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*Integrity - Service - Excellence*

## **Business Case on the Cost/Benefit of U.S. Government Support of Contractors in order to Maintain Industrial Base**

May 2019



**Presented by: Todd Pardoe**  
Co-Authors: John Stedge  
Chad Bielawski  
Jaimie Smith

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# Outline

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- Problem Statement
- Study Objective
- Bottom Line Up Front
- Commercial Consolidation
- Defense Consolidation
- Case Study Summaries
  - Commercial Consolidation (healthcare and beer markets)
  - Solid Rocket Motors (SRMs)
- Study Conclusion

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# *Problem Statement*

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## ■ Problem Statement:

- With the recent increase in consolidation within the aerospace and defense market, there is concern about the future of the defense and aerospace industrial base\*
  - Is the industrial base a problem about innovation?
  - Is the industrial base a problem about national security?
  - Is the industrial base a problem about competition and cost?
- Should the U.S. government actively support contractors that may be in danger of bankruptcy or acquisition?

\* <http://www.nationaldefensemagazine.org/articles/2017/6/2/navy-nuclear-chief-concerned-about-rocket-motor-industry>



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**BLUF**

- There is concern about the future of the defense industrial base
  - Consolidations and mergers reduced the industrial base in both commercial and defense industries
  - Less innovation, higher prices, less responsiveness
- Case studies in commercial/defense industries show impacts of competition related to the industrial base
  - Industrial base may drive lower prices
  - Industrial base drives advancements in technology to “stay in the game”
  - Many disadvantages to USG when there is only one viable vendor
- USG should pursue increase of the defense industrial base, but only when it makes sense
  - Consideration #1: Innovation
  - Consideration #2: Production Capability
  - Consideration #3: Future Cost Impact

**Industrial Base is vital to the future of the DoD and partner nations**

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# *Commercial Consolidation*

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- Over the years, competition in commercial sectors has been reduced through acquisition and mergers
  - Division of turf to reduce competition (cable/landline)
  - Fixing pricing scheme through price leadership
  - Fewer startups and lower productivity
  - Lower investment/higher stock buy back
    - Less innovation/higher CEO compensation

“Our competitors are our friends.  
Our customers are our enemies.”

-James Randall, former president, Archers Daniel Midland

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# Commercial Consolidation

- Monopolies and Local Monopolies
  - Cable/High Speed Internet
  - Computer Operating System
  - Social Networks
  - Search
  - Milk
  - Railroads
  - Microprocessors
  - Funeral Homes
- Duopolies (or effectively Duopolies)
  - Payment Systems
  - Beer
  - Phone Operating Systems
  - Cellphones
  - Online Advertising
  - Glasses

Segment	Market Share of Top Four Companies	Annual Revenue in segment (2012)
Warehouse clubs & supercenters	93.6%	\$406 billion
Drug Wholesalers	72.1%	\$319 billion
Auto & truck manufacturing	68.6%	\$231 billion
Drug Stores	69.5%	\$230 billion
Mobile-phone service	89.4%	\$225 billion
Airlines	65.3%	\$157 billion
Administration of pension funds	76.3%	\$145 billion
Landline-phone service	73.4%	\$142 billion
Cable TV	71.1%	\$138 billion
Airplane manufacturing	80.1%	\$113 billion

Source: Data from 2012 Economic Census

<https://www.marketwatch.com/story/americas-most-successful-companies-are-killing-the-economy-2017-05-24>

<https://www.census.gov/econ/concentration.html>

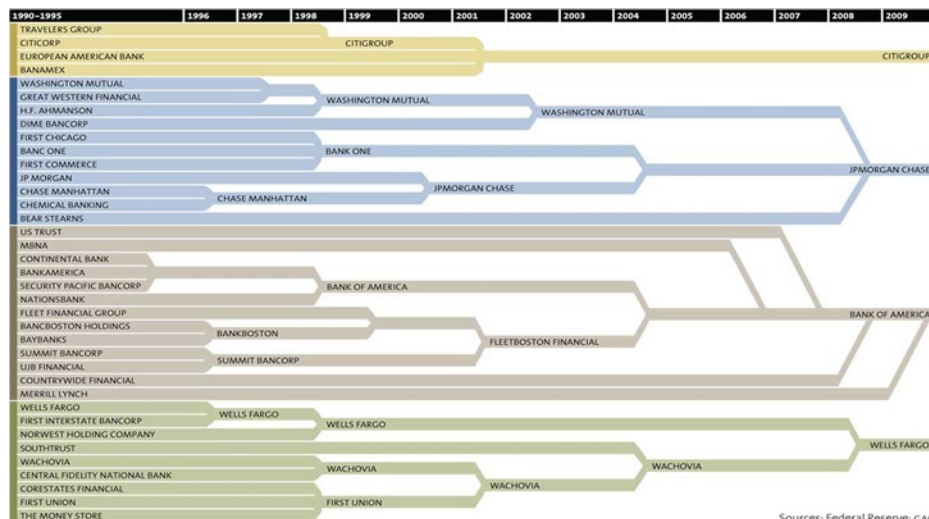


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# Commercial Consolidation

- Oligopolies
  - Credit Reporting Bureaus
  - Tax Preparation
  - Airlines
  - Phone Companies
  - Banks
  - Health Insurance
  - **Medical Care (ACA)**
  - Drug Wholesalers
  - Meat and Poultry
  - Agriculture
  - Media
  - Title Insurance



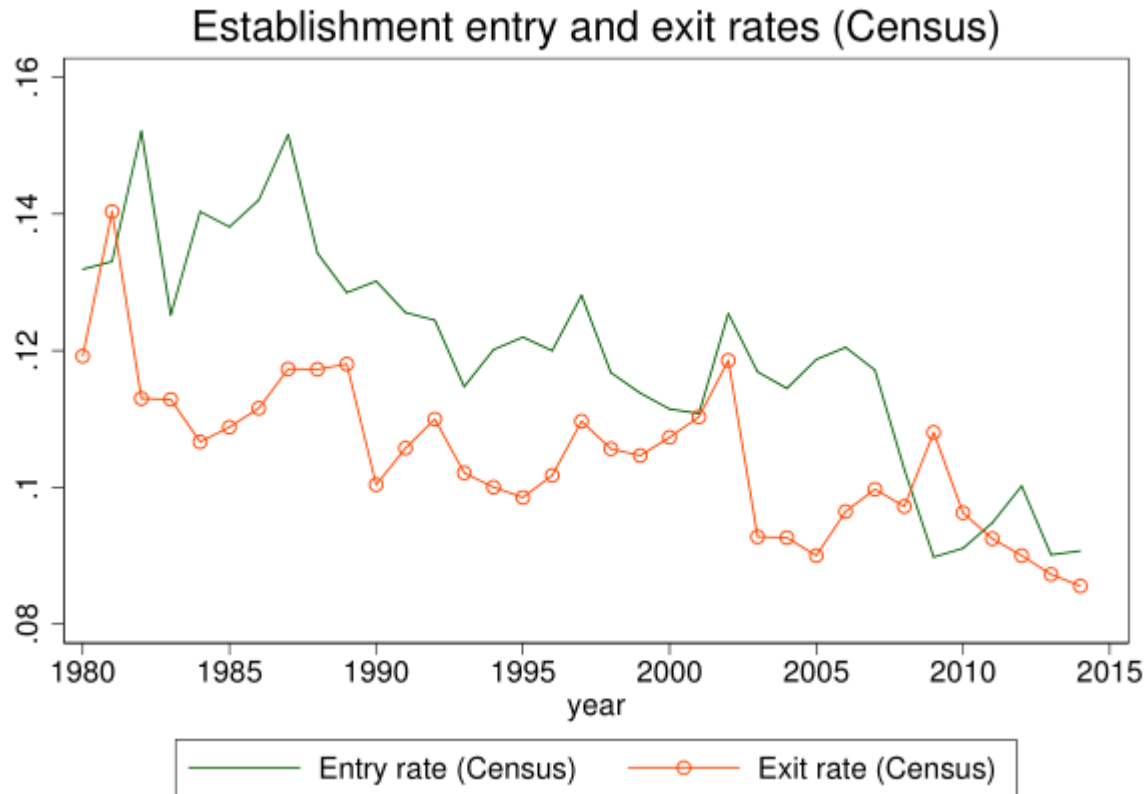
Sources: Federal Reserve; GAO

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# Commercial Consolidation



- Entry and exit rates across all commercial markets have steadily declined over the past 35 years, impacting competition

