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The Economics of Deterrence

Towards an Economic Framework to determine if Nuclear Deterrence is more Economical than Conventional Deterrence

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Drake Warren
Senior Member of Technical Staff

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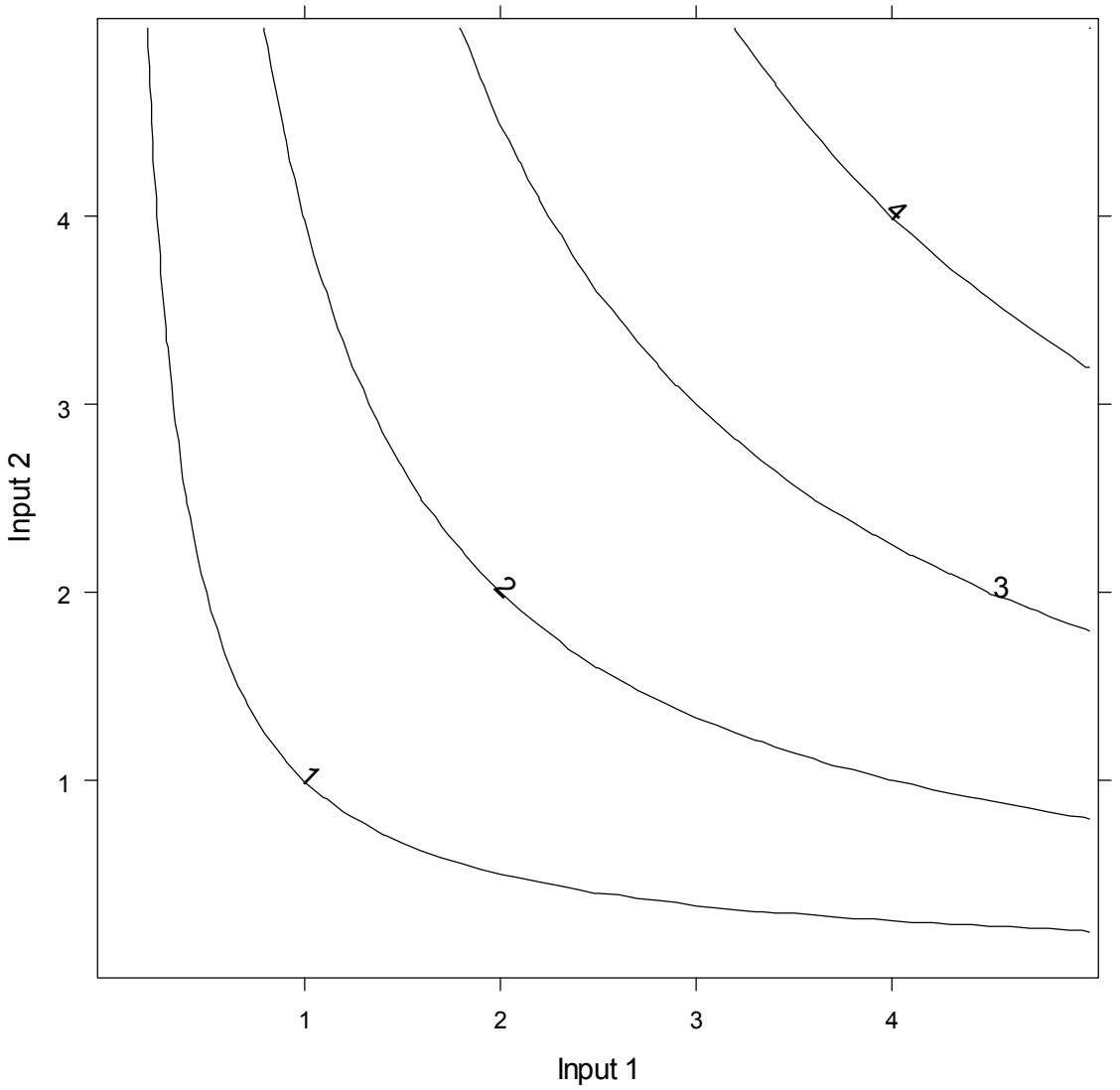
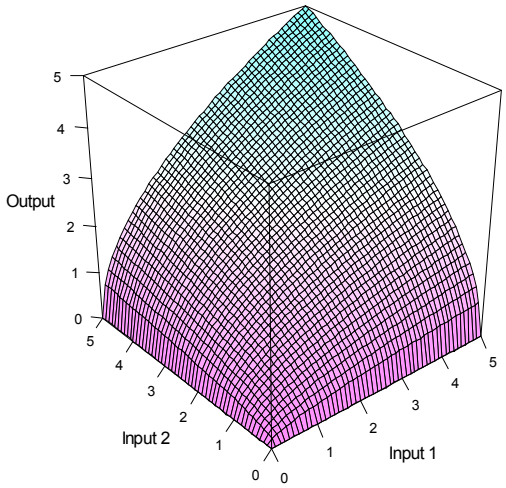
Is Nuclear Deterrence Economical?

