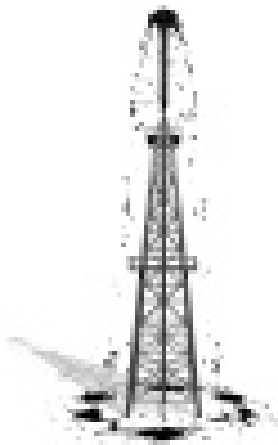


“Oil Field Unitization in Theory and Practice”

by

Dr. James L. Smith

**Cary M. Maguire Chair in Oil & Gas Management
Department of Finance
Southern Methodist University
Dallas, TX 75275 USA**



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Rio de Janeiro, December 15, 2011

Theory versus Practice

- In Theory:

An ideal solution to an important problem.

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An ideal solution to an important problem.

- In Practice:

Imperfect adaptations are unavoidable, but may jeopardize success.

Outline of My Talk

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 - **Aligns incentives**

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 - **How the former difficulties lead to the latter.**

The “Rule of Capture”...

... as explained by:





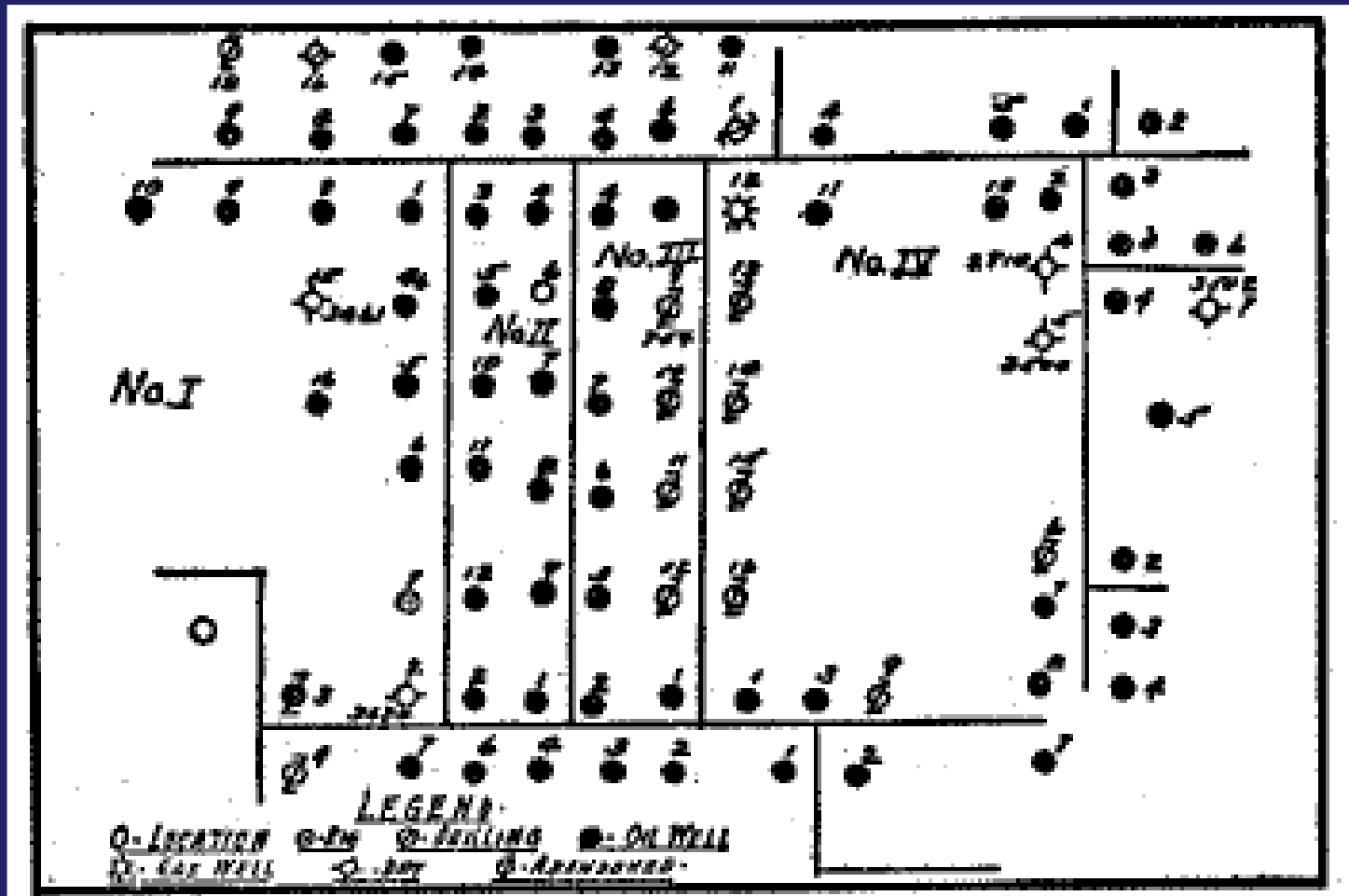
The “Rule of Capture,” as Explained by Law

- **The well bore may not cross property lines.**
 - **Mr. Burns is breaking the law.**

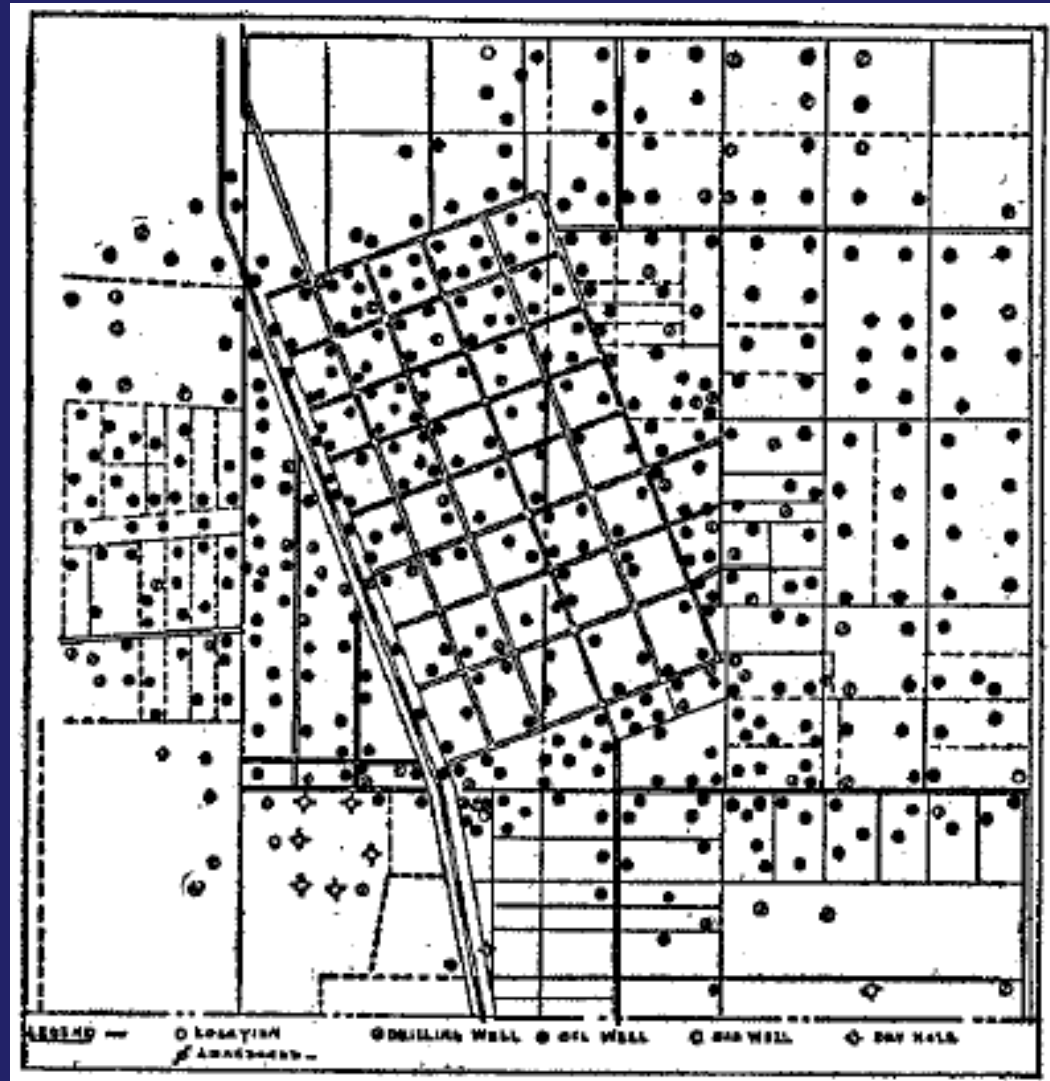
The “Rule of Capture,” as Explained by Law

- **The well bore may not cross property lines.**
 - Mr. Burns is breaking the law.
- **But hydrocarbons may (and will) cross property lines.**
 - Your neighbor’s vertical well is not breaking the law.
 - Without unitization, your neighbor will drill many wells that exploit your property.

Overhead View of the Ranger, Texas, Oil Field



Map of a Section of the Burkburnett, Texas Oil Field



Los Angeles, Rule of Capture, 1901



Huntington Beach, California



That Was Then. This is Now.



Prudhoe Bay Oil Field, Alaska North Slope

Satellite View: Sparse Wells, Small Footprint



Prudhoe Bay Oil Field, Alaska North Slope

And Much Closer to the Ground



Prudhoe Bay Oil Field, Alaska North Slope

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- Waste that hurts any one producer, hurts all.
- Unit governance is simple: wise decisions receive unanimous support.