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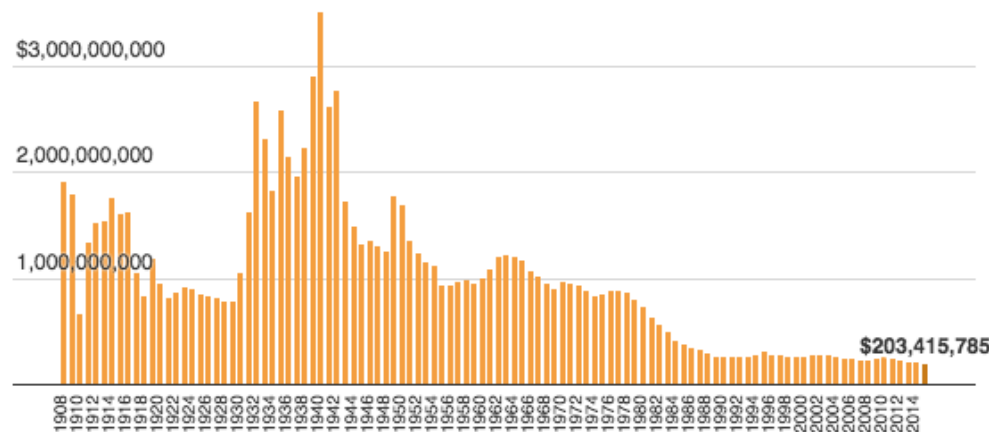
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# Defense Consolidation

- Actual defense R&D and procurement spending has fallen below projections
- Less DoD spending/changes in antitrust policy encouraged mergers/acquisitions
- Defense industrial base declined from 70+ companies to five major companies

## Declining antitrust enforcement

The chart shows how much money the Justice Department and the Federal Trade Commission have spent on antitrust enforcement, adjusted for inflation, GDP and productivity. Figures are in 2009 dollars.



<https://www.fastcompany.com/40441299/europe-is-going-after-american-tech-giants-the-way-the-u-s-used-to>

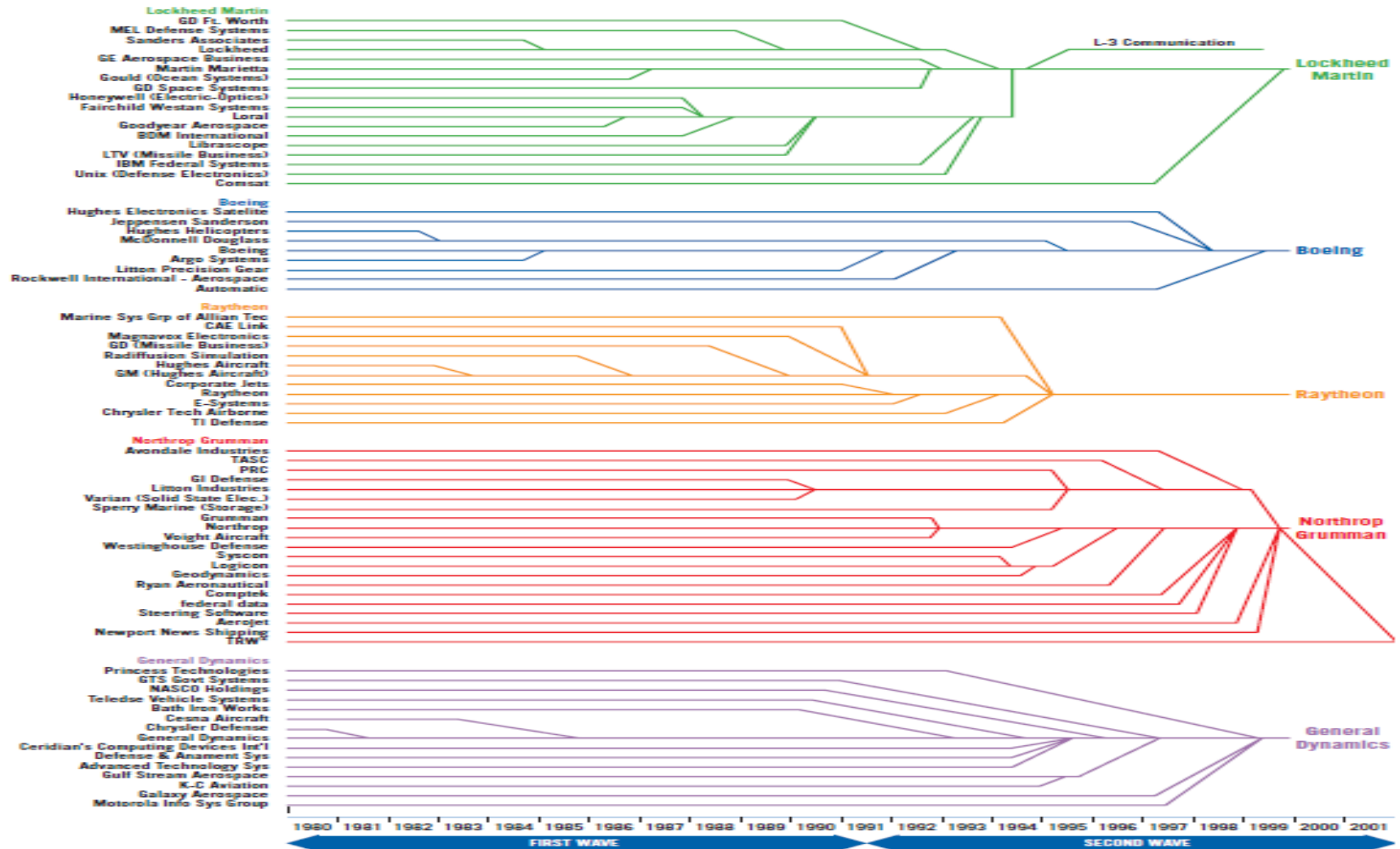
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# Defense Consolidation

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Commission on the Future of the United States Aerospace Industry, 7-4

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# Commercial Case Studies

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# *Consolidation of Healthcare Market*

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- Enactment of Affordable Care Act (ACA) inadvertently drove consolidation of healthcare market
- Impacts of reduced industrial base
  - If physician group owned...
    - By a local hospital, patients charged 10% more
    - By a multihospital system, patients charged 20% more
  - Hospital prices 15% higher when no competition present (less than 3 competitors)\*
  - Price inflation 4x greater than the rise in physician pricing

\* <https://news.yale.edu/2015/12/15/hospital-prices-show-mind-boggling-variation-across-us-driving-health-care-costs>

\* <http://www.healthcarepricingproject.org/papers/paper-1>

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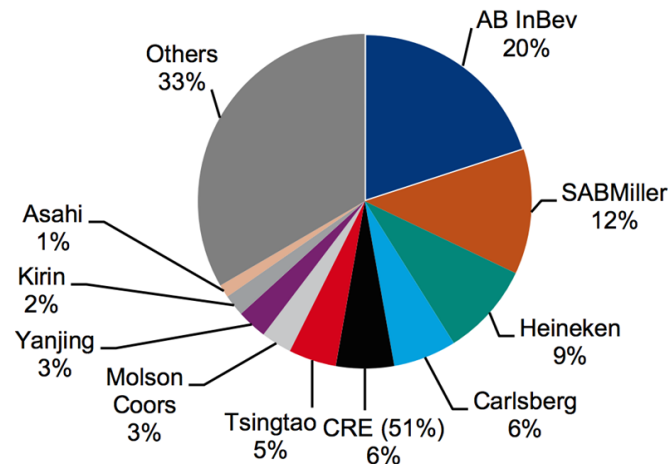
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# Consolidation of Beer Market

- Beer industry has undergone massive consolidation
  - In 2004, 10 major brewers accounted for 50% of all sales
  - In 2008, joint ventures controlled 90% of domestic beer production\*
    - Molson Coors and SABMiller (MillerCoors)
    - Anheuser Busch and InBev (AB InBev)
  - In 2015, 4 brewers account for 50% of all sales\*\*