- Nuclear deterrence has been justified, in part, by its favorable economics (i.e., it is said to use fewer resources, more effectively than conventional deterrence)
  - e.g., Western deterrence of Soviets in Europe
  - e.g., Russian tactical nuclear weapons
- A better understanding of the economics of nuclear deterrence can help guide future policies (e.g., operation of the complex and arms control)
- This presentation uses basic microeconomic production theory to frame economic issues
  - Ultimate goal is a framework that can help determine if nuclear deterrence is economical

Economics 101—Production Functions





- **This is a typical form of a production function of one output from two inputs**
- **Traditional microeconomics is really multivariate calculus**

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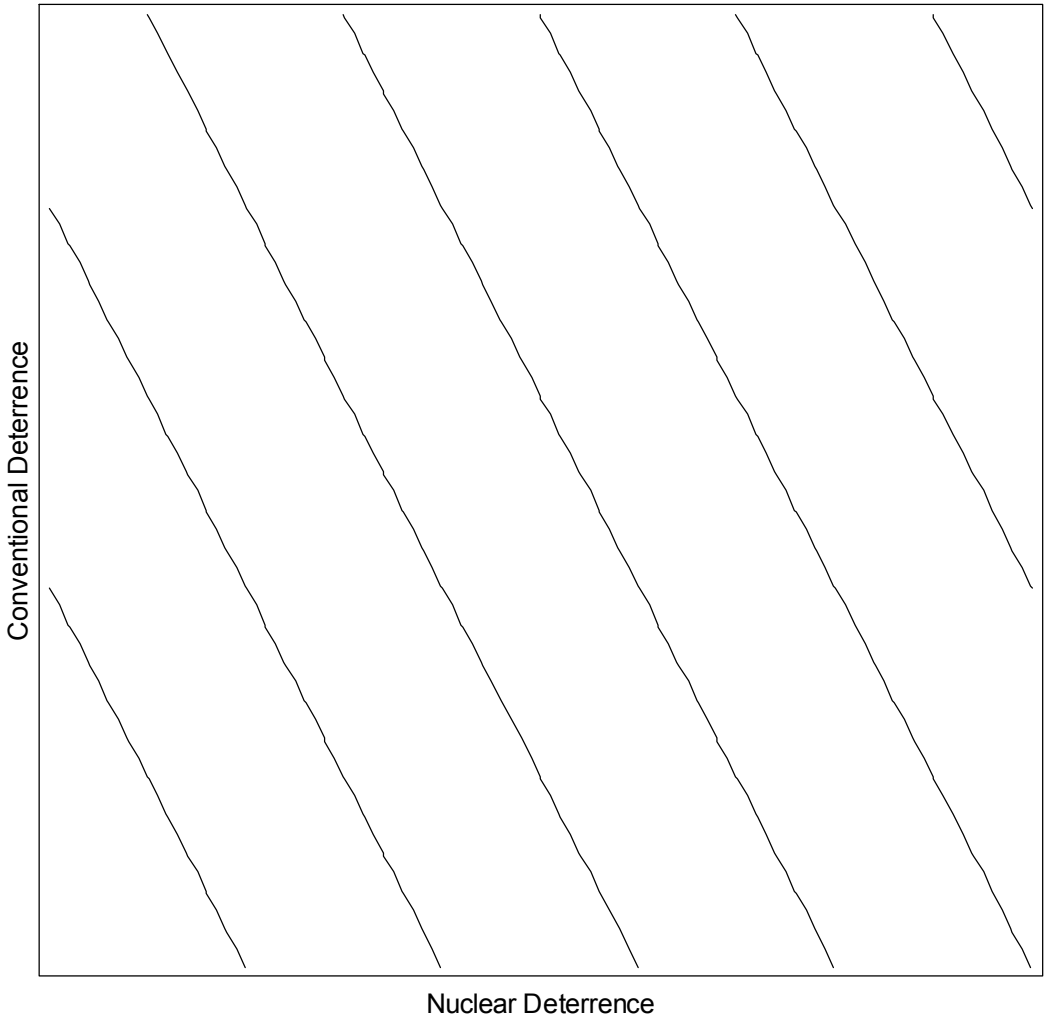
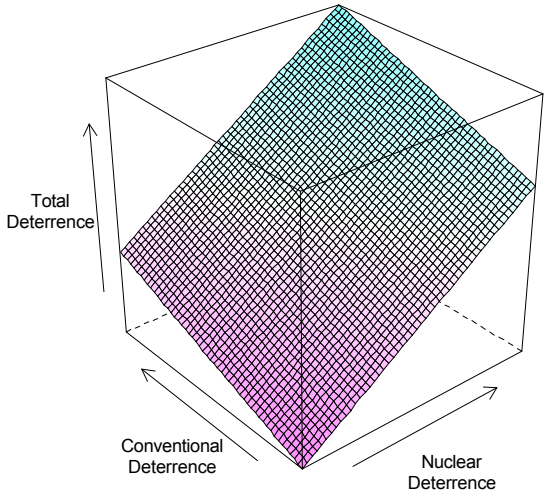
Perfect Substitutes (Output=Deterrence?)