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(John Nash, Noble Laureate, 1994)

Bargaining to Form a Unit

Company 2: Majority Interest

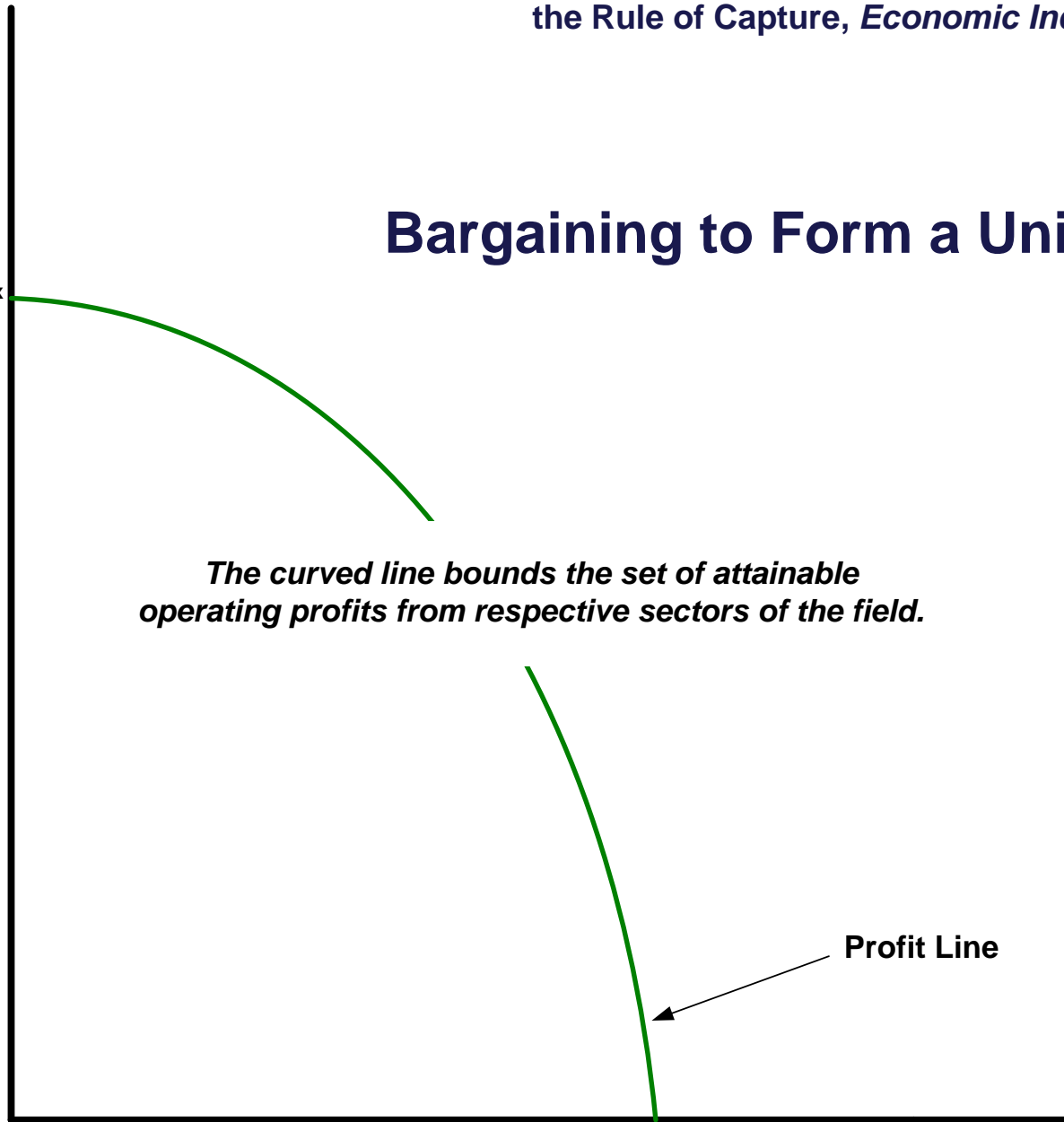
Π_2^{\max}

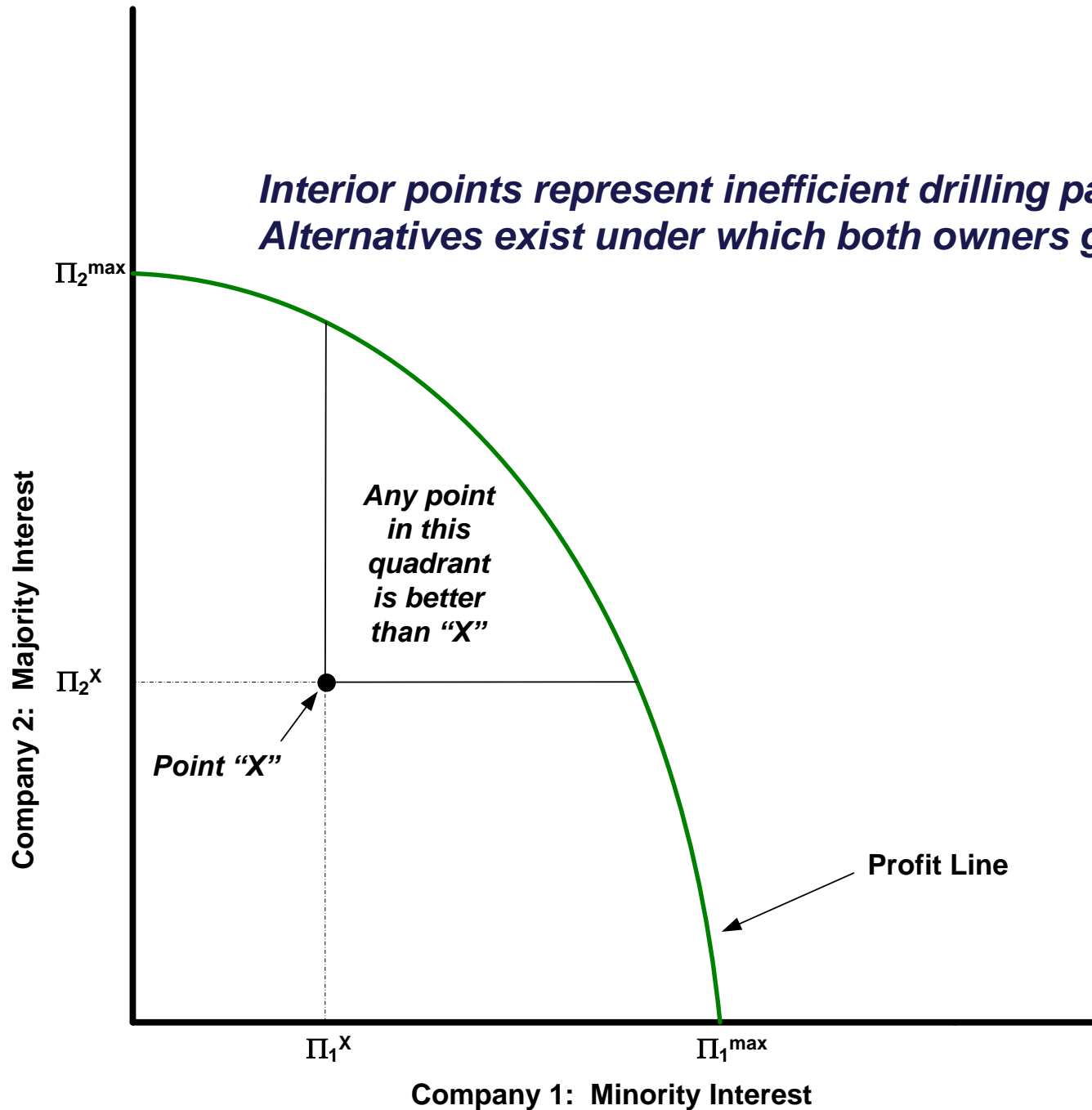
The curved line bounds the set of attainable operating profits from respective sectors of the field.

