went elsewhere.

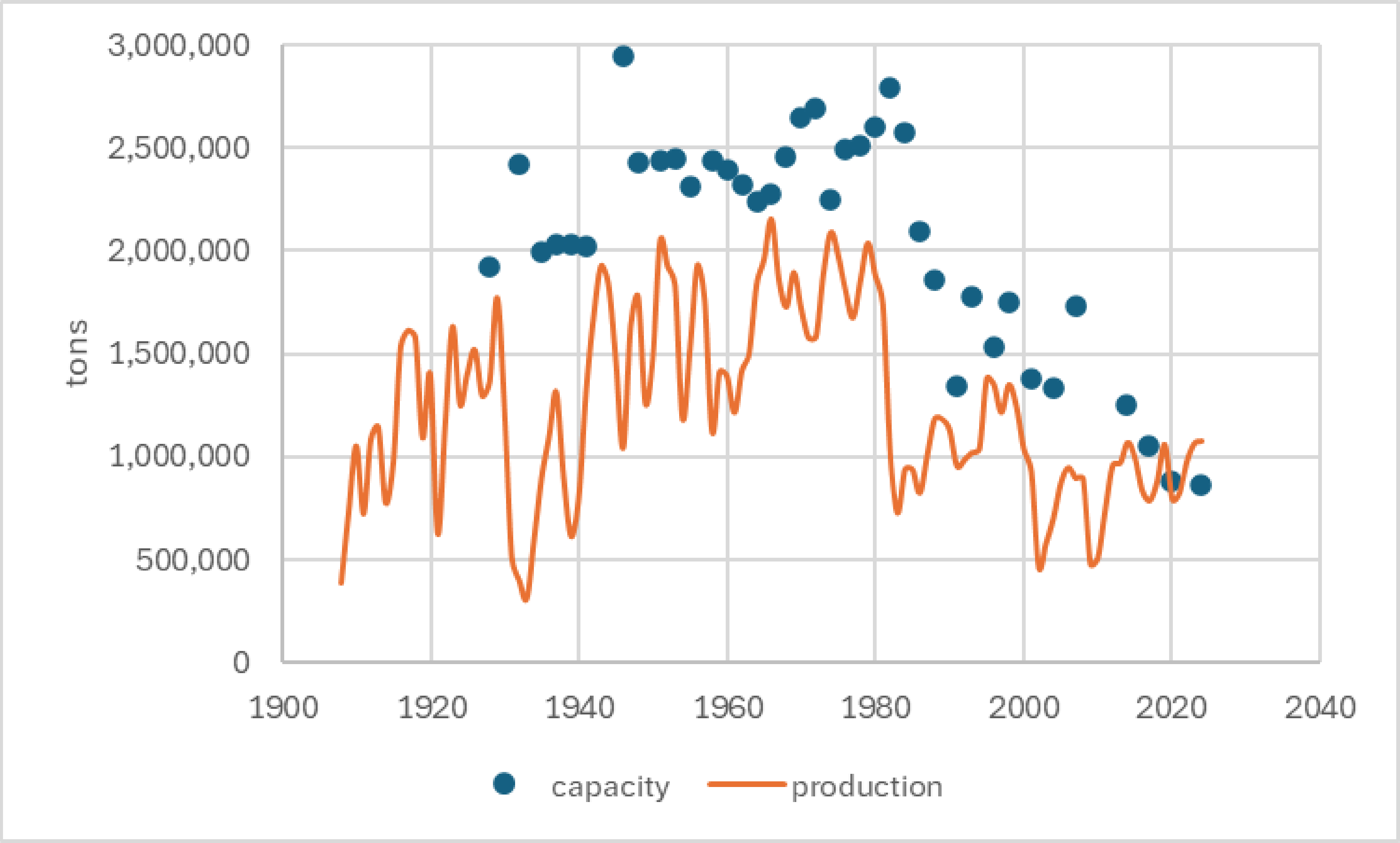


Steel Casting Production and Capacity showed the expected result of De-industrialization

Demand and value went up after 2004 but the domestic sources were not able to keep up at times of peak demand.

Changes in fiscal and monetary policy resulted in more volatility that was exacerbated by the financial crisis and the response to the pandemic as seen in the prior slide.

Domestic producers suffer from a combination of achieving attractive profitability and finding workers.



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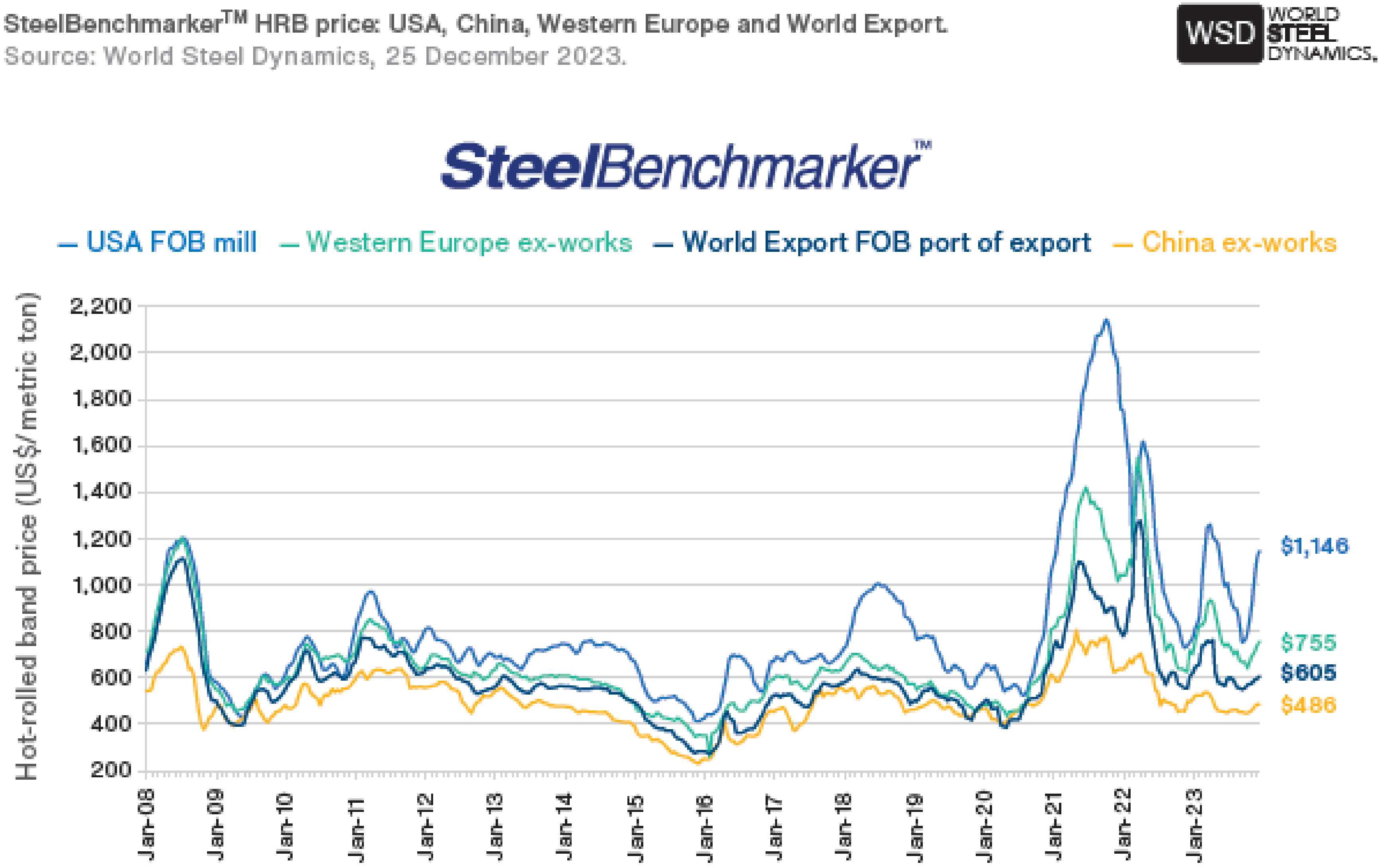
Comparisons of Steel Mill Prices show that Domestic Sources are more expensive

Steel purchasers are driven to use the lowest cost steel available to be competitive in their markets. Producers in the U.S. routinely have prices for ordinary steel that are higher than the rest of the world.