Source: Canadean, BofA Merrill Lynch Global Research estimates

\* <https://www.nytimes.com/2017/04/07/opinion/is-it-last-call-for-craft-beer.html>

\*\* <https://www.businessinsider.in/These-4-companies-produce-almost-half-of-the-worlds-beer-and-make-74-of-the-profits/articleshow/47807799.cms>



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# Consolidation of Beer Market

- In 2016, the DoJ approved merger of AB InBev and SAB Miller
  - Gives leading presence in every market and a third of all beer produced
  - Practice of inorganic growth, buying producers in various markets
- The mergers are to maintain price leadership and trigger strategies
  - AB InBev bought Grupo Modelo (Corona) to keep price leadership
    - Previously, Corona didn't raise prices after Bud/Coors raised theirs\*
    - 6% price increase after the merger
- AB InBev expects to reap major savings from economies of scale and scope
  - Should not expect savings to be passed on to consumers
  - Prices may actually go up due to the merger
    - In 2008, after consolidations, beer prices rose from under \$10 to \$10.40 for a twelve-pack
    - Annualized inflation (escalation) on beer from 1973 to 2013 is 7.71%\*\*
  - Fewer competitors in industry results in higher profits and less choice

\* <https://www.nytimes.com/2013/03/03/magazine/beer-mergers.html>

\*\* <https://www.telegraph.co.uk/finance/personalfinance/10682032/Beer-bubble-how-price-of-a-pint-has-risen-twenty-fold.html>

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# DoD Case Study

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# SRM Background

- Concern – Limited large Solid Rocket Motor (SRM) manufacturers
  - Two SRM manufacturers
    - Northrop Grumman Innovation Systems (NGIS)
    - Aerojet Rocketdyne (AJRD)
  - SRM requires extensive infrastructure and highly specialized explosive material such as ammonium perchlorate
  - Manufacturing process is fairly standard for established manufacturer, but high barriers to entry for new entrants due to capital investment and regulations (handling of propellant)
  - Homogeneity is crucial for strategic systems
  - Cost
    - Highly dependent on the size of booster
    - Highly dependent on the lot size\*

\*<https://www.military.com/dodbuzz/2011/04/07/cost-of-trident-rocket-motors-jumps-by-85-percent>





# SRM Background

- 
- Uncertainty Associated with Cost Data
    - Minuteman I, II, and III
      - 1950s - 1970s Data
      - Spiral Development
      - Lot production data with questionable cost information
        - Learning curve: approx. 85% – 91% learning
        - Rate curve: approx. 83% - 94% rate
    - Peacekeeper
      - 1970s – 1980s Data
      - Limited production data
        - Learning curve: approx. 90% - 95% learning
        - Rate curve: approx. 62% - 82% rate
    - Trident
      - 1980s Data
      - Limited Production data
        - Learning curve: 97% - 98% learning
        - Rate curve: 75% - 90% rate

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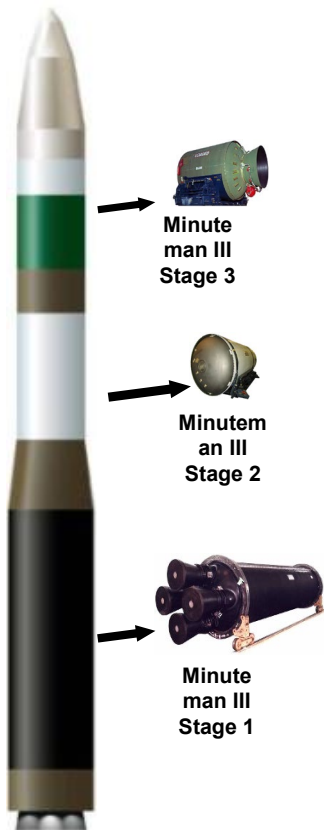
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# SRM Scenarios

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Representative SRM  
(MMIII)



- Three Production Scenarios
  - All Stages to one manufacturer
  - Stages 1 & 2 to one manufacturer, Stage 3 to another
  - Stages 1 & 3 to one manufacturer, Stage 3 to another
  
- Primary Cost Driver: Size of Stage
  
- Cost Impacts Considered
  - Learning Curve
  - Rate Curve

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# SRM Analysis

## ■ Analysis\*

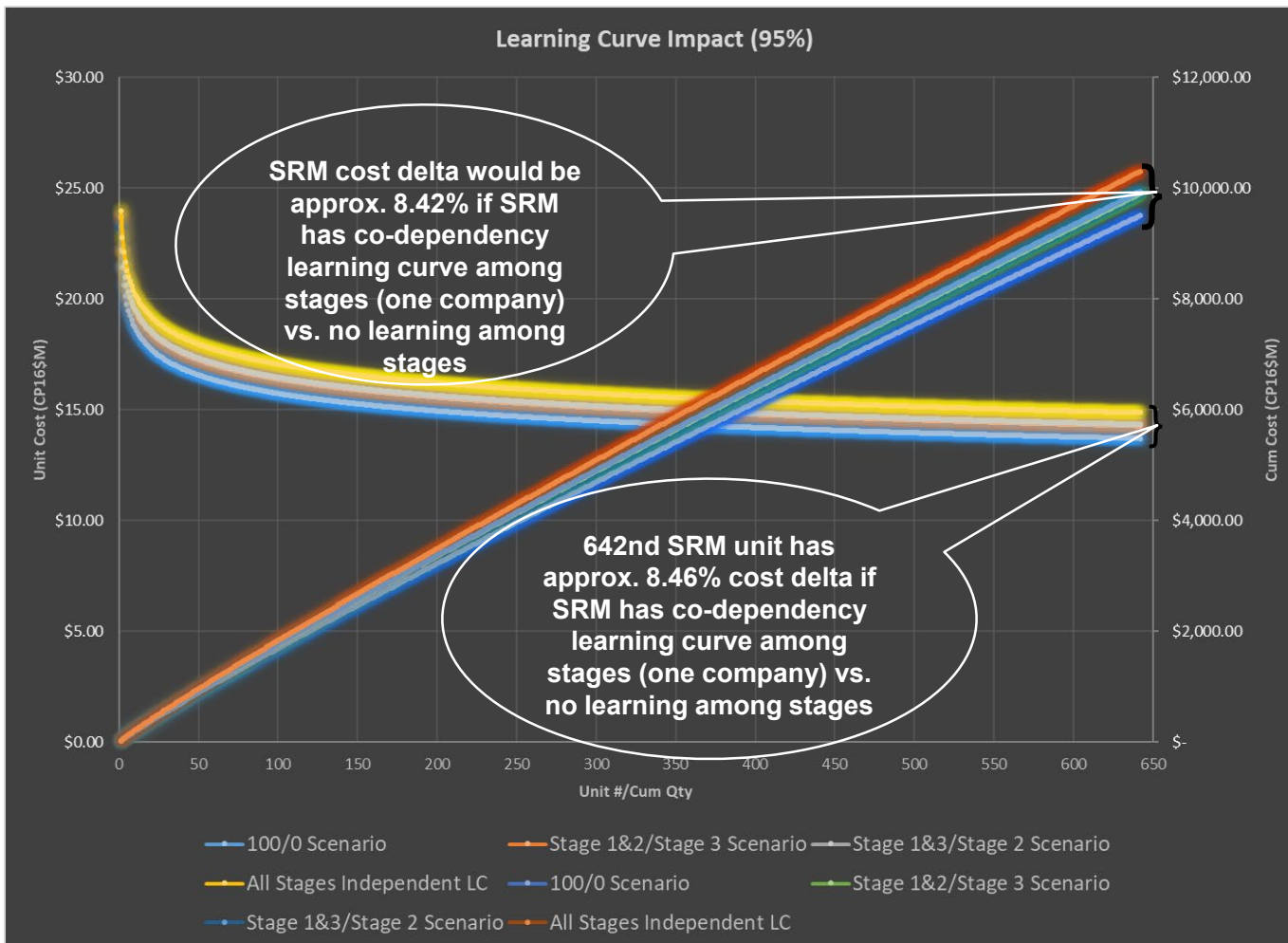
- Qty: 642
- No EMD Impact\*\*
- 3 Scenarios for Learning Curve (Co-dependency among stages) – baseline assumption 95%
  - 100/0 – one manufacturer (i.e. 642 SRMs = 1,926 Stages)
  - 2/3 vs 1/3 – two manufacturers; 66% for one (Stage 1&2), 33% for another (Stage 3)
  - 2/3 vs 1/3 – two manufacturers; 66% for one (Stage 1&3), 33% for another (Stage 2)
- 3 Scenarios for Rate Curve – baseline assumption 85%
  - 100/0 – one manufacturer
  - 80/20 – two manufacturers 80% equiv. qty (Stage 1&2)/20% equiv. qty (Stage 3)
  - 70/30 – two manufacturers 70% equiv. qty (Stage 1&3) /30% equiv. qty (Stage 2)