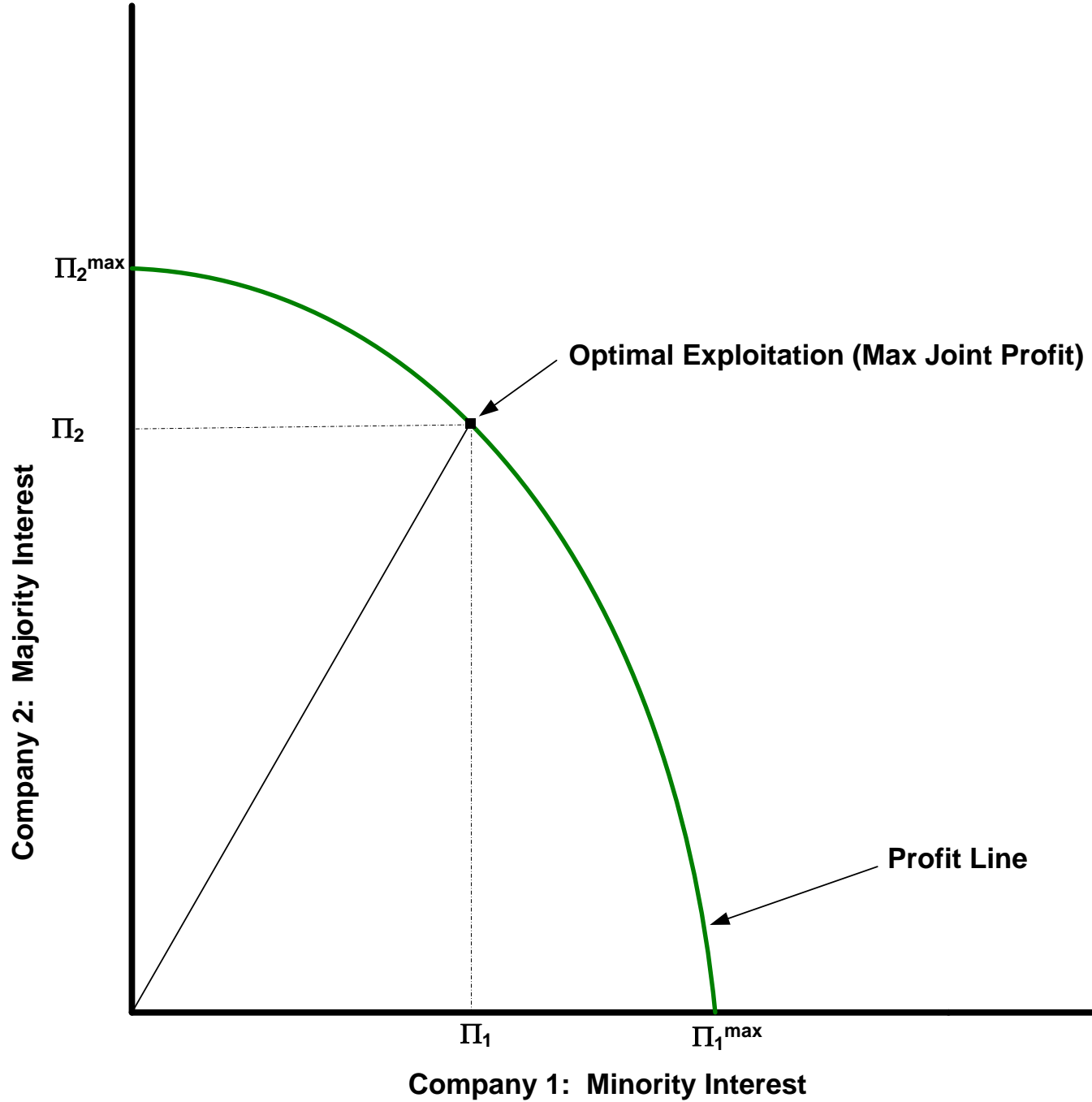
Profit Line

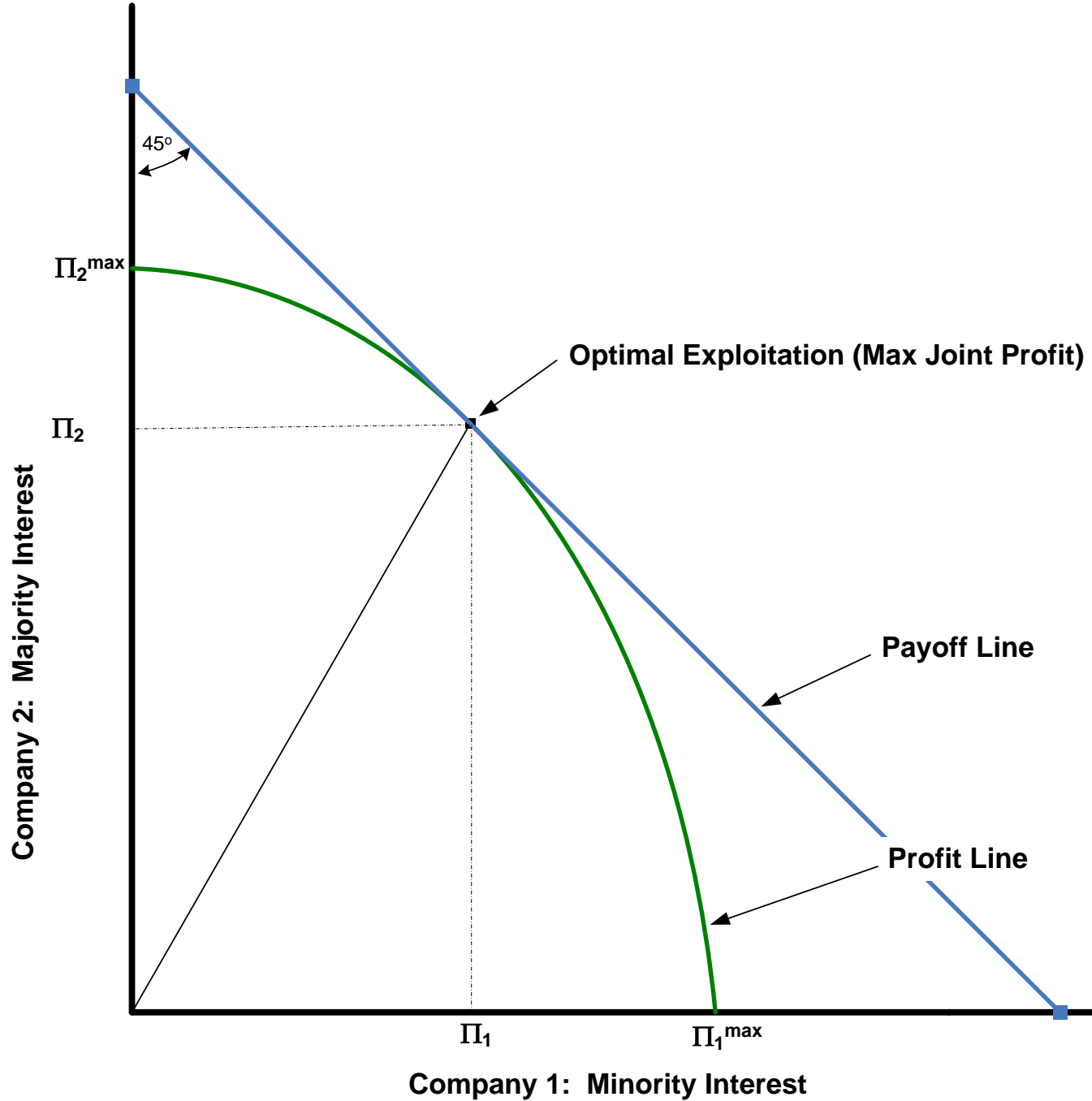
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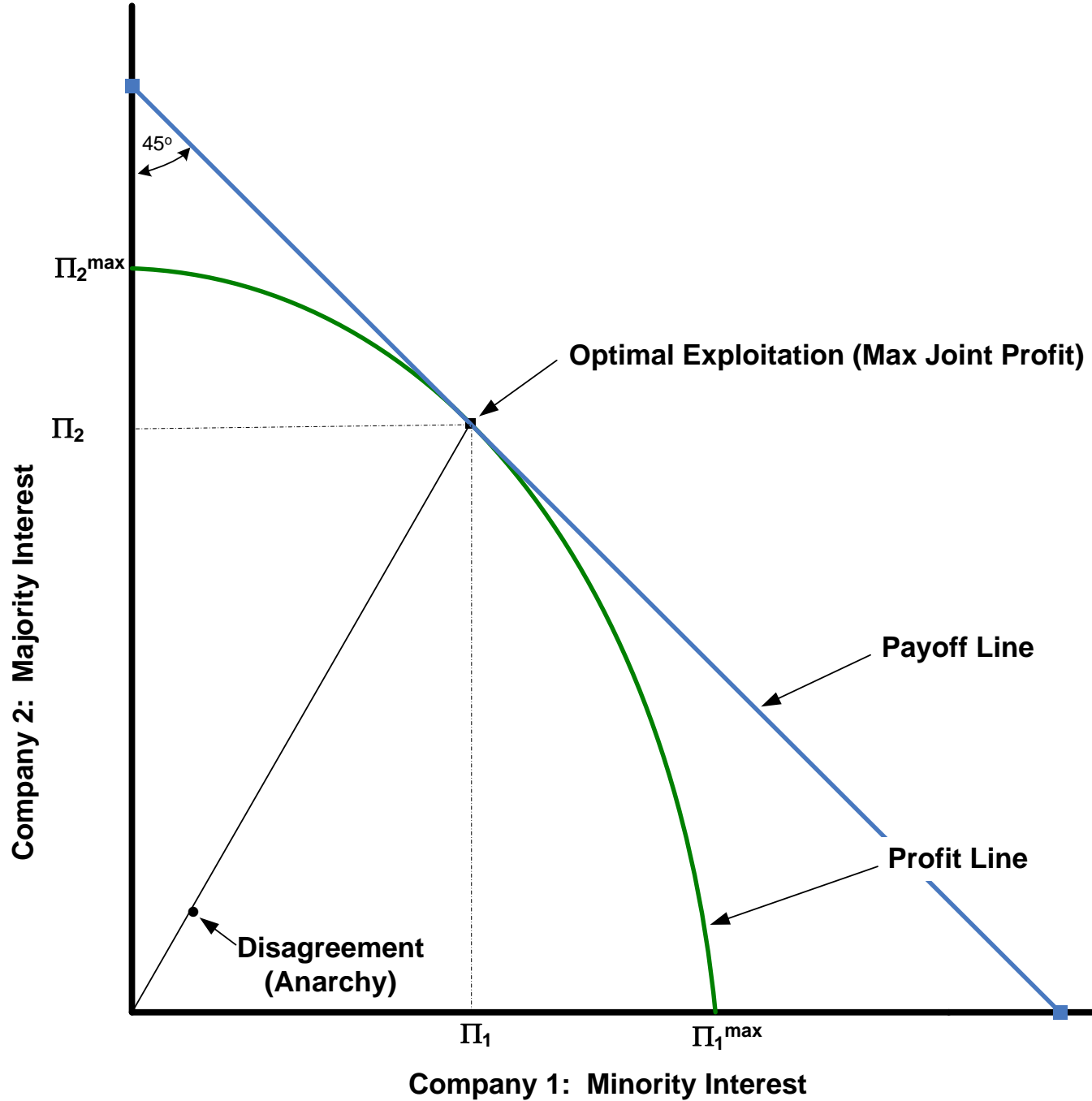
Company 1: Minority Interest