Economists and policy makers assume that domestic steelmakers are incapable of competing with alternative global sources.

SteelBenchmarker™ HRB price: USA, China, Western Europe and World Export.
Source: World Steel Dynamics, 25 December 2023.



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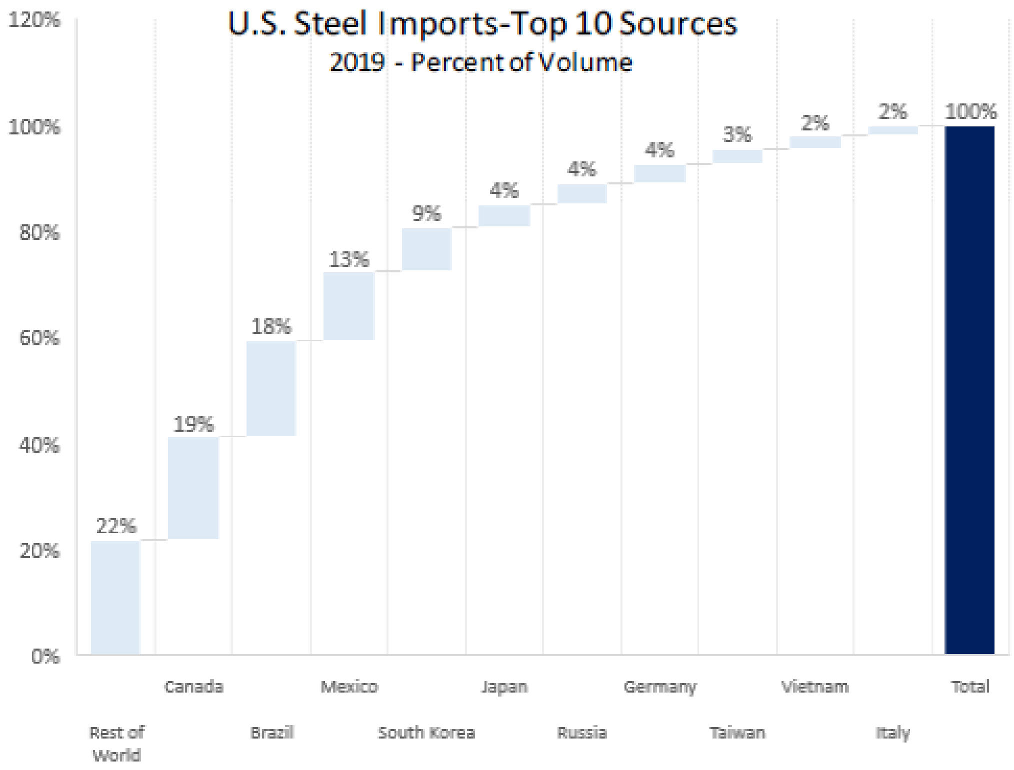
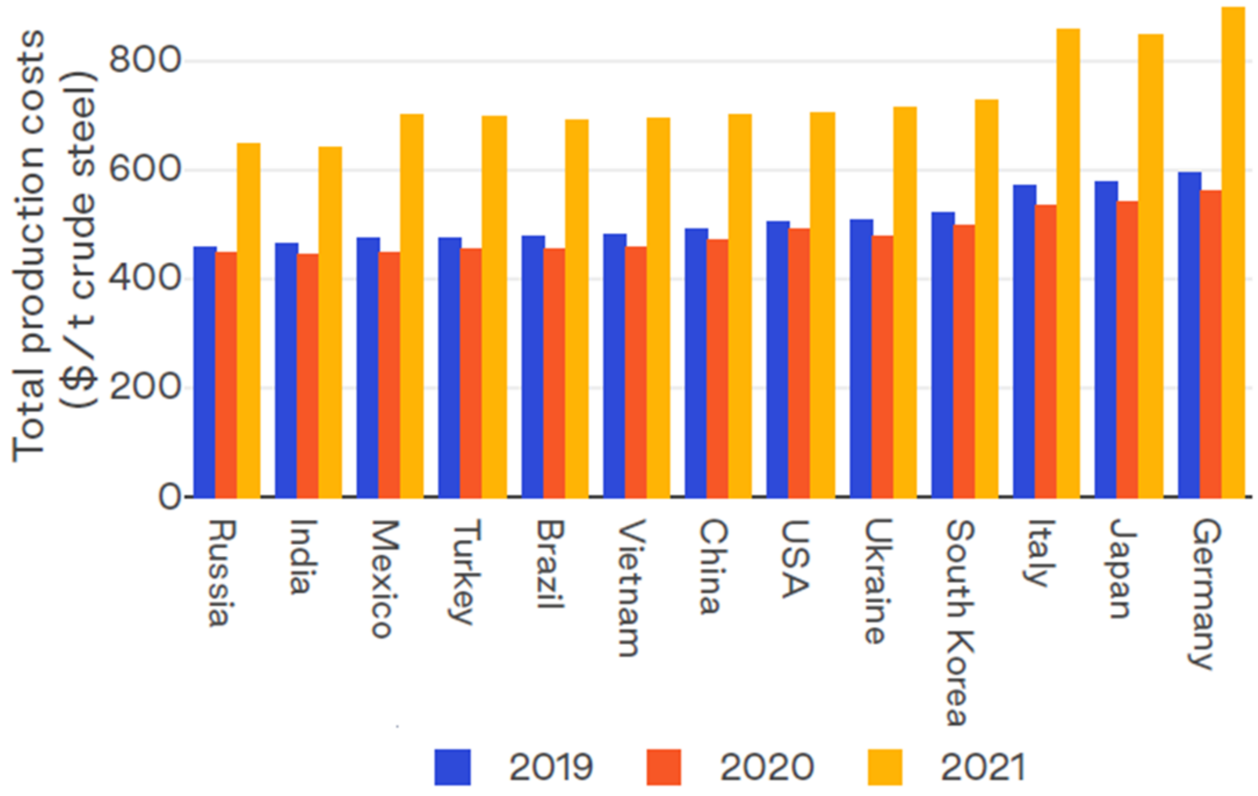
Steel Production Costs in the U.S.A. are at parity with other Major Import Sources

If steel production costs are at near parity and imported steel must be transported and handled to be available, how can it be the less expensive source?
Our public policy burdens capital intensive industries with economic externalities that must be included in the price.