Total	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8	Lot 9	Lot 10	Lot 11	Lot 12	Lot 13	Lot 14	Lot 15
642	5	5	32	36	55	55	55	55	55	55	55	55	55	44	25

\* Constant Price (CP) for the analysis & actual analysis from the program office and DoD used different assumptions  
 \*\* If both manufacturers need to design, the EMD may increase due to the additional integration risk



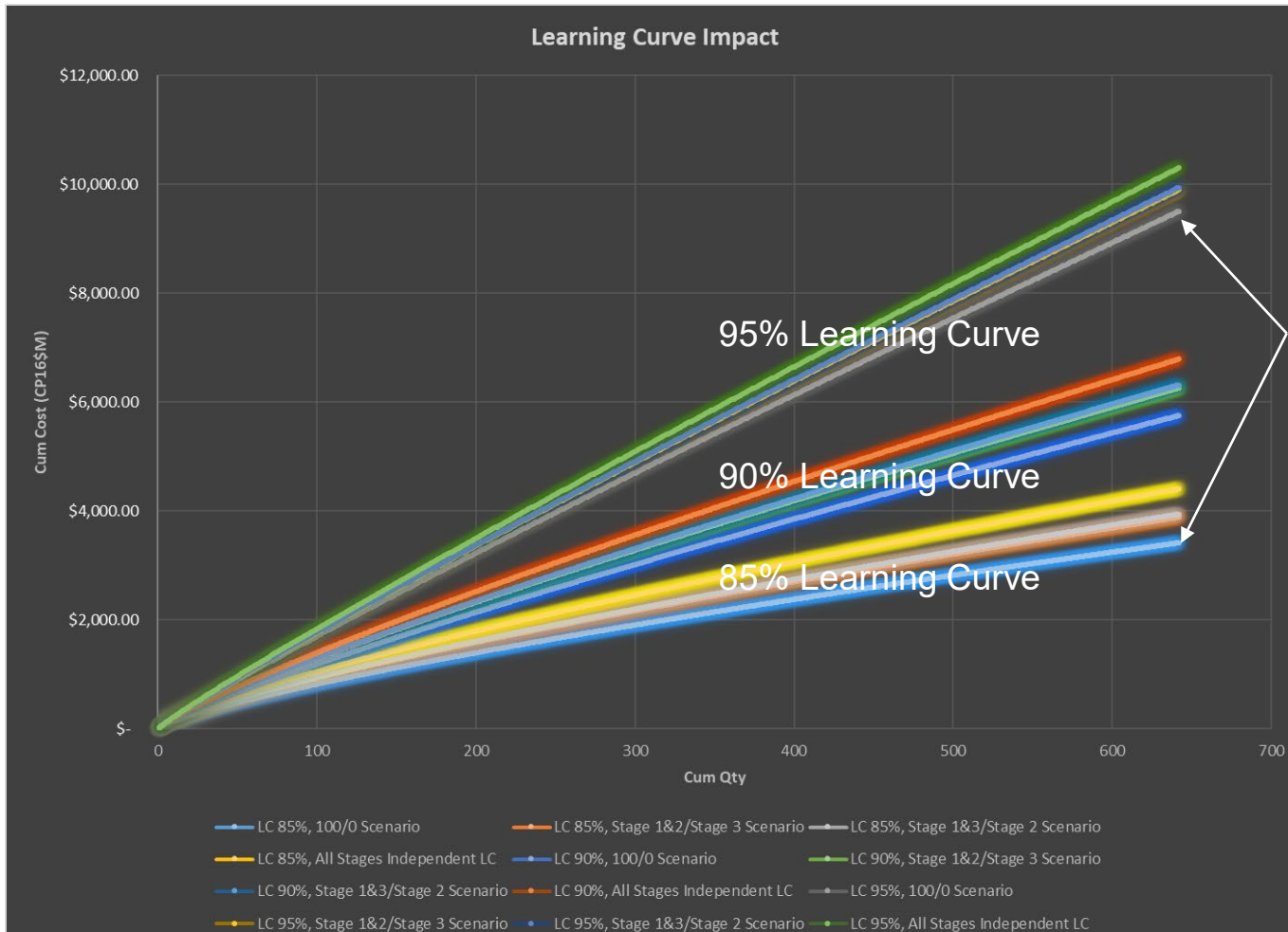
# SRM Analysis – Learning Curve (95%)



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# Learning Curve Sensitivity Analysis



178% Cost Delta!

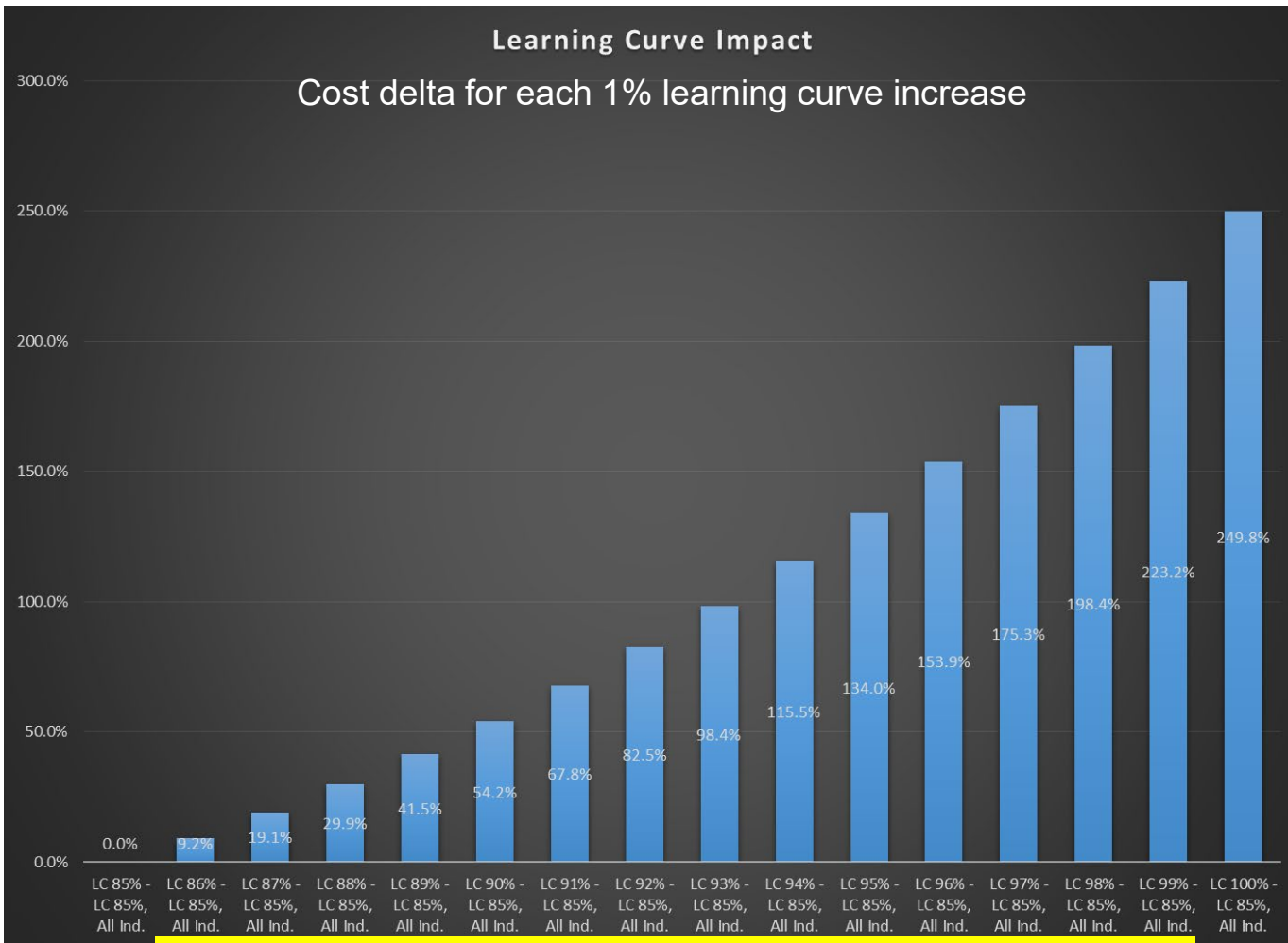
**The cost delta between 85% learning curve to 95% learning curve is approx. 178%!**