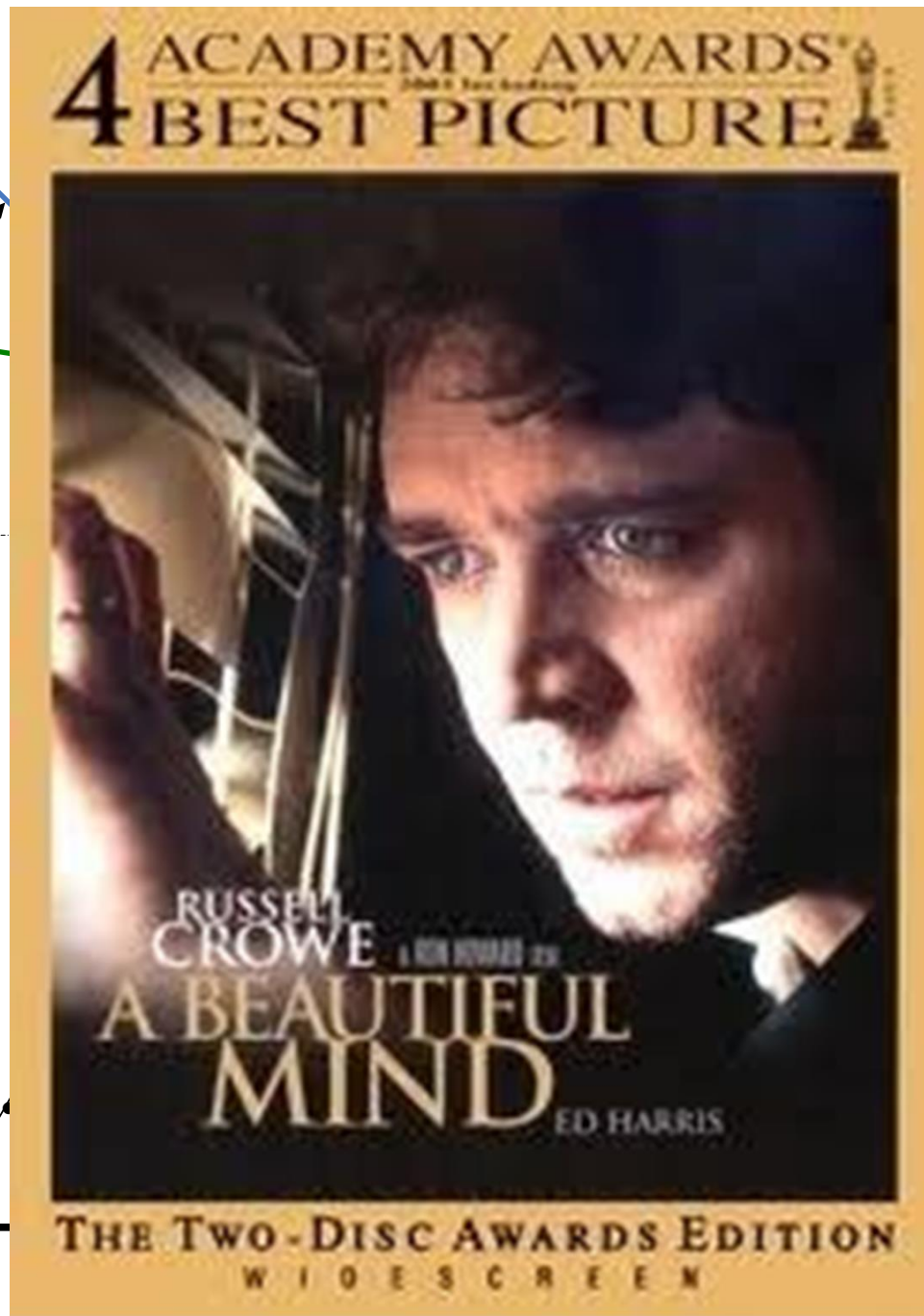


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Π_2

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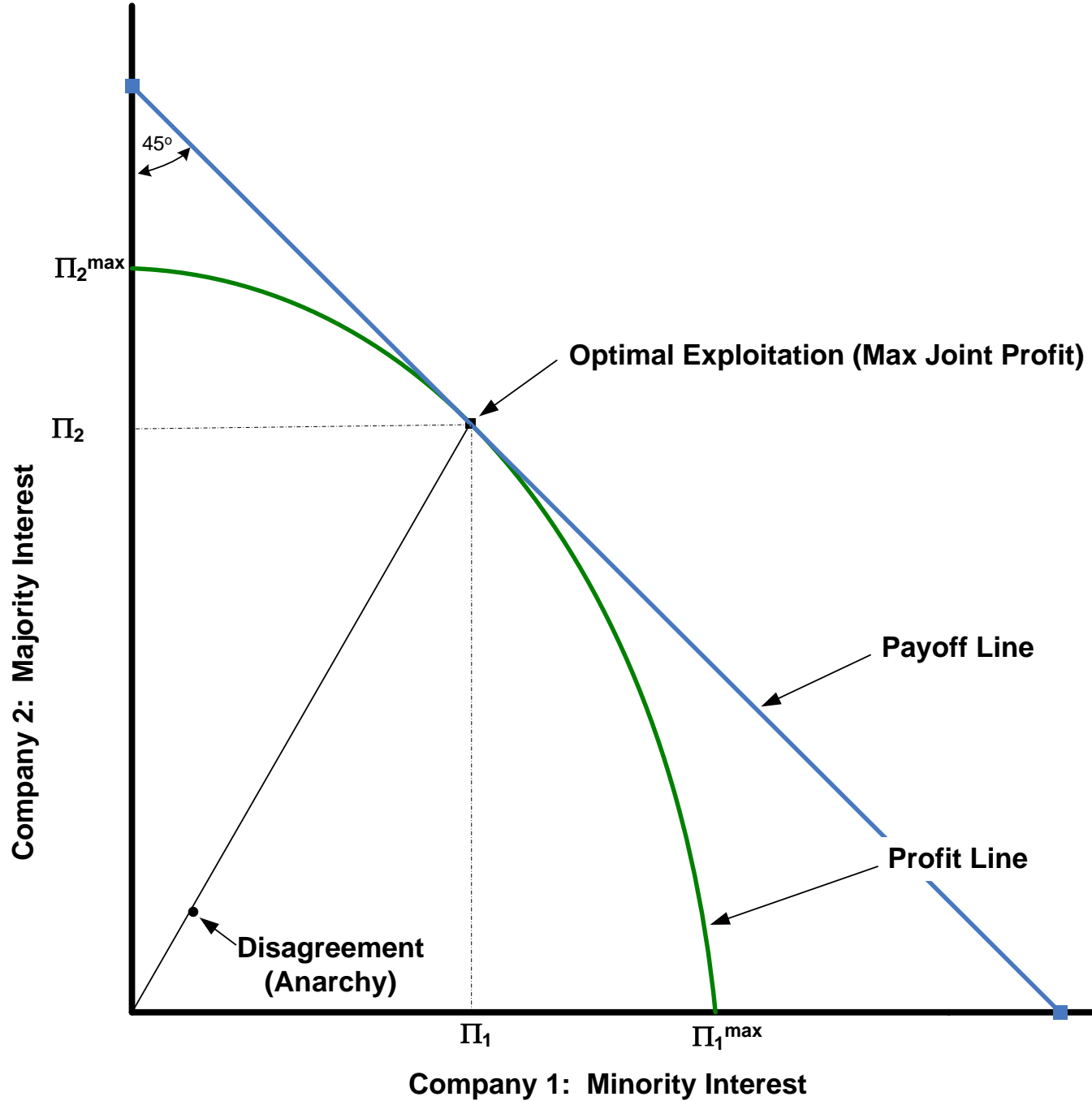
45°