https://legacy.trade.gov/steel/countries/pdfs/imports-us.pdf

Figure 1. Total steel production costs in different countries, 2019-2021

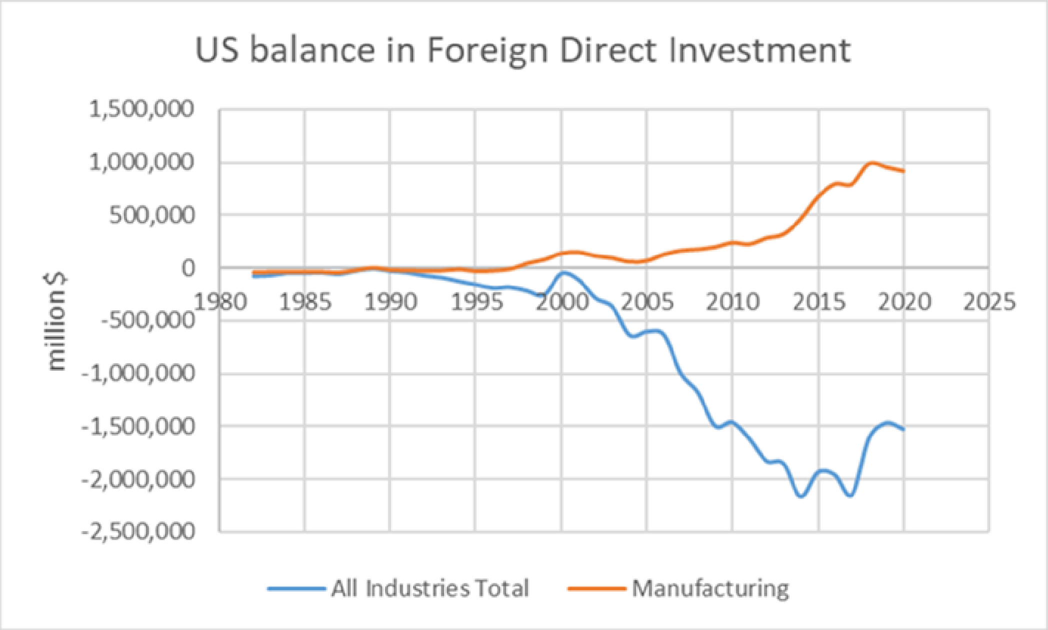


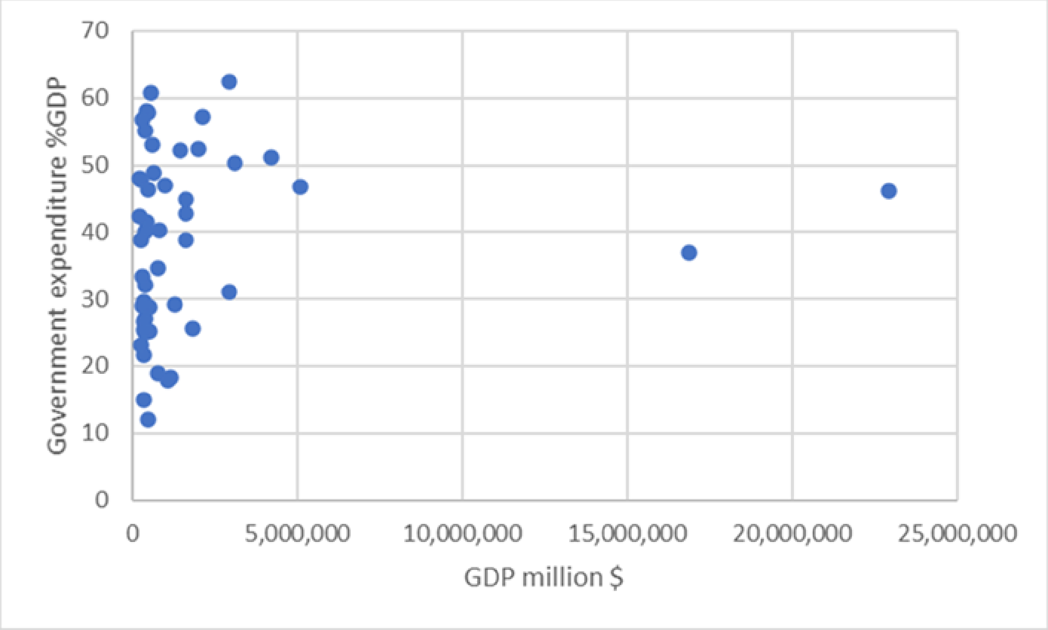
Source: This analysis by TransitionZero and GEI

Steel Competitiveness of U.S. Producers is an artifact of U.S. public policy

The purchase of U.S. steel plants by foreign entities who have the capital to modernize and invest is an indication that our domestic policy limits our profitability and new investment. The loss on product volume for capital intensive plants makes them unprofitable since there is not enough market of advanced products to support the needed investment and staffing.

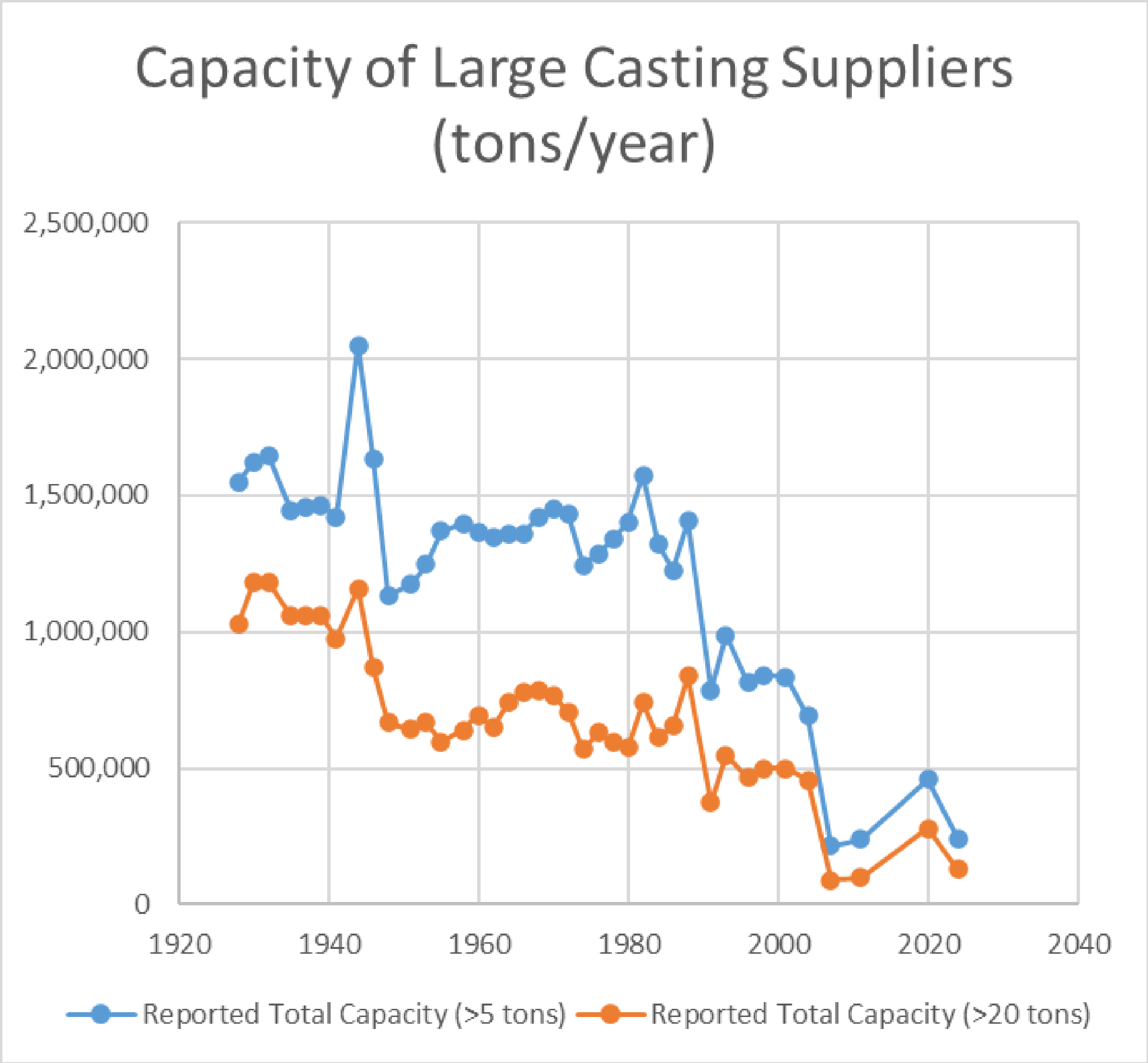
	SteelBenchmarker HRB price				AIST
Prices are $/ton	USA FOB Mill	Western Europe ex-works	China ex-works	World export FOB port of export	No 1 HIM
Med	745.5	566.5	486.5	521.0	241.0
Ave	1,024.4	735.8	541.0	634.3	284.7
Std	559.5	321.1	120.7	209.4	83.6
Max	2,124.0	1,428.0	757.0	1,100.0	415.0
Min	530.0	453.0	390.0	402.0	172.0