- **Here nuclear deterrence is cheaper than conventional deterrence**
- **In reality, function depends on other inputs and specific deterrence mission**

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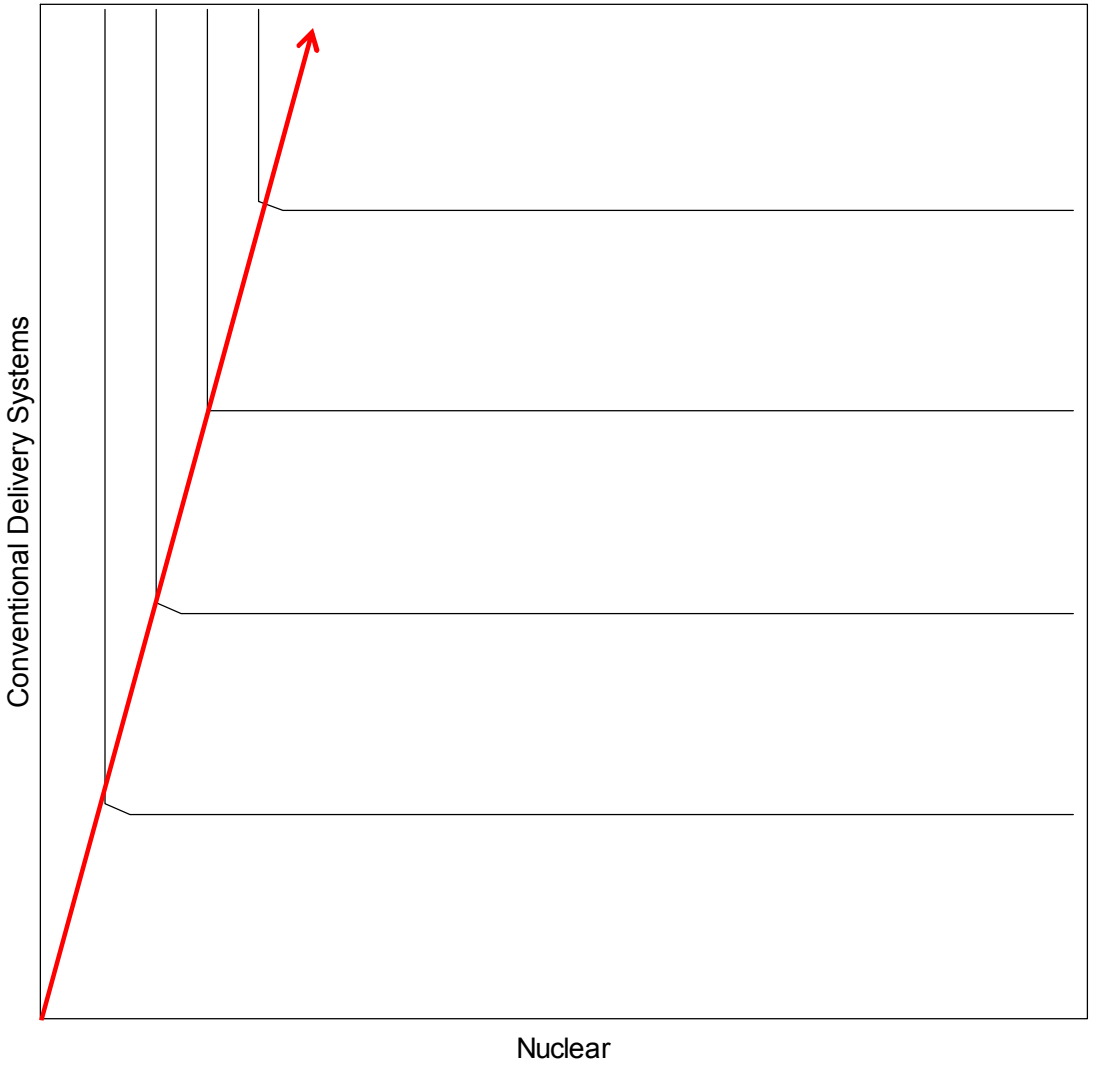
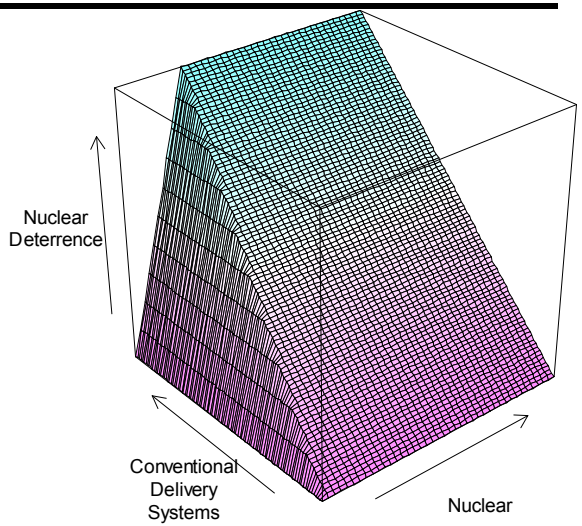
Perfect Complements (Output=Nuclear Deterrence?)





- **No ability to subsitute.**
- **Nuclear inputs are still cheaper than conventional, but it implies a large multiplier effect for the cost of nuclear deterrence**