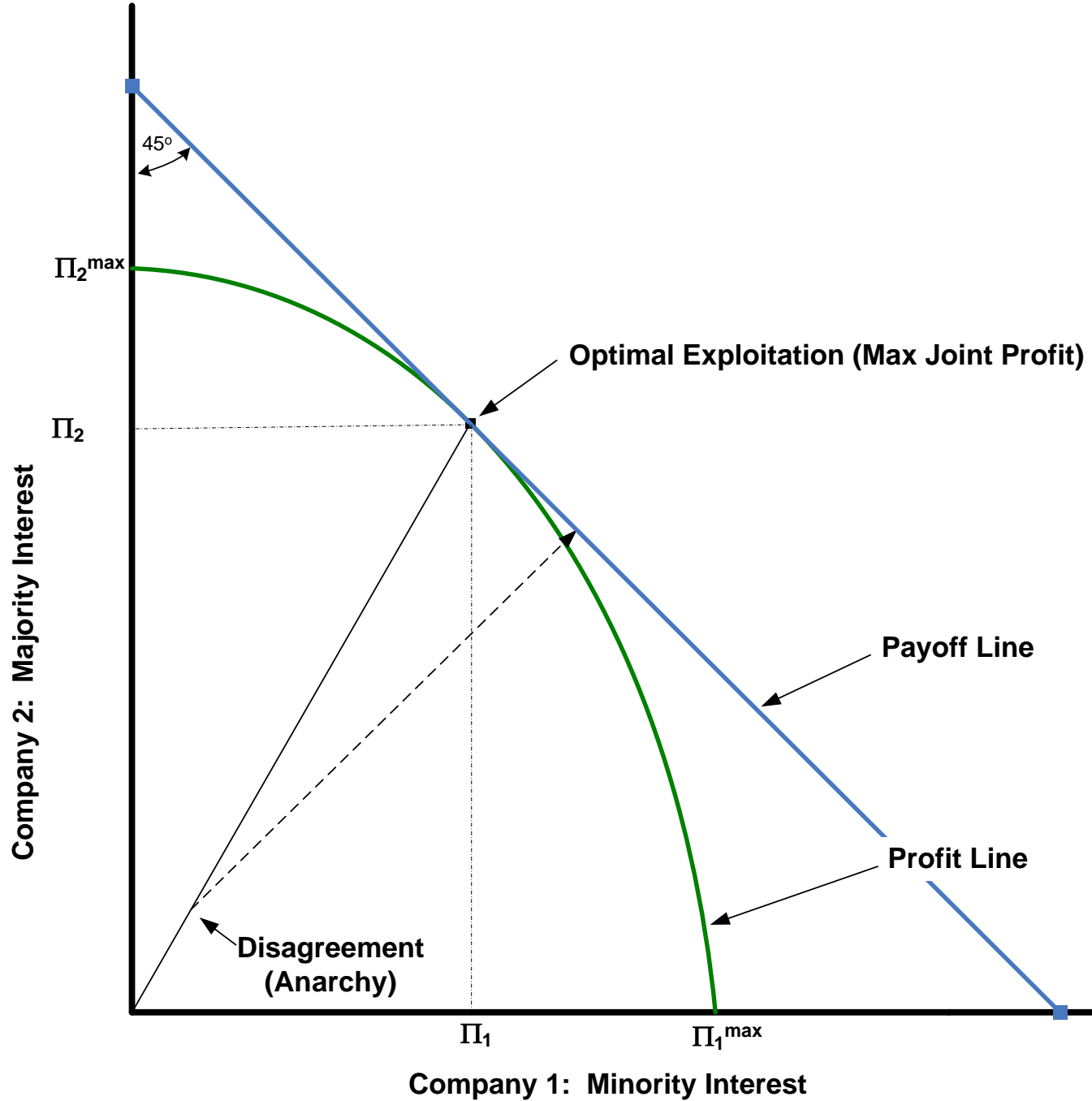


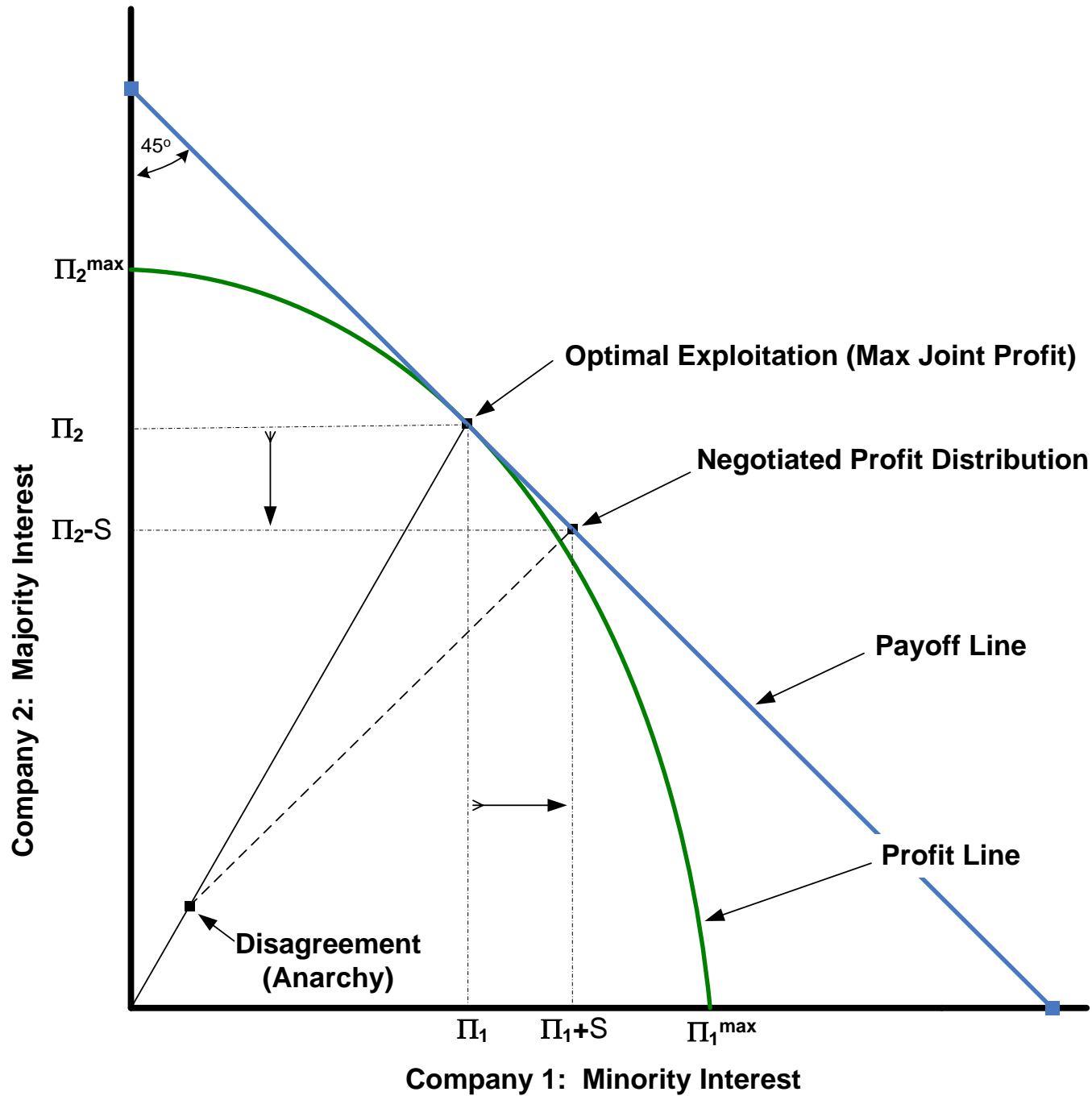
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Government Intervention

- **Well spacing and permitting regulations replace anarchy (in the event of disagreement) with order. This limits the bargaining power of smaller interests.**