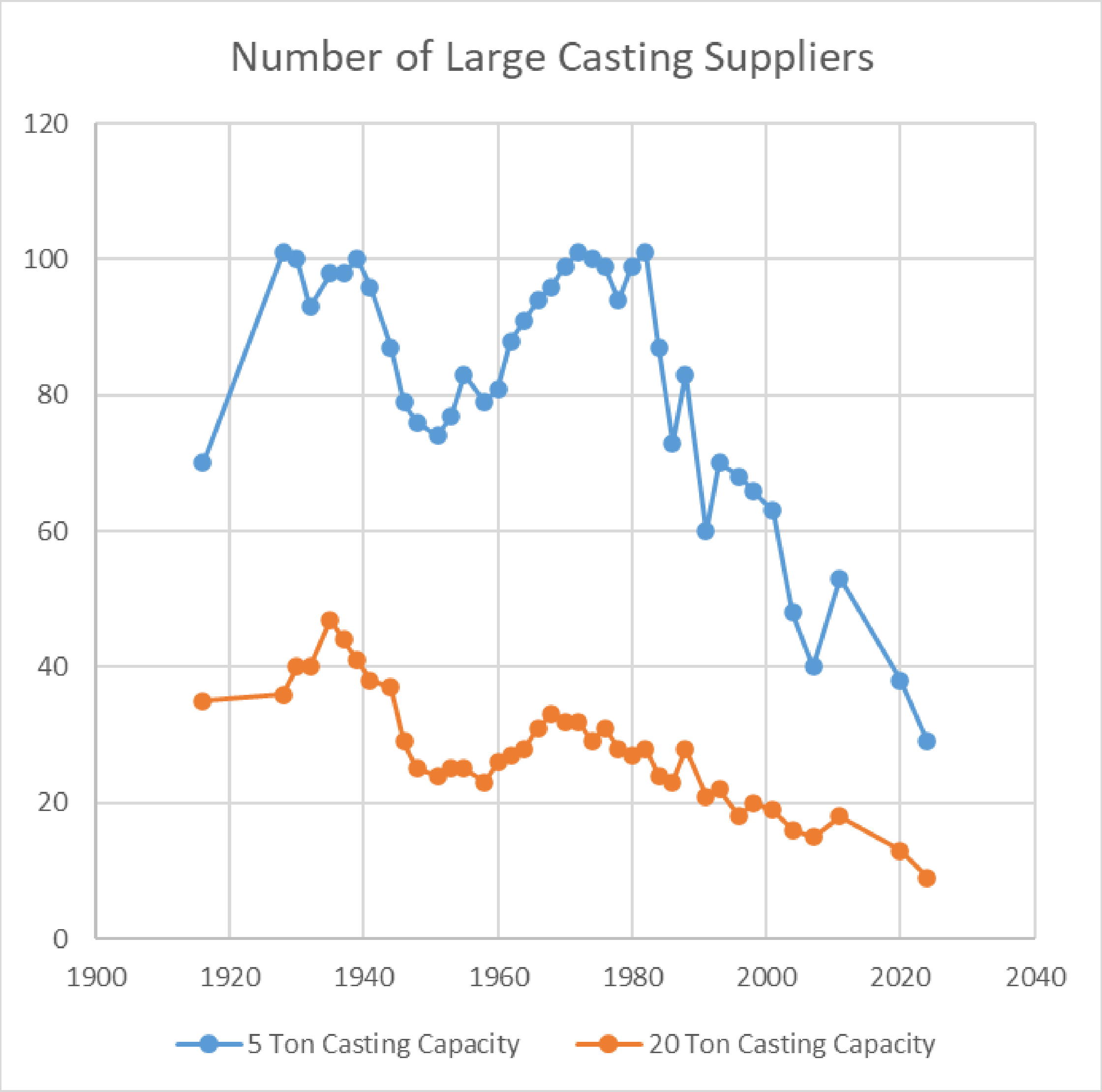




Large Steel Casting Capacity has fallen precipitously with limited Market Demand

Specialty and Advanced Large Castings essential for infrastructure, energy and defense requires a regular market for common products to maintain the staff and equipment needed.