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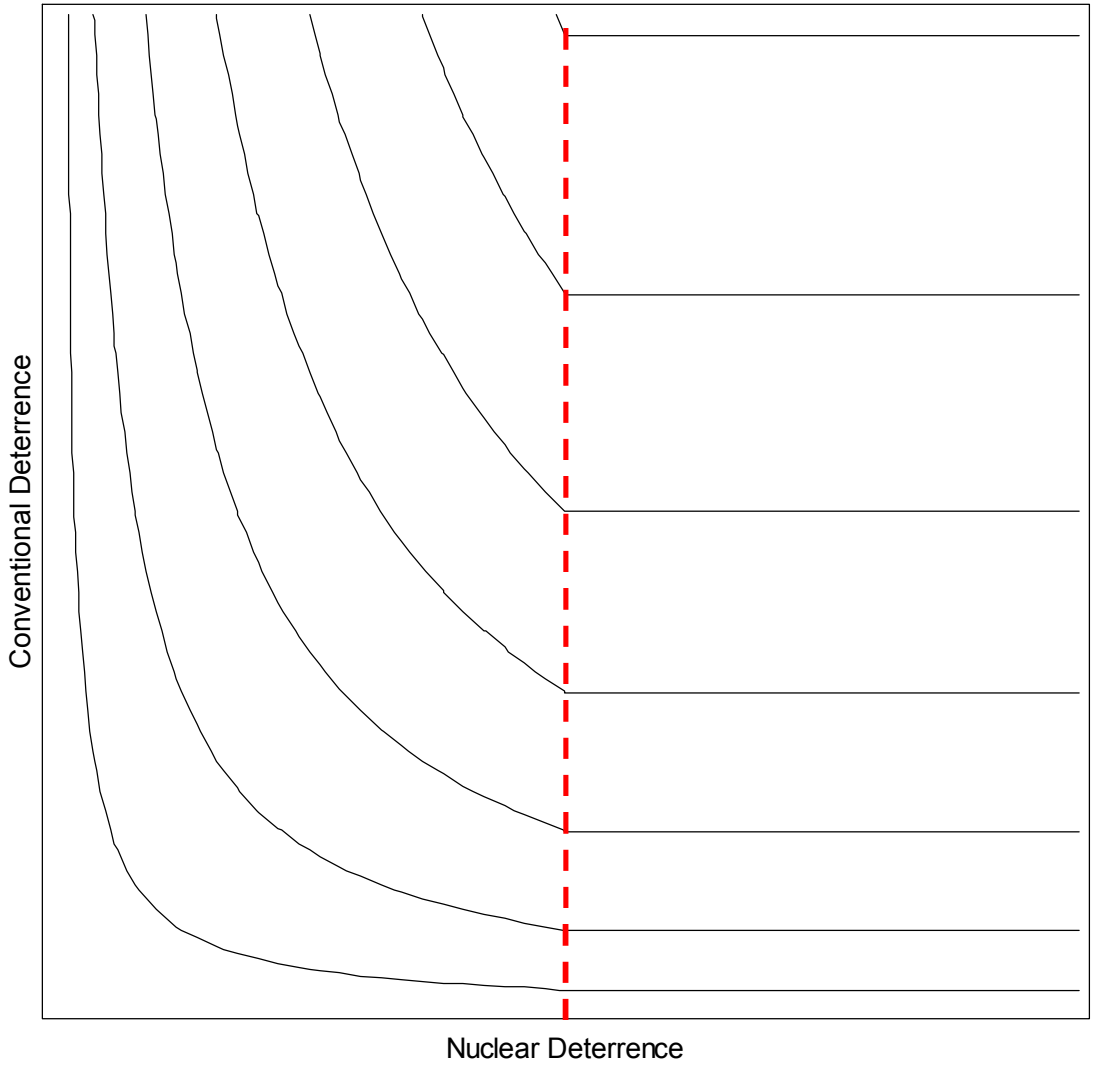