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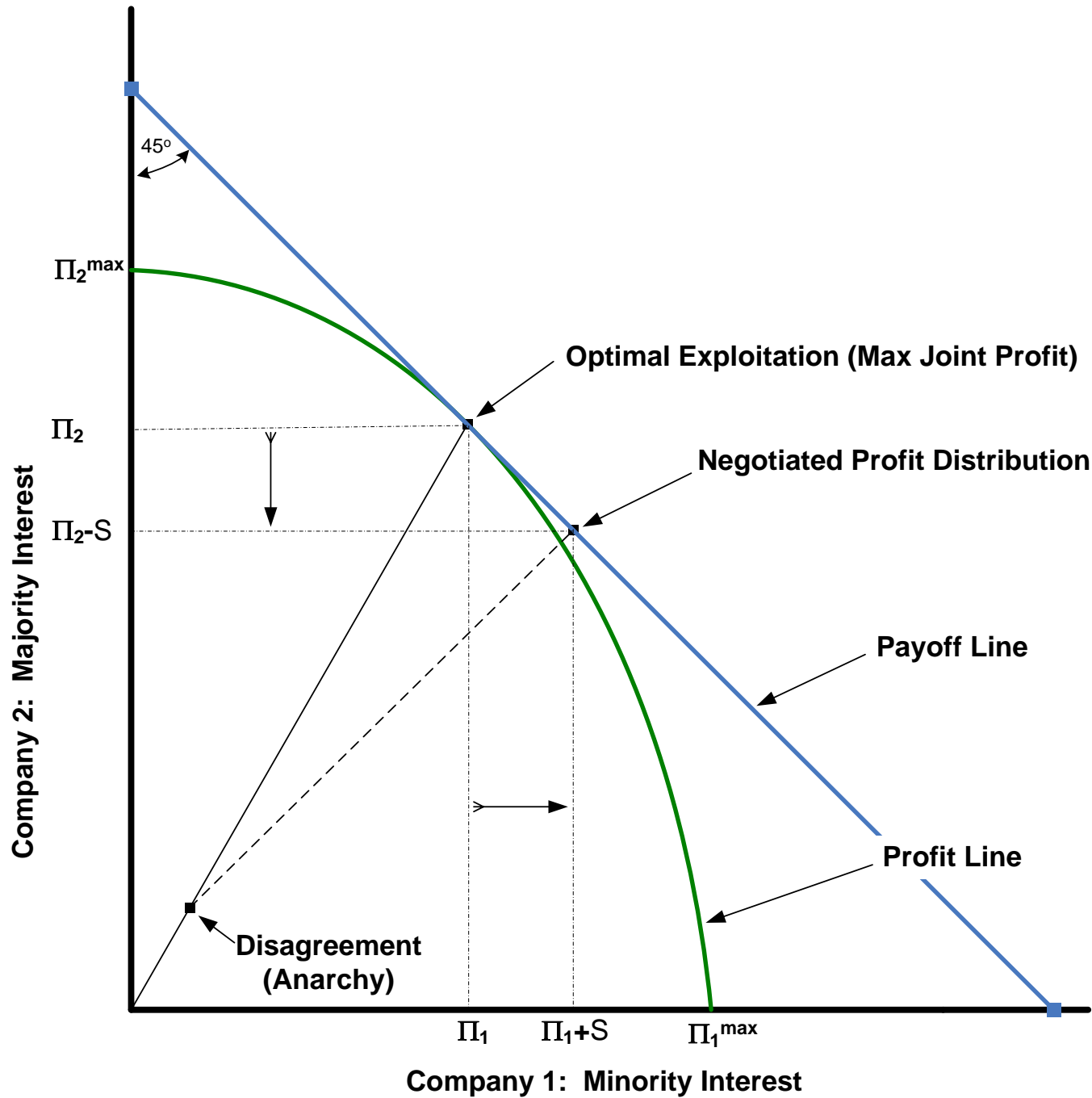
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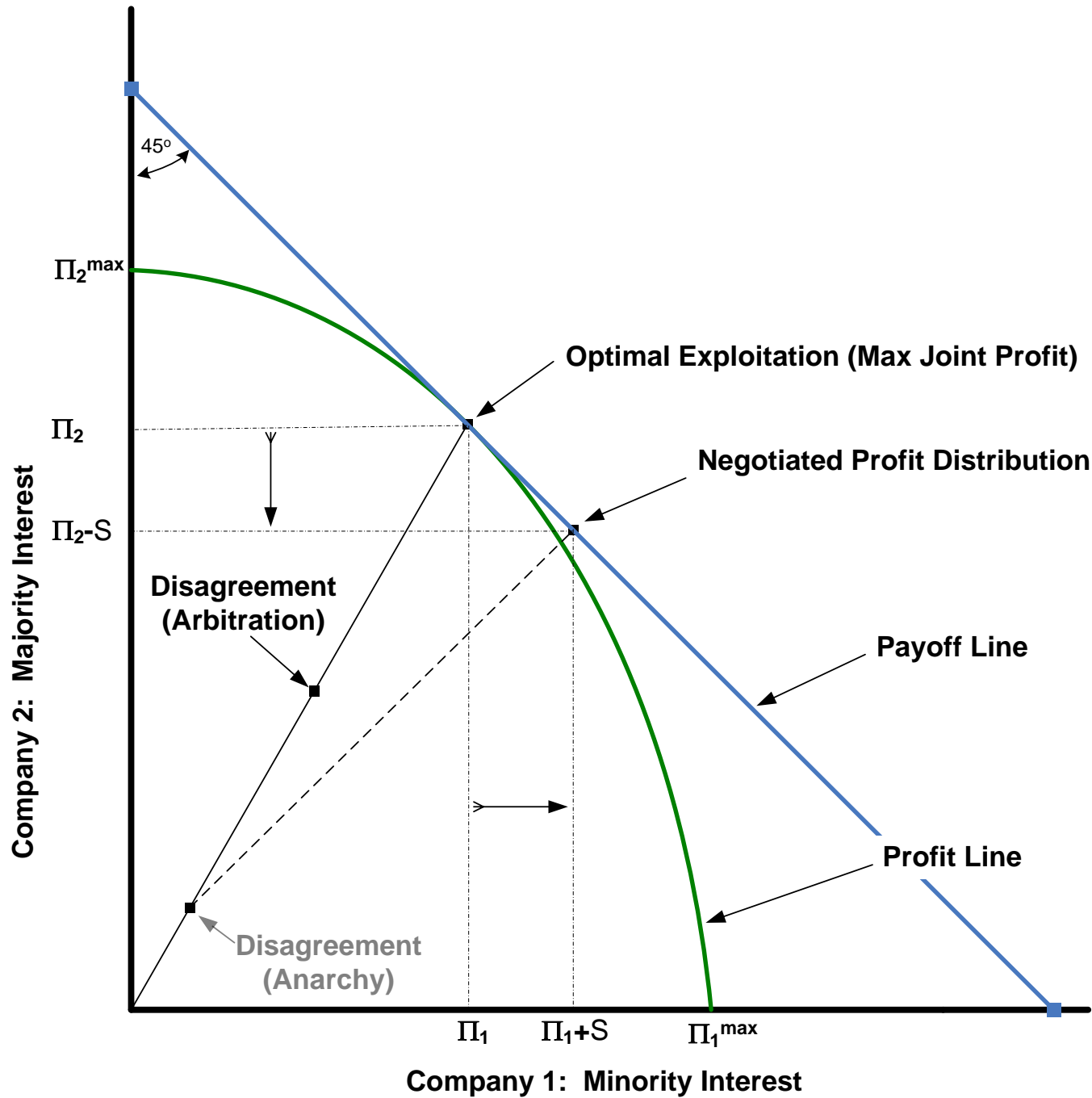
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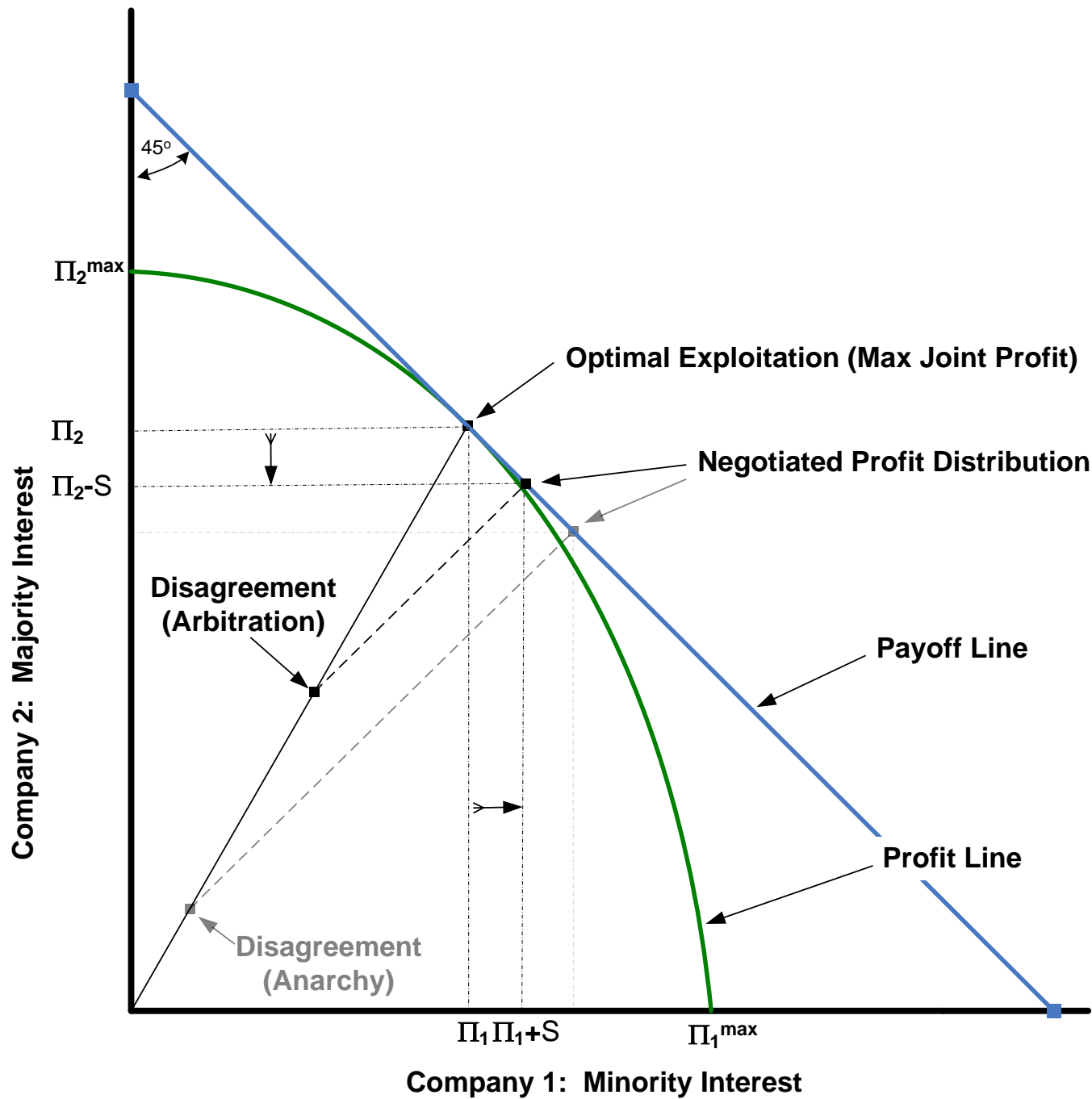
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- **Arbitration may fine-tune both of these to the circumstances of a specific field.**
- **The bargaining problem is mitigated, not eliminated!**







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 - **royalty leases vs. production sharing contracts??**
- These may prevent agreement on “terms of trade” by which individual holdings are exchanged for shares of the unitized field.

How Many “Participating Areas” in the Unit?