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# SRM – Learning Curve Sensitivity

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**Learning curve is very sensitive to industrial base analysis!**

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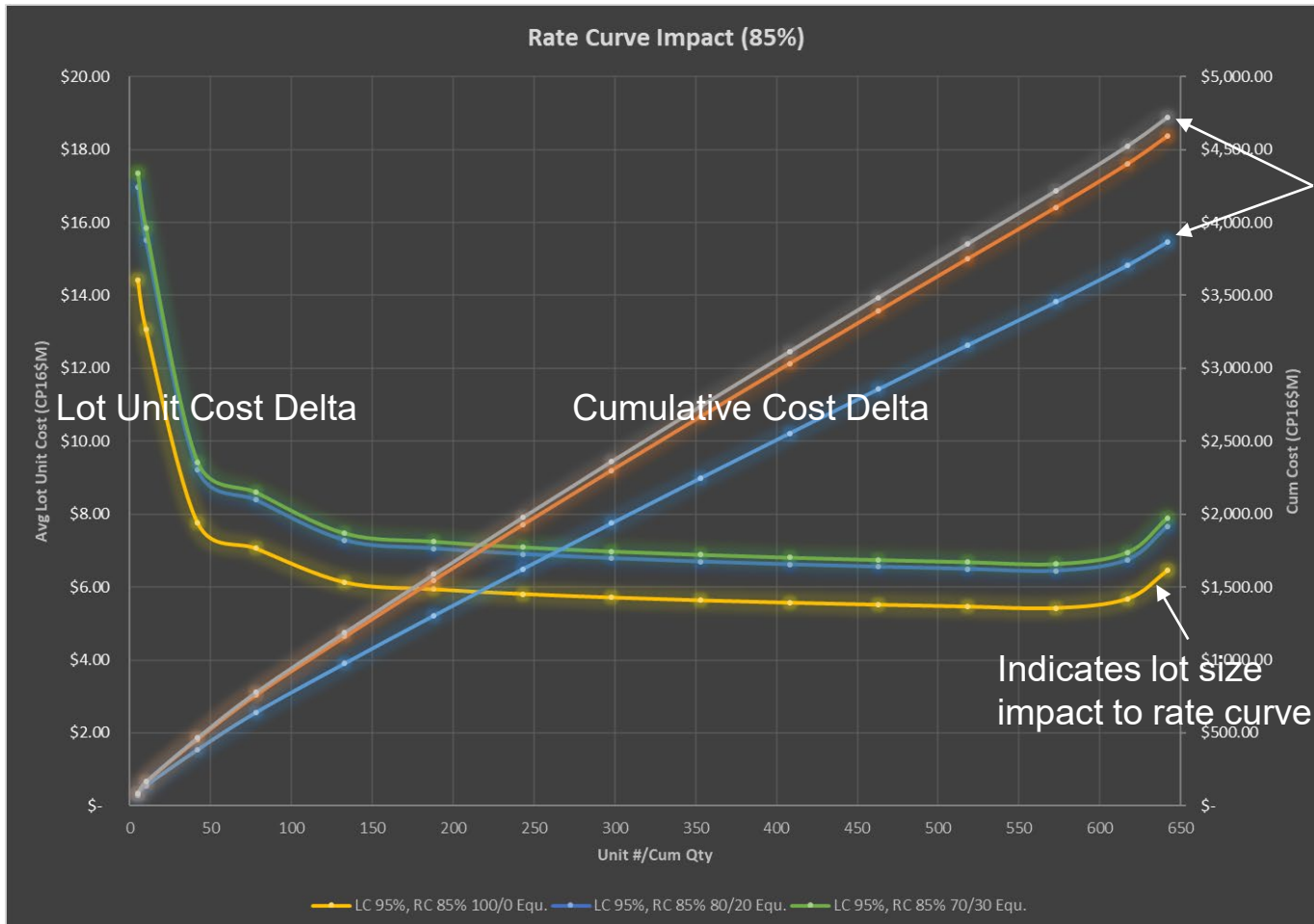
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# SRM – Rate Curve Analysis (85%)



**Rate curve shows higher sensitivity than learning curve for splitting production**

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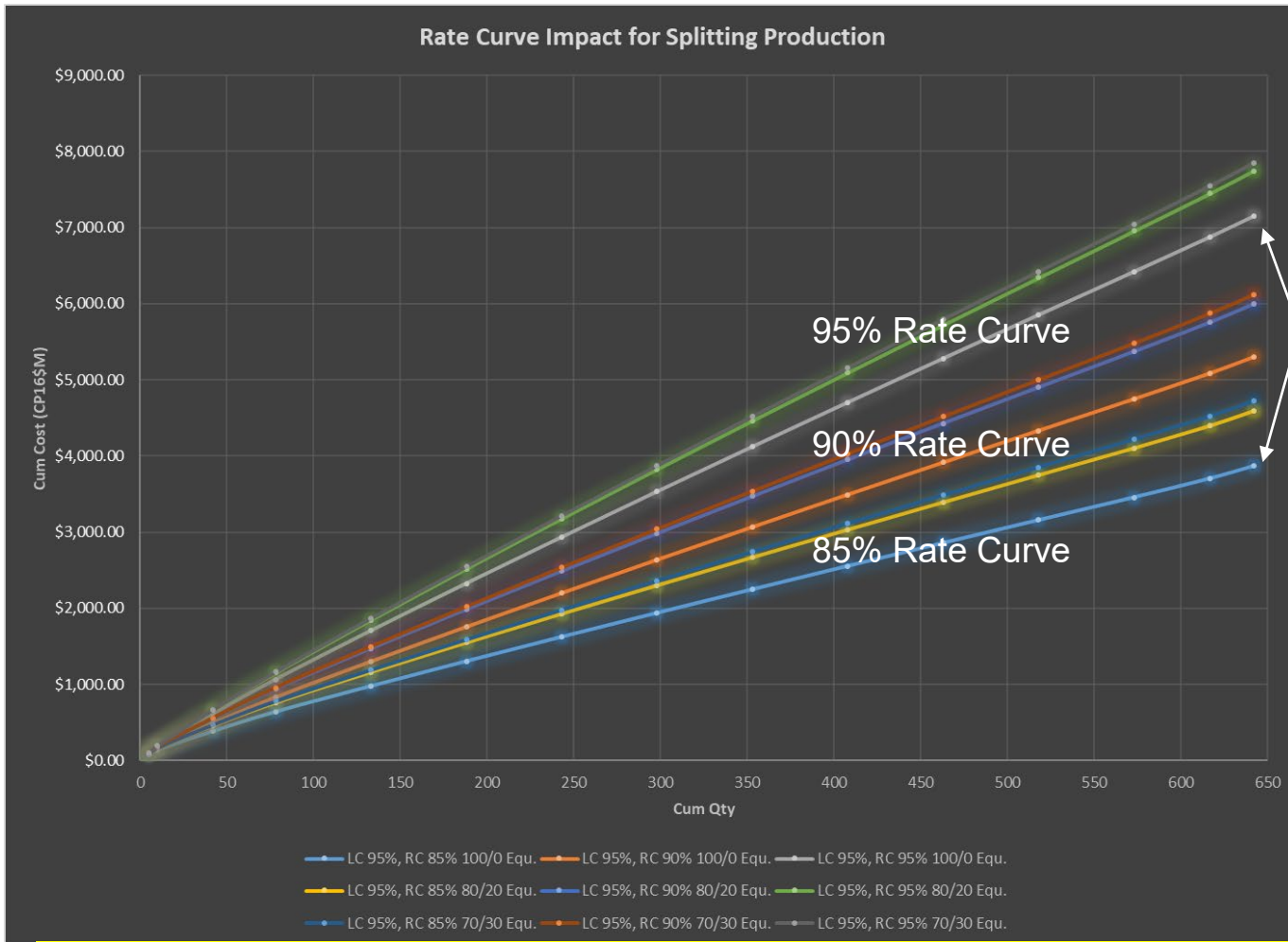
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# SRM – Rate Curve Sensitivity Analysis