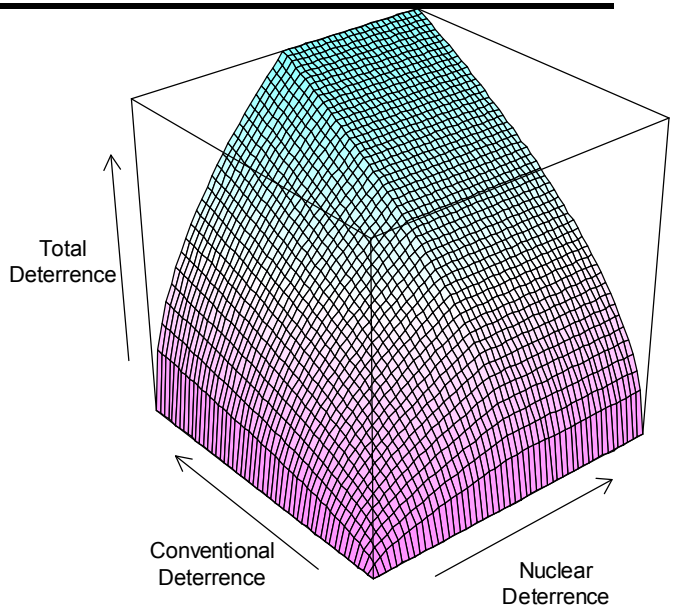
Minimum Deterrence?