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- Relevant only if there is both uncertainty and disagreement about the relative value of the dissimilar assets (oil vs. gas)

Negative Impact of Dual Participating Areas

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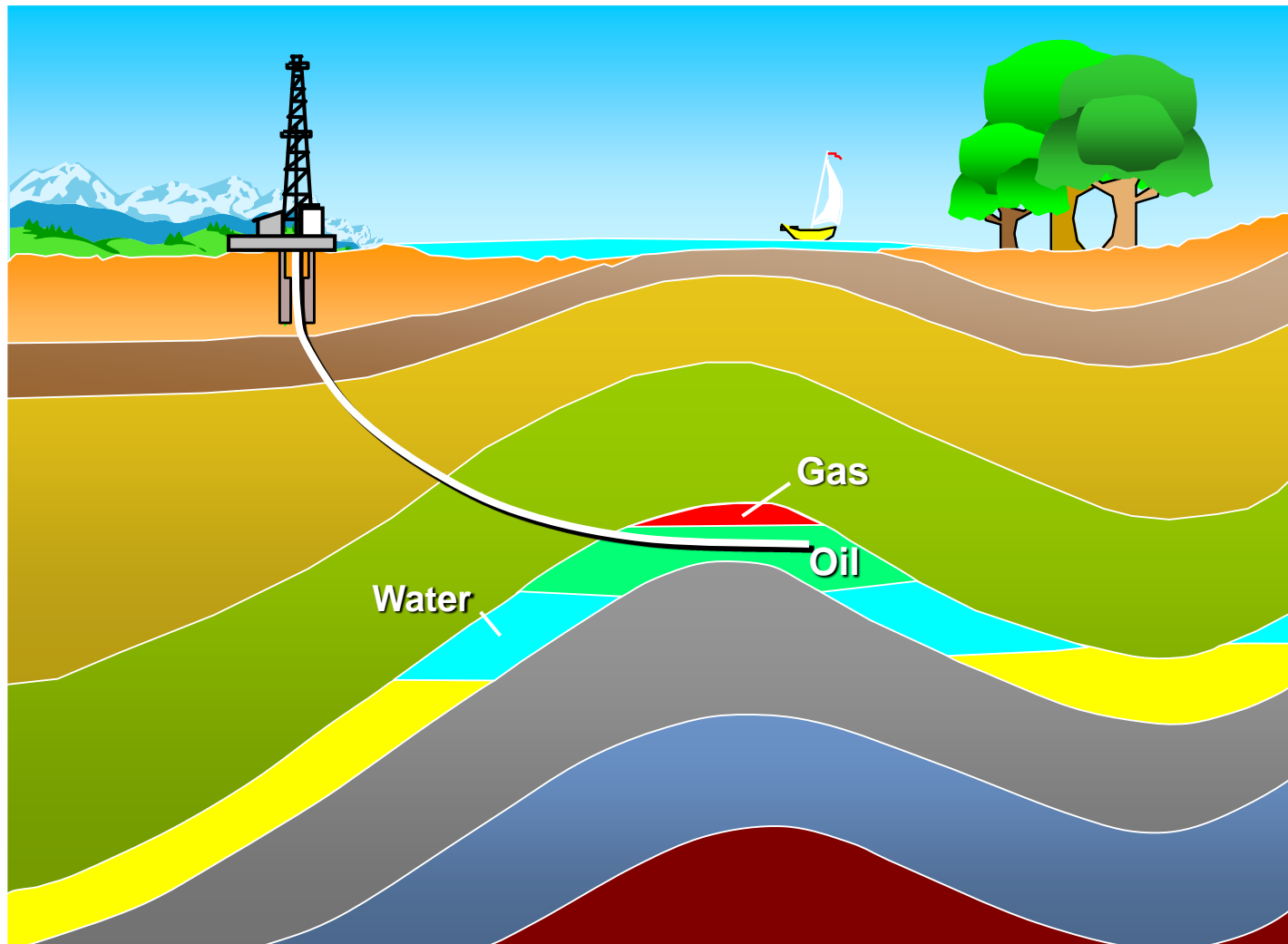
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- **Creates competition among owners.**
- **Imposes conflicting perspectives on a shared investment problem.**
- **Exposes owners to the “hold up” problem: pressure to alter agreements after costs have been sunk and bargaining leverage lost.**
- **Only postpones hard decisions, and may increase the cost of reaching ultimate agreement.**

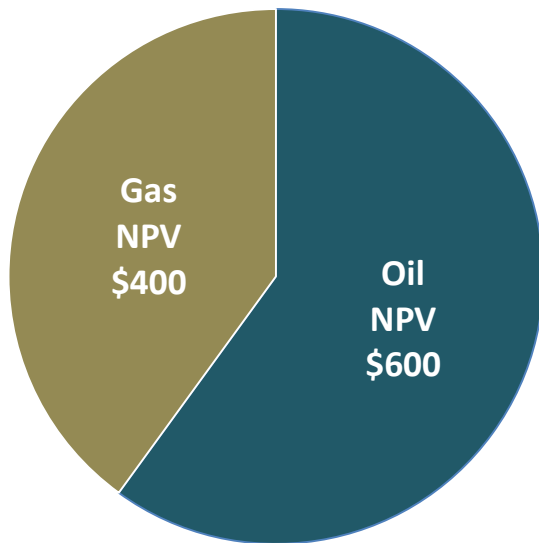
Gas Cap vs. Oil Rim



Source: American Petroleum Institute, 1986

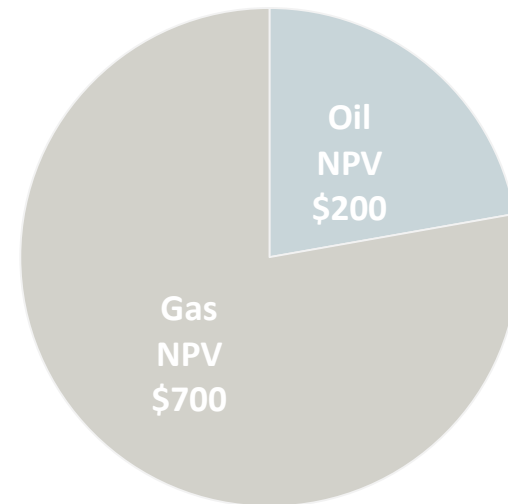
Ex. 1: Reservoir Development Dilemma: Gas Cycling vs. Early Gas Sales

Gas Cycling



Combined NPV = \$1,000

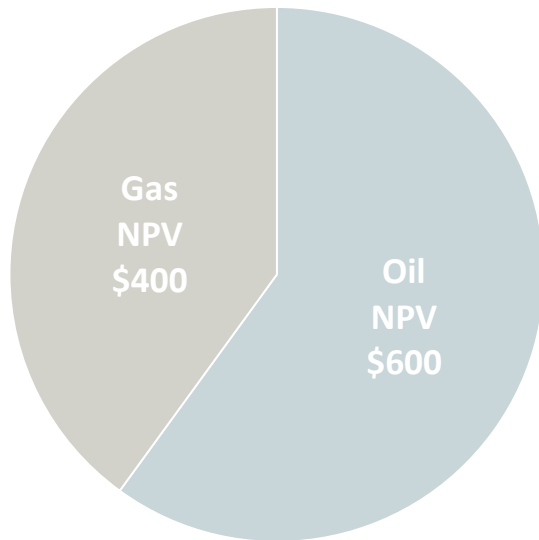
Early Gas Sales



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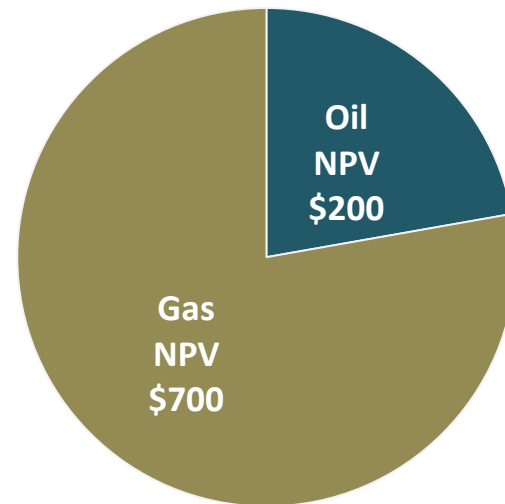
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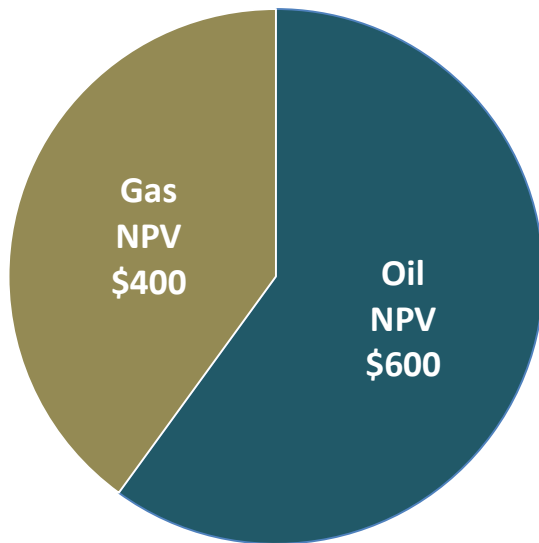
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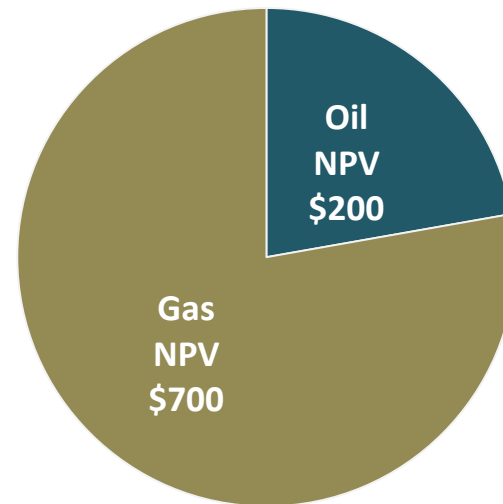
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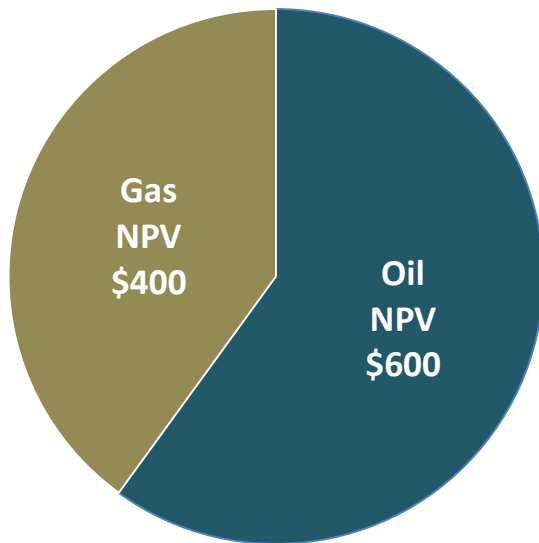
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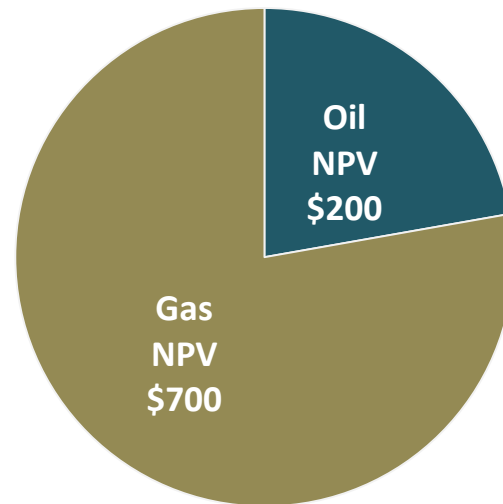
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Dual Participating Areas Create Conflict