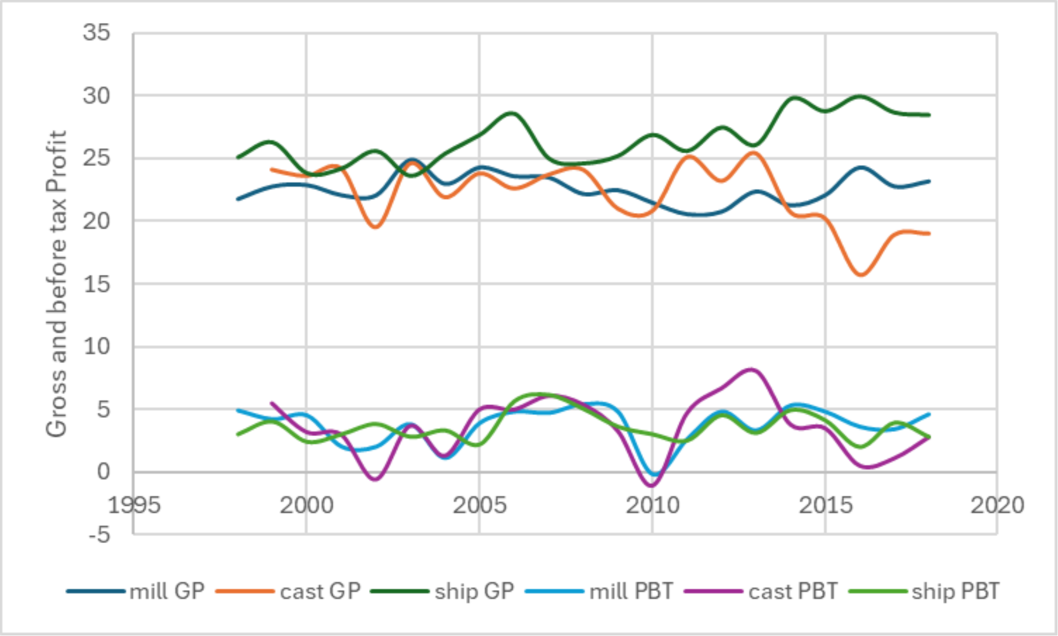
Paying for Economic Externalities

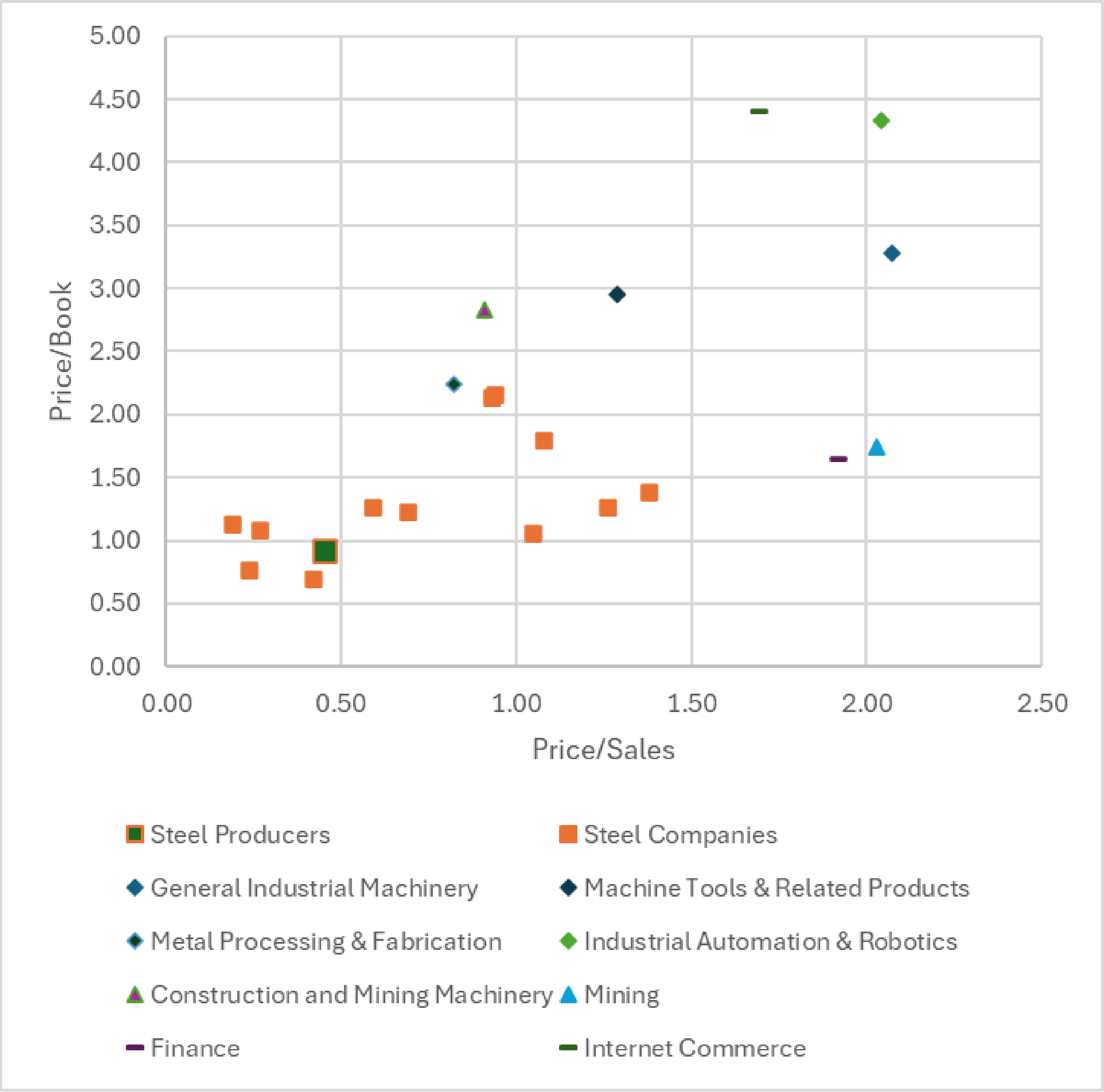
Economic externalities are the costs to society as a whole. Public policy imposes these costs, on manufacturing including:

- Health care and retirement
- Environmental impact and exposures
- Social justice

When manufacturing was regional, and all plants had the same costs, this made sense.

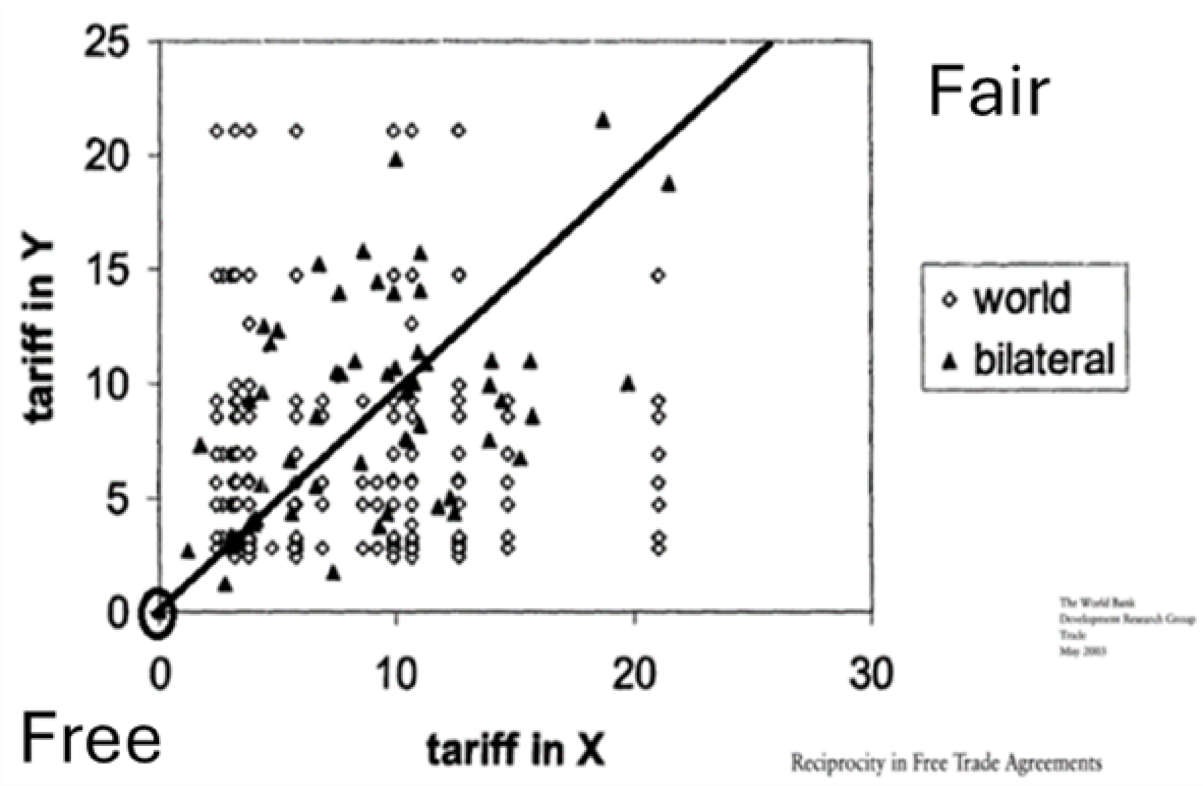
https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Externalities

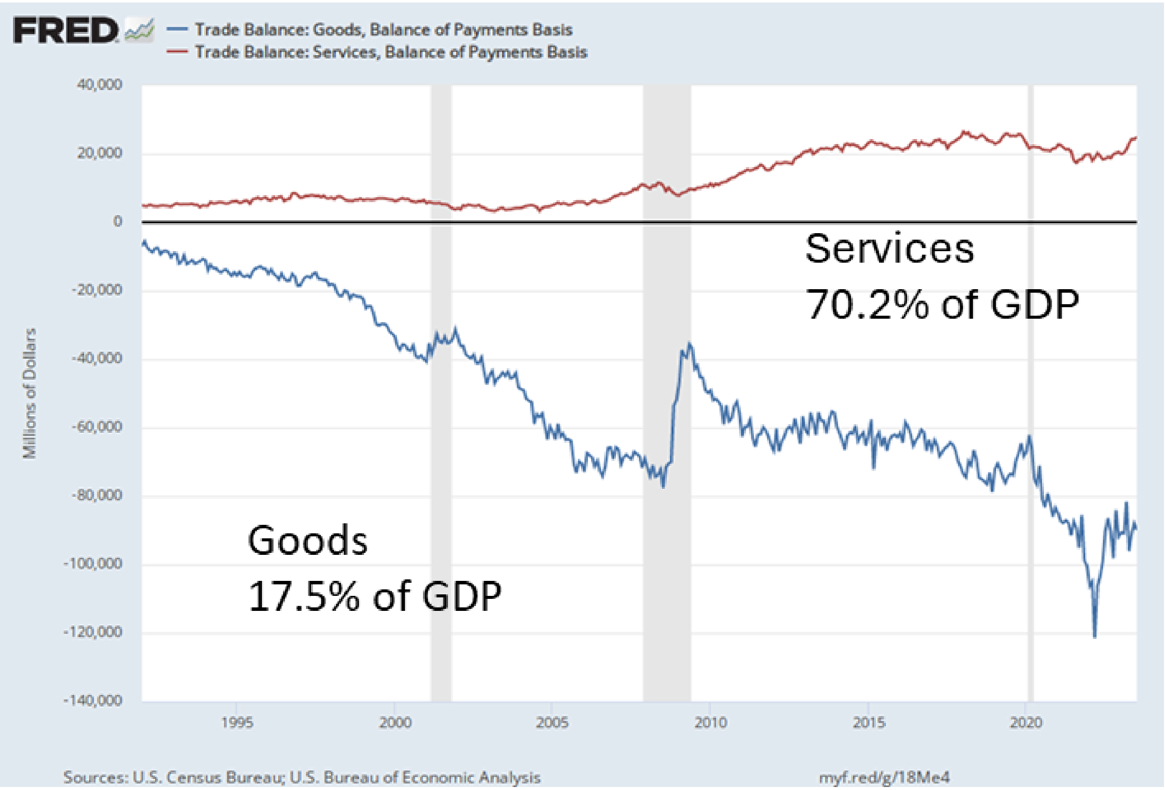




Globalization was not a free market discovery of best value but a mercantilist geo-political structure.