**The cost delta between 85% rate curve to 95% rate curve is approx. 85%!**

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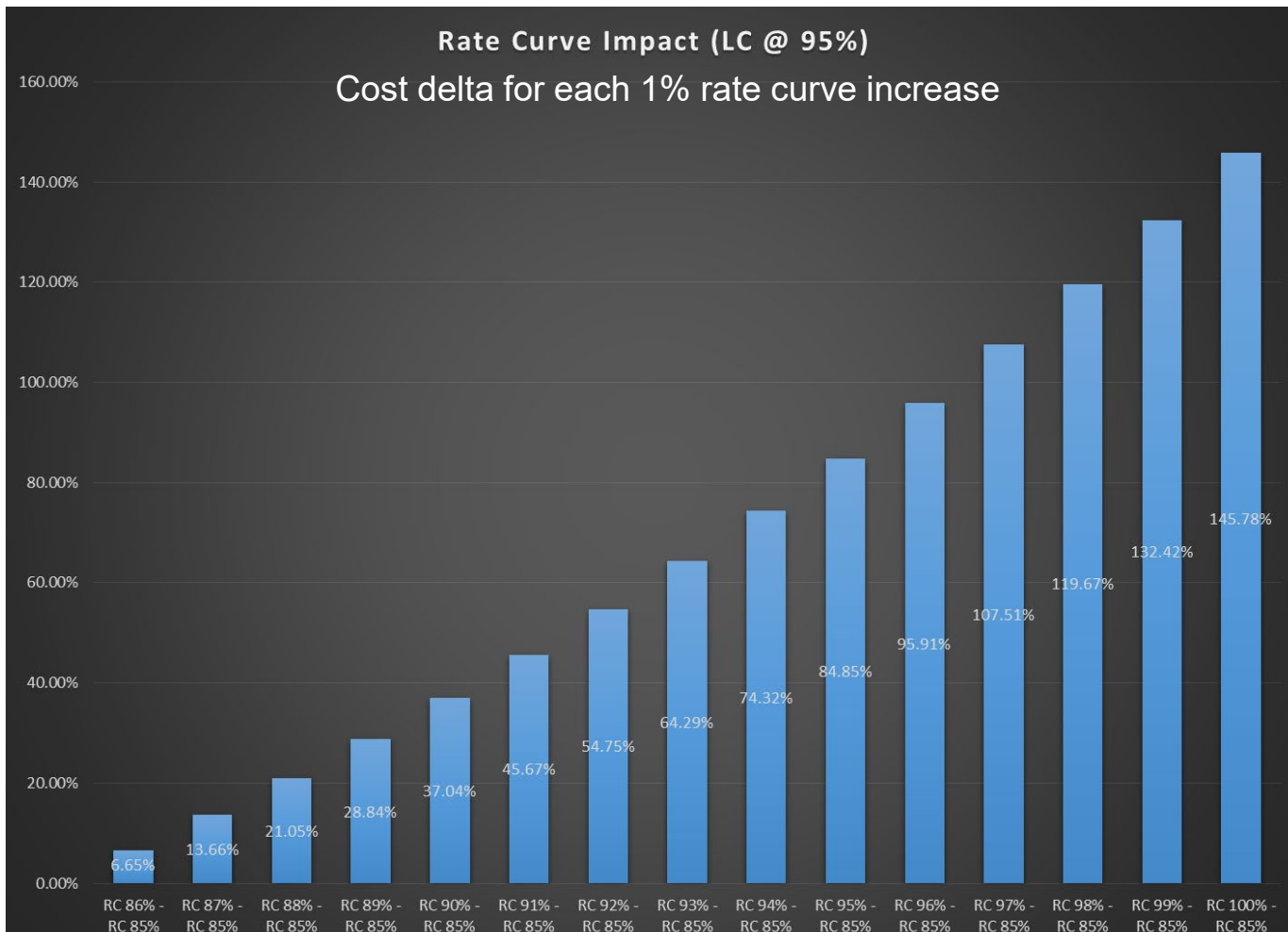
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# SRM – Rate Curve Sensitivity

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**While rate curve assumption is very sensitive to industrial base analysis, learning curve shows higher sensitivity**

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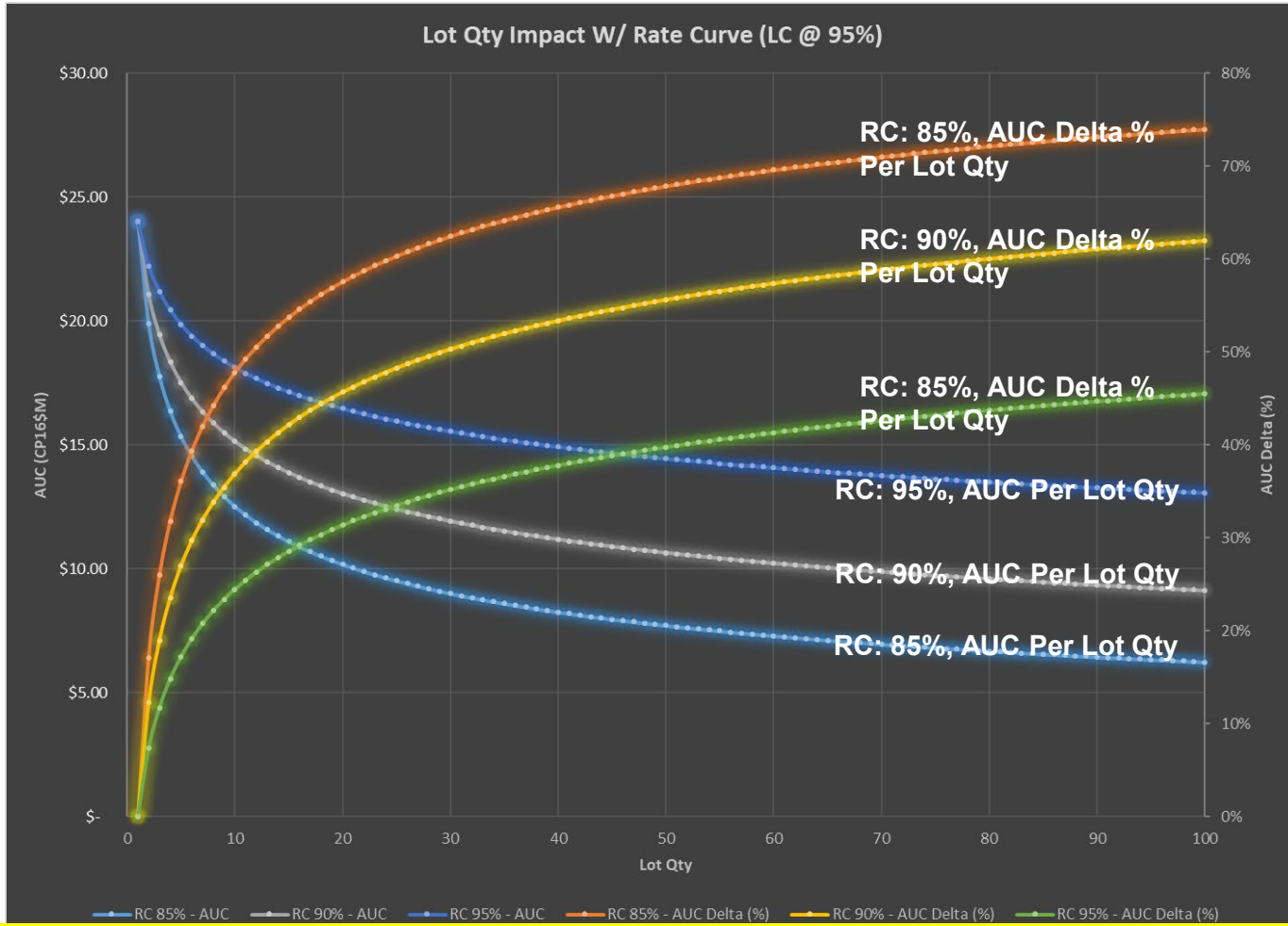
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# SRM – Lot Size Sensitivity Analysis



Rate curve is highly sensitive to lot size; therefore, it has a significant impact to industrial base analysis!