- **Production functions are likely more complicated**
- **Here there is a maximum level of nuclear deterrence, but the optimal may be nearby**

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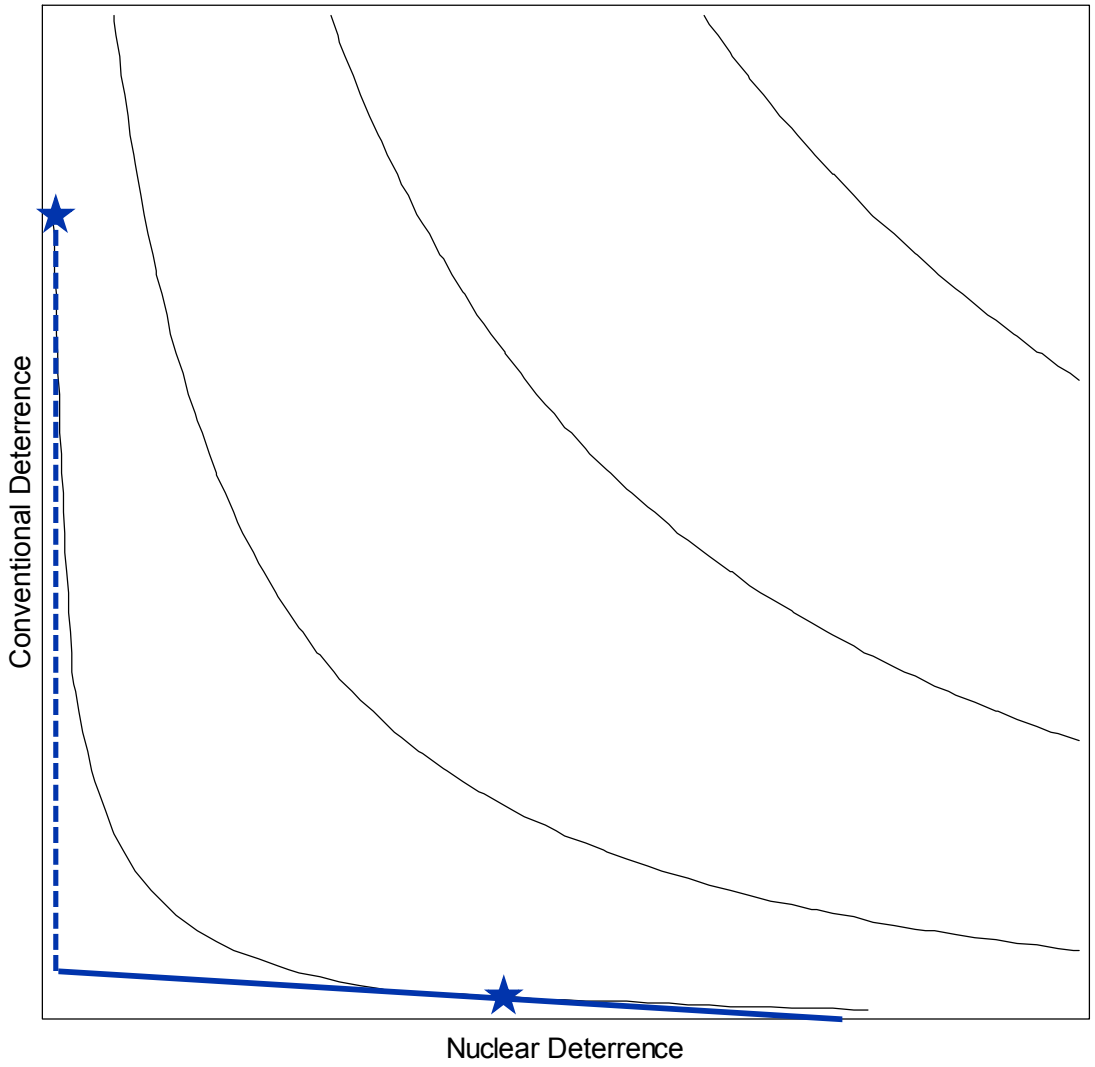
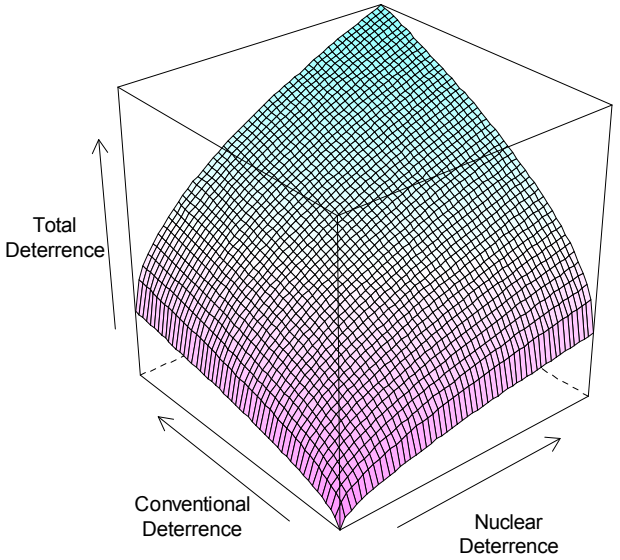
A Quick Note About Prices/Costs