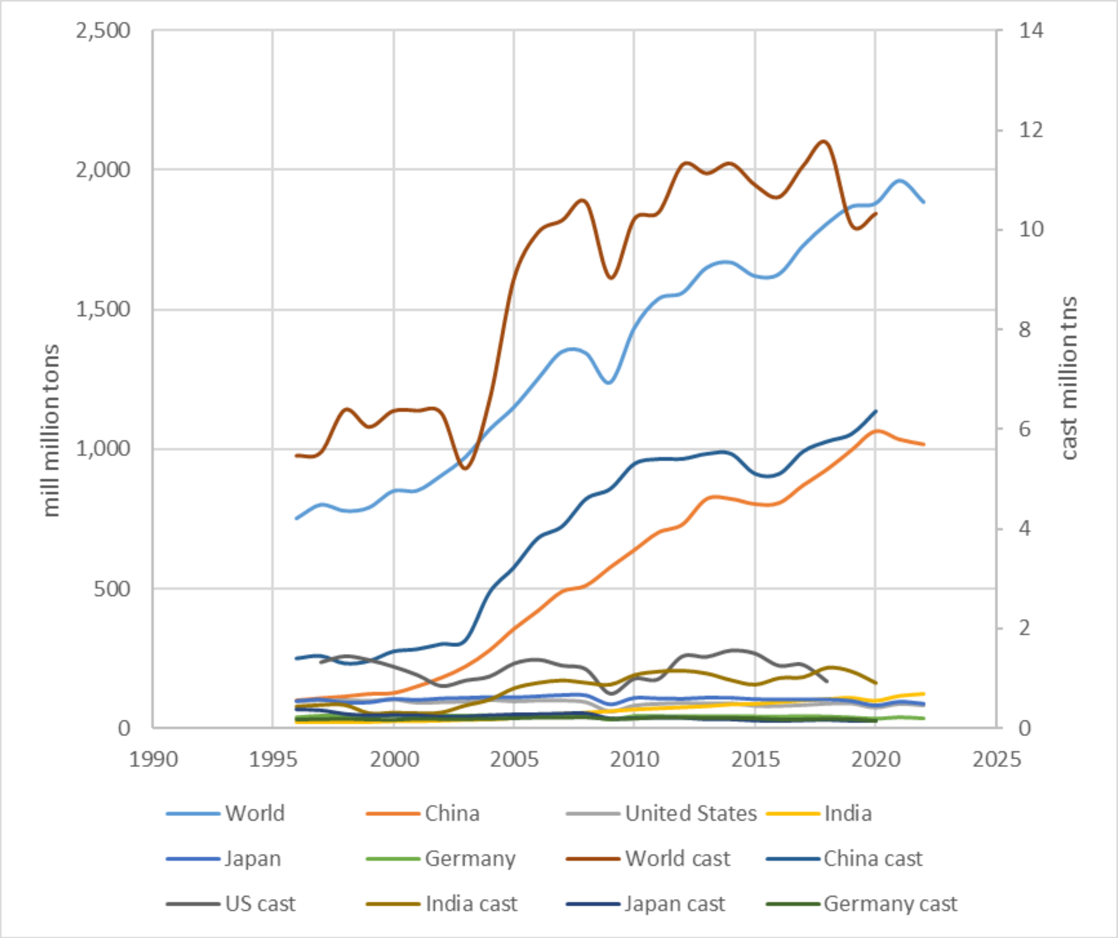
Globalization was a huge benefit for the world economy and allowed developing countries to participate in modernization, raising their standard of living and reducing poverty. It resulted in supply chains that were dispersed across the globe using and exploiting the skills, talents, resources and policies of countries. Large corporations and agencies created supply chains with access to new markets and exploiting lower costs. The U.S. negotiated trade agreements not to achieve reciprocity to allow market values or production to determine sources domestically but evenhandedness that allowed us to benefit from global sources that supported their producers to gain markets. The U.S. prioritized services as ate largest part of the economy and more profitable.

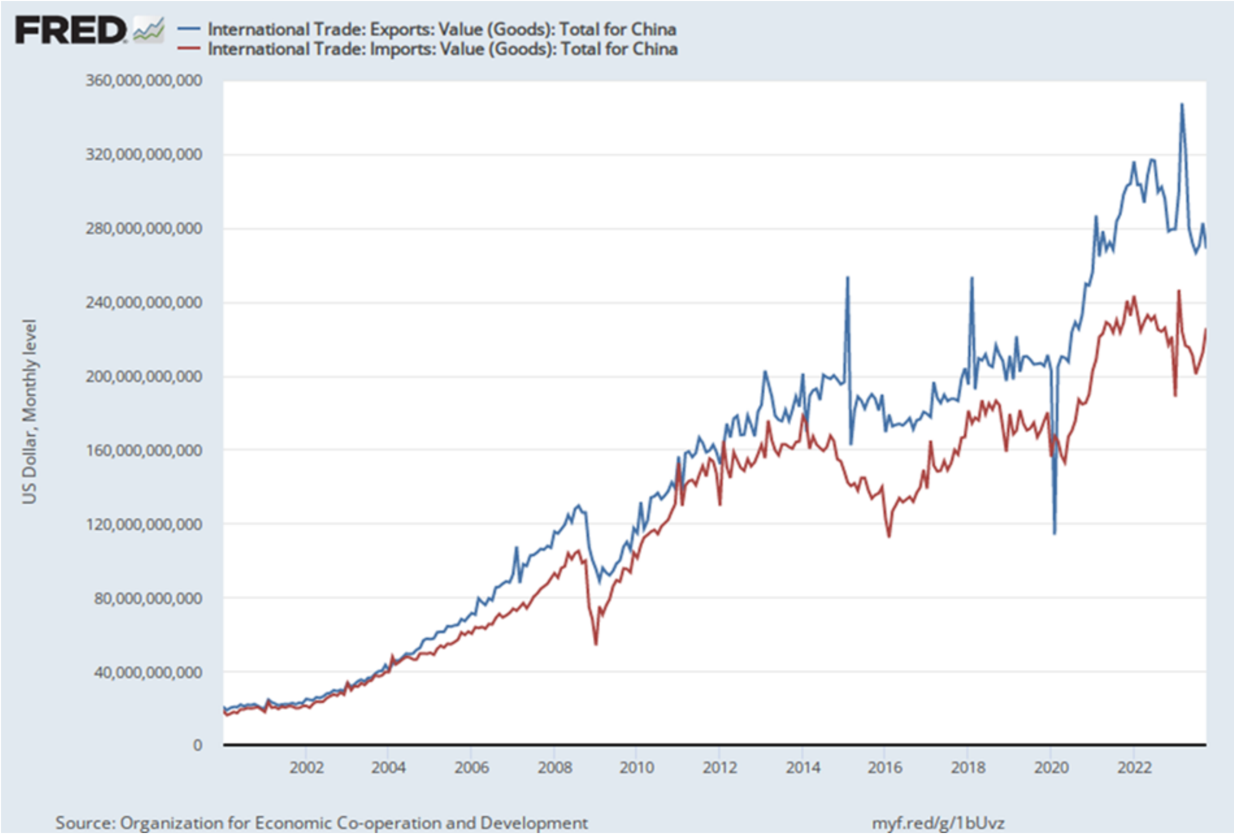




China used their ascension to the WTO to develop dominant positions in critical materials

China used the size and resources of their economy to target the critical production of the intermediate materials needed by the world. Their dominant position in steel is a typical example where they have no inherent economic advantage but invested to become the largest supplier. The graph shows that their import/export effort is not from domestic resources but by refining and producing.