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# SRM Assessment

## ■ Assessment:

- With 95% learning curve (co-dependent among stages), the cost impact for splitting production was approx. 4.1% to 4.6%
- With 85% rate curve and 95% learning curve (co-dependent among stages), the cost impact for splitting production is approx. 18.8% to 22.0%  
- assuming splitting production won't change both contractors rate curve

## ■ Other Observations:

- Each 1% change in improvement curve (whether learning or rate) has significantly higher impacts than previously thought (assuming co-dependency)
- Each 1% change in LC has approx. 10.0% to 11.2% cost impact
- Each 1% change in RC has approx. 5.8% to 6.6% cost impact
- Lot quantity with rate curve has significant impacts to production cost

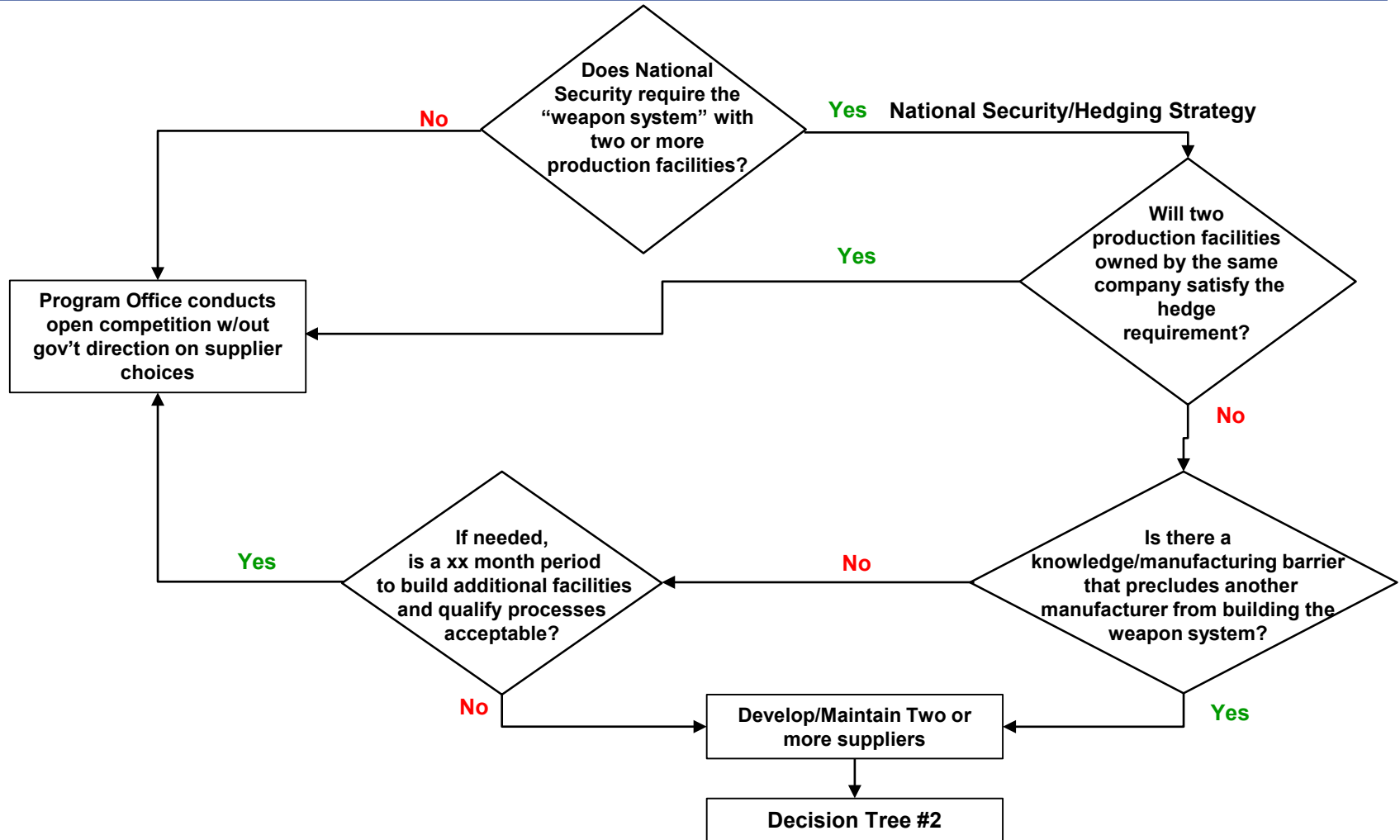
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# Decision Tree #1 for Industrial Base

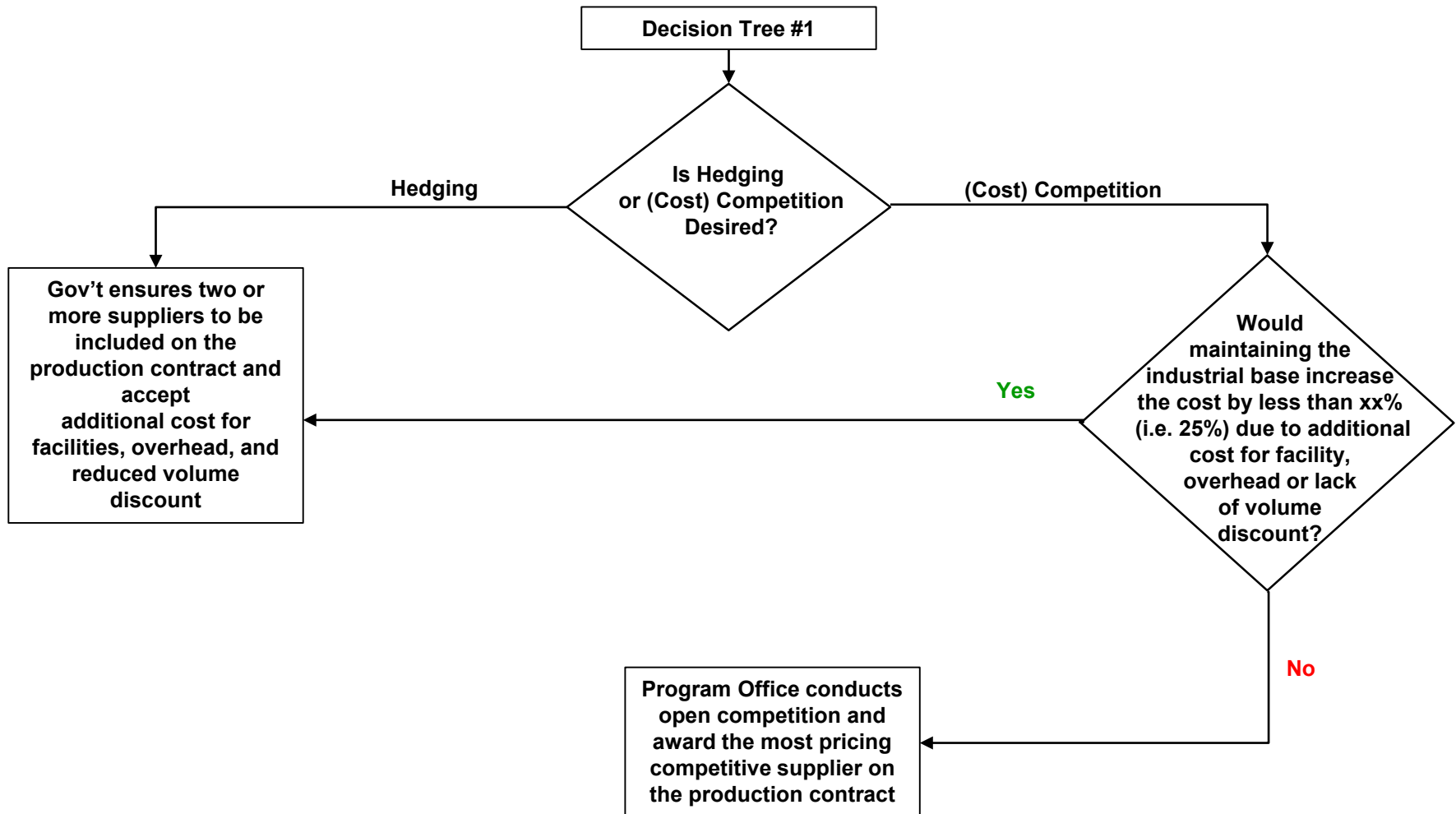
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# Decision Tree #2 for Industrial Base