- **If there are relatively high initial fixed costs, nations that use nuclear deterrence will tend to use a lot**
  - **Could evolve to lower nuclear deterrence when fixed costs are sunk**

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Implications

- The shape of the production function as well as current allocations of inputs determine properties like substitutability
  - The relative mix of inputs to produce deterrence will be based on costs, budgets, and can include non-economic factors (e.g., political preferences).
  - Basic microeconomic production theory provides clear guidance on economical levels of nuclear deterrence vs. conventional deterrence.
    - I.e., for a desired level of deterrence (isoquant), economical levels of nuclear and conventional deterrence will minimize economic and non-economic costs

Limitations

- Economic theory can provide qualitative insights
  - It can provide narratives about economic efficiency and aid decisions, but it can never provide The Answer
- Entire production functions cannot be quantified
  - "Deterrence" is difficult to measure and rapidly changes depending on the situation
    - Easier to use systems, but deterrence (mission) is final output
  - Relatively little experience, few chances to experiment
  - Even isoquants are impossible to quantify
    - Likely many answers for "How would conventional deterrence need to change to maintain the same level of deterrence?"
- For most of the economy, uncertainties are overcome with markets, prices, and evolution.

Limitations

- Multiple products and multiple inputs complicate
  - Theory can handle this when given perfect information, but these factors add more unknowns
  - Implication: It is difficult to determine the costs of multiple, related missions.
    - E.g., Separately pricing nuclear weapons stewardship and arms control would require either stovepiping (at a cost) or accounting that assumes a split
- Production theory assumes that production operates on the curve (no additional output can be produced without using additional inputs)
  - Markets provide incentives to maximize production
  - These incentives may not exist in the production of deterrence

Conclusions

- Production theory is a static tool that can provide economic insights to dynamic problems like deterrence
  - E.g., it can identify economic factors that may influence the conventional/nuclear balance
  - It cannot provide definitive answers (like optimal production decisions)
- It is impossible to say that either nuclear or conventional deterrence is optimal in a general sense
  - For specific cases, production theory provides insights about relative levels, but large uncertainties will exist
- Policy focus should be on the big picture rather than narrow stovepipes: how to effectively provide deterrence (and related products) for a range of missions that will change in uncertain ways throughout time.