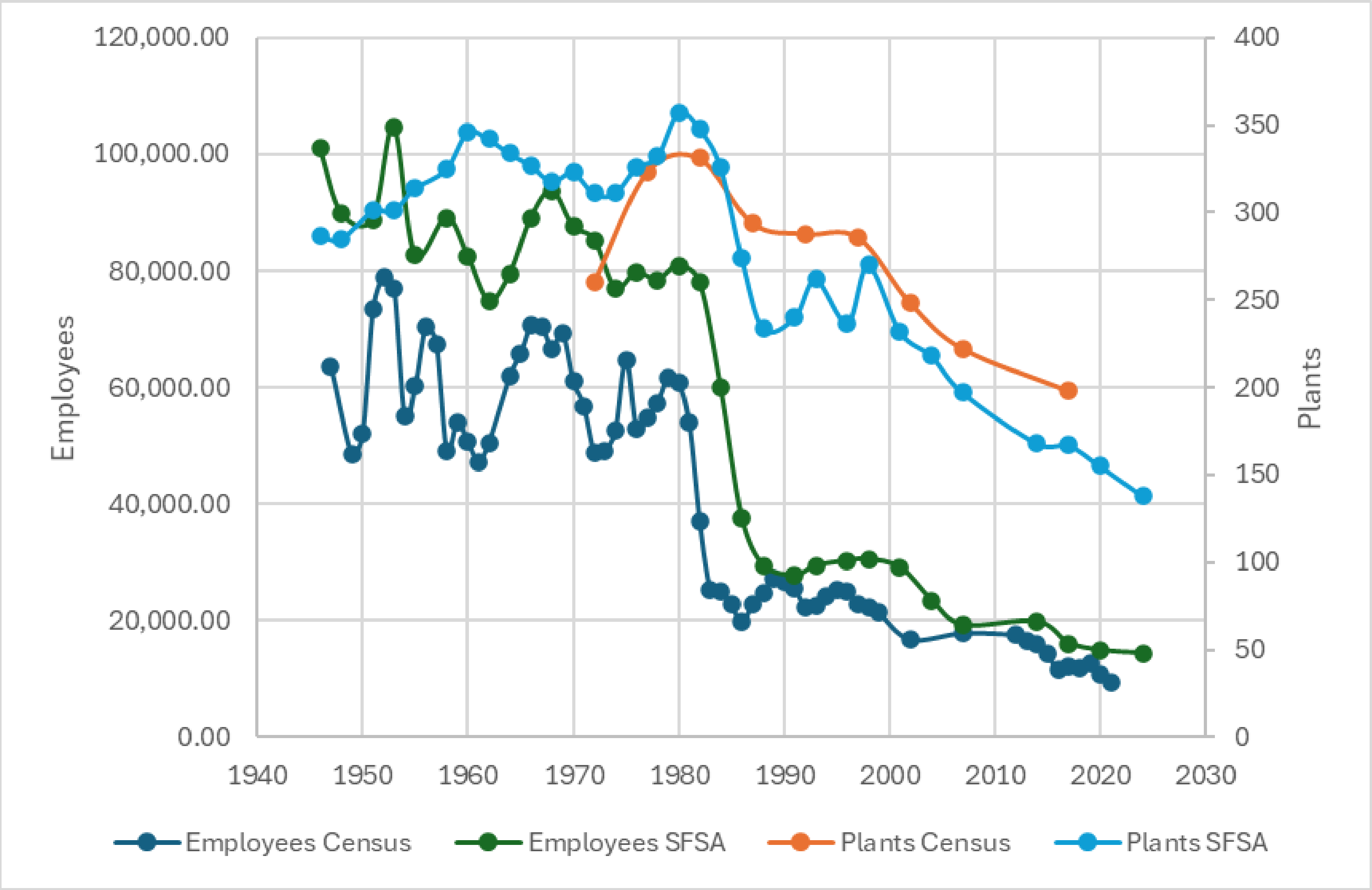




Steel Casting Plants and Employees have dropped dramatically since 1980

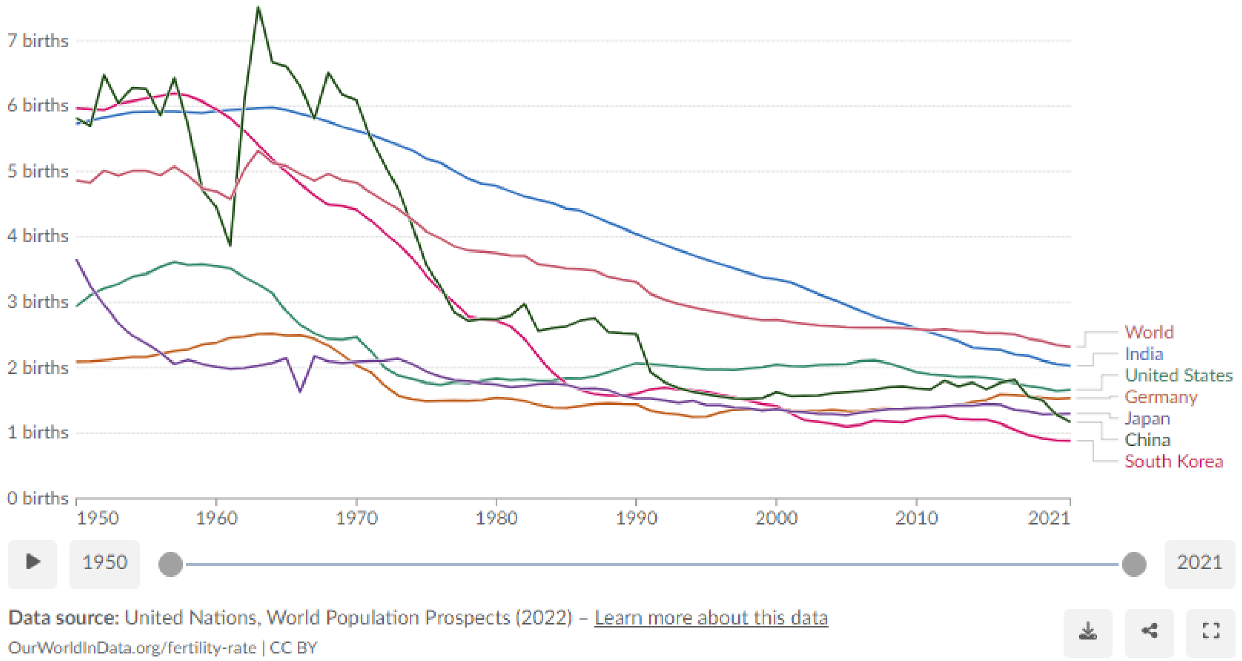
Steel casting producers have suffered from a lack of profitable market opportunities as domestic customers lost their markets or developed their own global sourcing to be cost competitive. The idea that the U.S. industrial supply could retain its dominant position in design, development, and advanced products has been illusory. Without domestic production volumes to provide the cash flow and maintain the profitable investment, the industry declines.