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# Study Conclusion

- Monopolies can have detrimental effects to a given industry
  - Assumption is that commercial effects will have similar impact to defense
  - Gov't should consider discouraging DoD Industry acquisition and merger (DoJ)
  - Gov't should consider increasing DoD budget to encourage broader defense industry participations
- Decision trees can assist the decision makers and stakeholders to pursue increased industrial base or pure price/cost decision
  - GAO indicated up to 25% cost increase for future price for monopoly – recommended huddle rate for decision tree if more information is not available
- Industrial base is very important to the DoD
  - Case studies show various impacts of introducing or keeping industrial base
    - Keeping industrial base could increase or reduce cost for the DoD
  - Aside from cost, there are other benefits to industrial base that must be evaluated
    - Innovation – future technological advancement and adaptability
    - National Security or Hedging (production capability)

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# *Back-up Slides*

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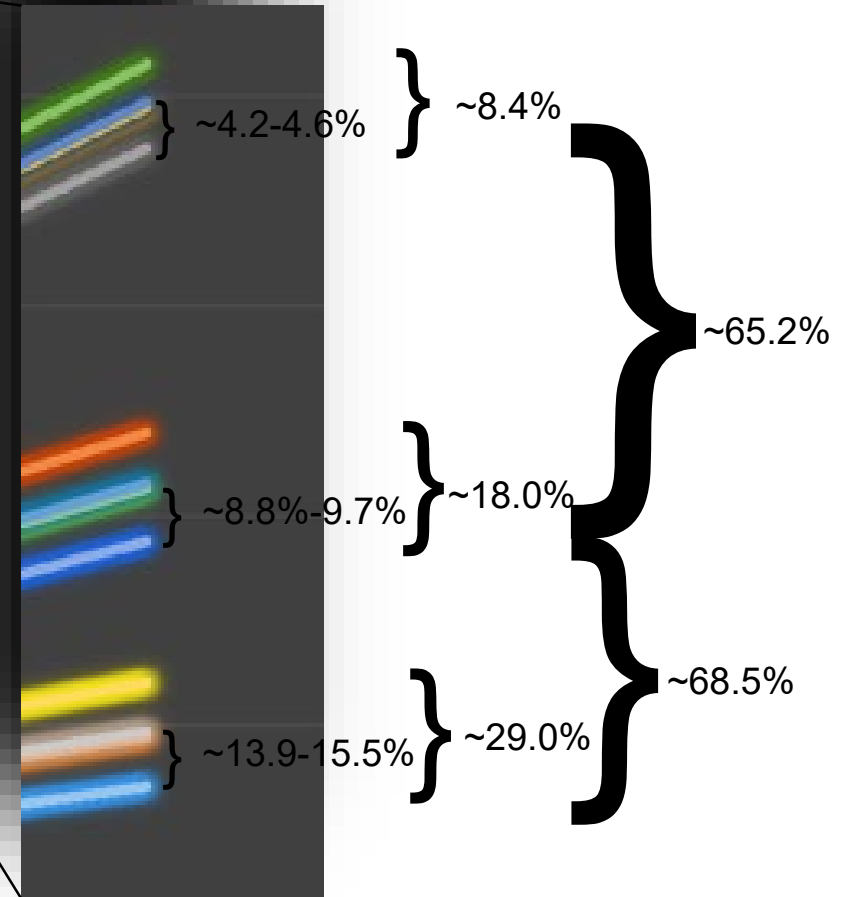
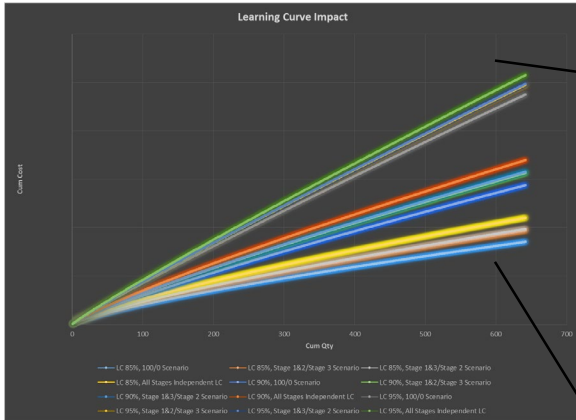
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# SRM – Learning Curve Sensitivity Analysis

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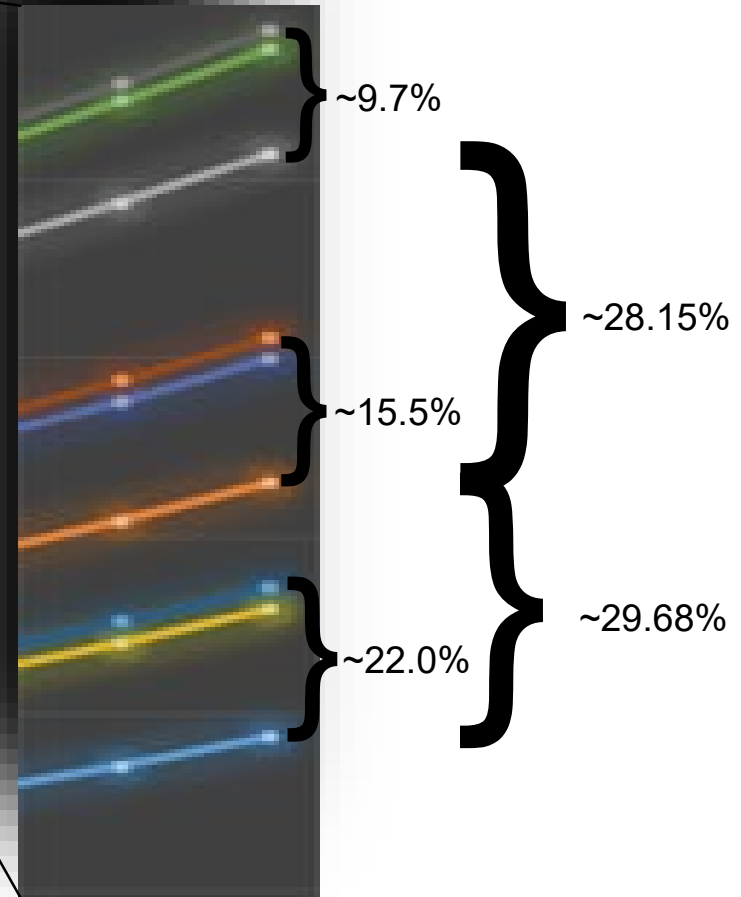
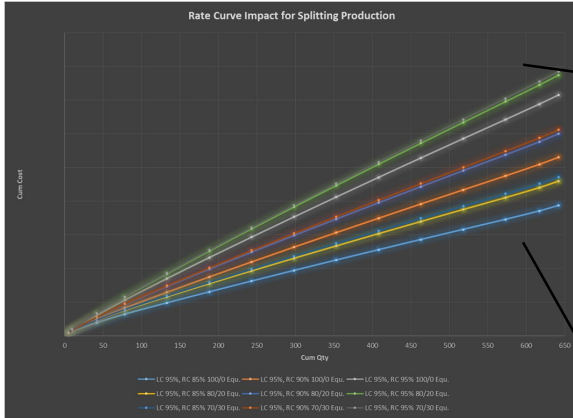
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# SRM – Rate Curve Sensitivity Analysis

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