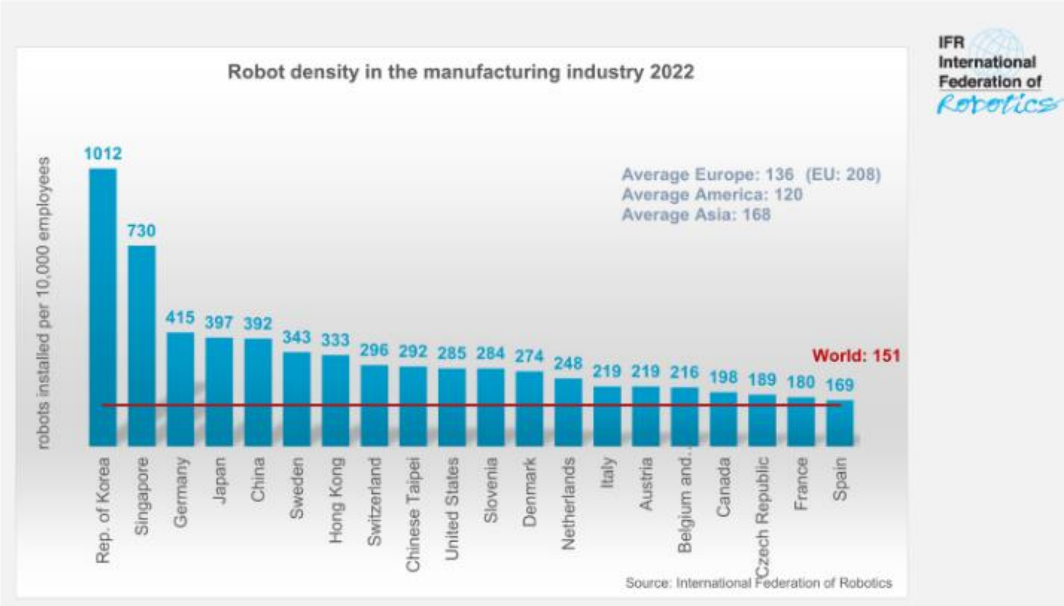
Engaging young people to discover the value and meaning of artisan manufacturing is a key challenge.

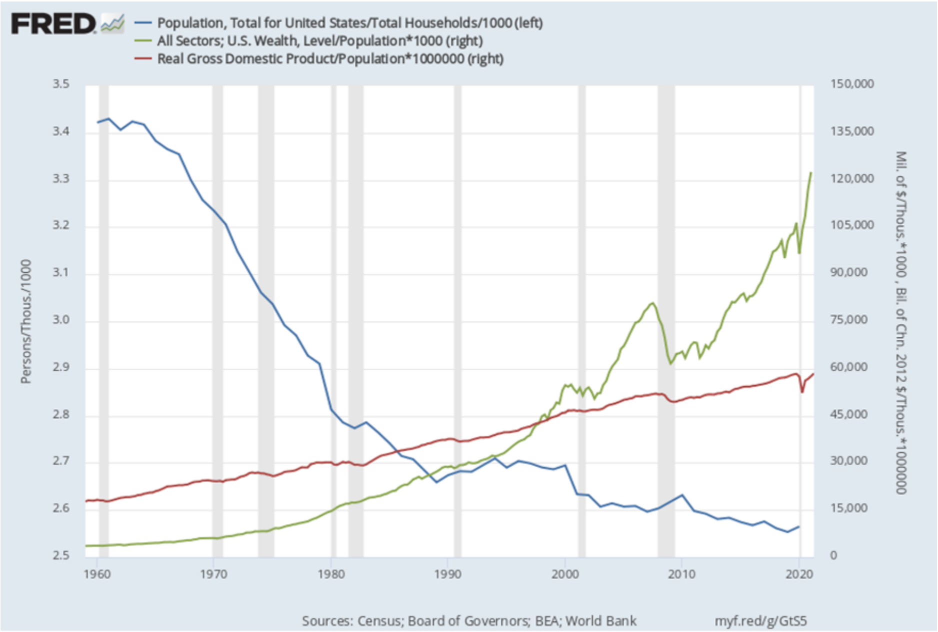


Demographics and People

Young people that are our future are in short supply and are not compelled to work to eat. They want to join a community that values them and that is allowing them to contribute to efforts that are meaningful and has purpose. Our challenge is to first engage them to see the value and creativity and meaningfulness of our community.







https://ourworldindata.org/fertility-rate

https://ifr.org/ifr-press-releases/news/global-robotics-race-korea-singapore-and-germany-in-the-lead

DoD Acquisition Practices are the Major Hurtle for all their suppliers.

Supply challenges for castings for defense are driven by the DoD acquisition system. In process approvals, agreement between the suppliers, OEMs, and services is unclear, decision-making processes are indeterminate, requirements are subjectively evaluated and inscrutable.

DoD Costs for Suppliers and Castings and Forgings per plant						
Qualification Costs						
Issue	Frequency	Time (months)	Fixed Cost	Added Cost for firm of 1000	Added Cost for firm of 100	Service
CCMC/CUI	Initial	12	100,000	1,000,000	100,000	DoD
	Annual	ongoing	25,000	500,000	50,000	DoD
ITAR	Initial	12	50,000	250,000	20,000	DoD
	Annual	ongoing	10,000	100,000	10,000	DoD
Technical req	Annual	ongoing	50,000	200,000	25,000	DoD
HY80/100 T300R2	Initial	18 to 48	1,000,000 to 3,000,000			Navy
	Re-qualification	9 to 12	1,000,000			Navy
	WIP financing	per mo		50,000	10,000	Navy
	WIP Storage	per mo		50,000	10,000	Navy
MIL-A-11356F	Initial	9 to 18	200,000 to 400,000			Army

Key challenges include:

- Lack of response for needed information and decisions- months not days, no answer= busted schedule. DoD process requirements and lack of timely approvals consumes factory floor space and capital in excess of commercial work.
- No information on timing, type, requirements, size, schedule of orders- No longterm agreement with a business case that justifies new capacity, small lots from low-cost supplier limits innovation
- Complex purchase organization – DOD/OEM + lack of expertise. Purchase is not a market transaction but a government contract – FAR, ITAR, CMMC, etc.
- Risk driven decisions keeps old technology with tightening requirements of no demonstrated value.

Elon Musk’s Engineering Principles – The 5 Step Process

1) Make your requirements less dumb

•Your requirements are definitely dumb. It does not matter who gave them to you.

•It’s particularly dangerous, if a smart person gave you the requirements, because you might not question them enough.

•Everyone’s wrong, no matter who you are, everyone’s wrong some of the time.

2) Try very hard to delete the part or process

•The bias tends to be very strongly towards “let’s add this part or the process step in case we need it”.

•If you’re not adding things back in 10% of the time, you’re clearly not deleting enough.

•Whatever requirement or constraint you have, it must come with a name, not a department. Cause you can’t ask the departments, you have to ask a person and that person who’s putting forward the requirement or constraint must agree that. They must take responsibility for that requirement. Otherwise you could have a requirement that basically an intern two years ago randomly came up with and they’re not even at the company anymore. And actually there’s no one at the department that currently agrees with that.

3) Simplify or optimize

•The reason it’s the third step is cause it’s very common, possibly the most common error of a smart engineer, to optimize the thing that should not exist. Why would you do that? Everyone has been trained in high school and college that you gotta answer the question, convergent logic. So you can’t tell a professor “your question is dumb”. You will get a bad grade. So everyone, without knowing it, they got like a mental straight jacket on that is they’ll work on optimizing the thing that should simply not exist.

•There’s another important principle, which is that you really want everyone to be chief engineer. So if everyone is chief engineer means that people need to understand the system at a high level to know when they are making a bad optimization.

4) Accelerate cycle time

You’re moving too slow, go faster. But don’t go faster until you’ve worked on the other three things first. If you’re digging your grave, don’t dig it faster, stop digging your grave.

5) Automate

I have personally made the mistake of going backwards on all five steps multiple times. Literally I automated, accelerated, simplified and then deleted. Automating was a mistake. Accelerating was mistake. Optimizing was a mistake. We just deleted and just bypassed this $2 million robot cell as a complete pile of nonsense.

//www.christianscheb.de/archives/893

Thanks! Questions?

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