Assume the holdings of one company are concentrated in the Gas Cap (gas-prone leases).

If the owners form two PA's, their interests will be misaligned.

<u>Oil Rim PA</u>		
Example:	Co. A	30%
	Co. B	70%

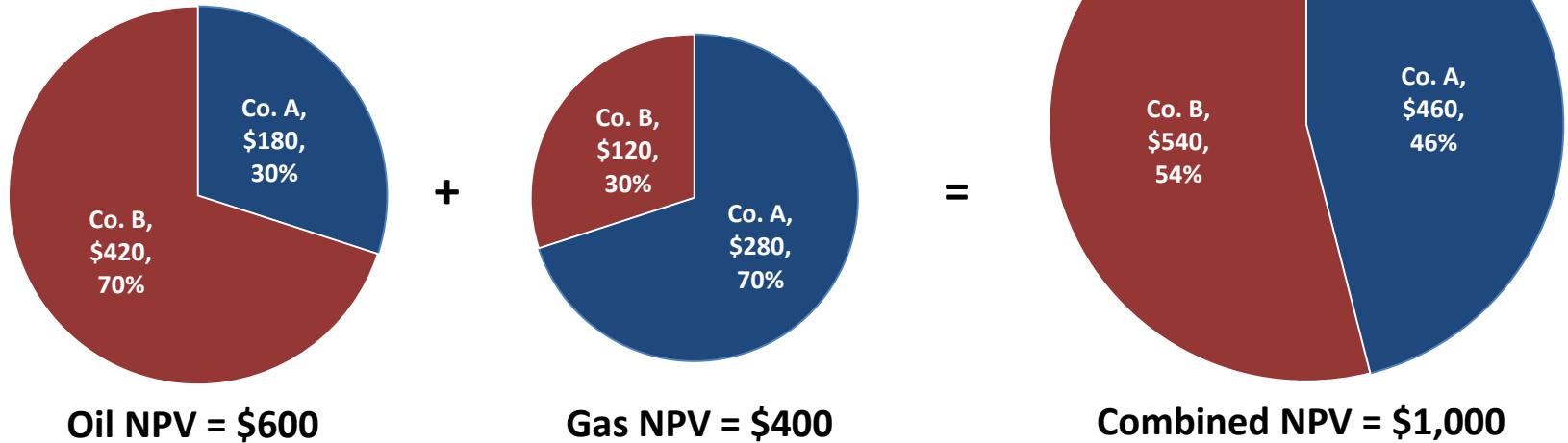
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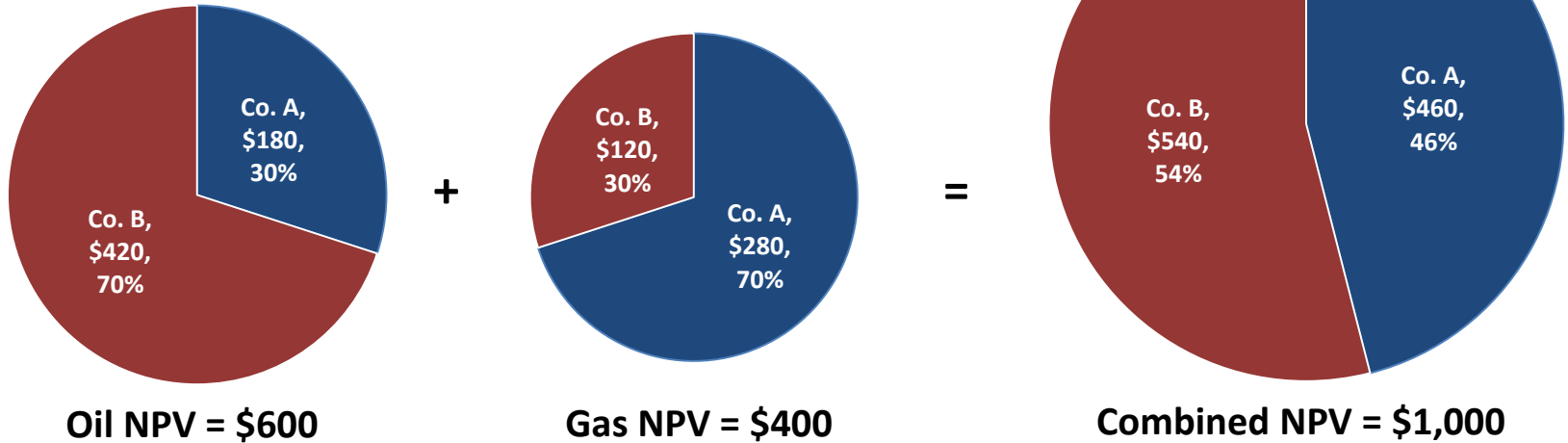
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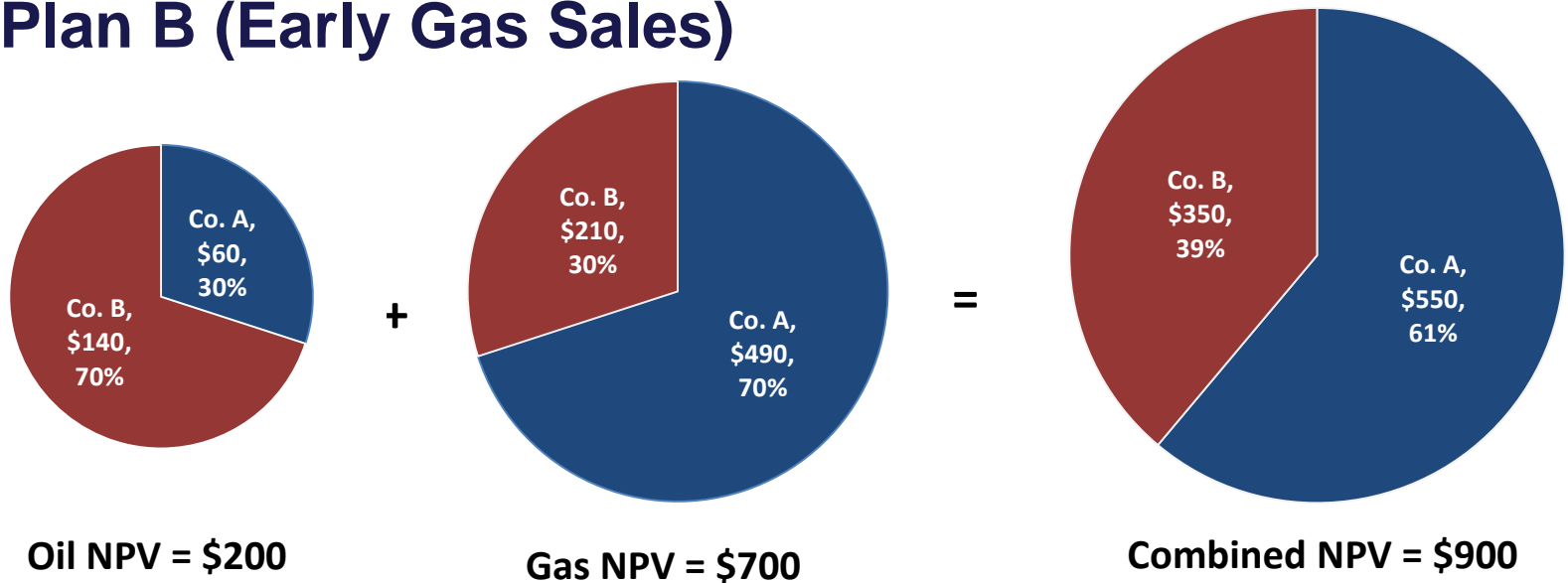
Plan A (Gas Cycling)



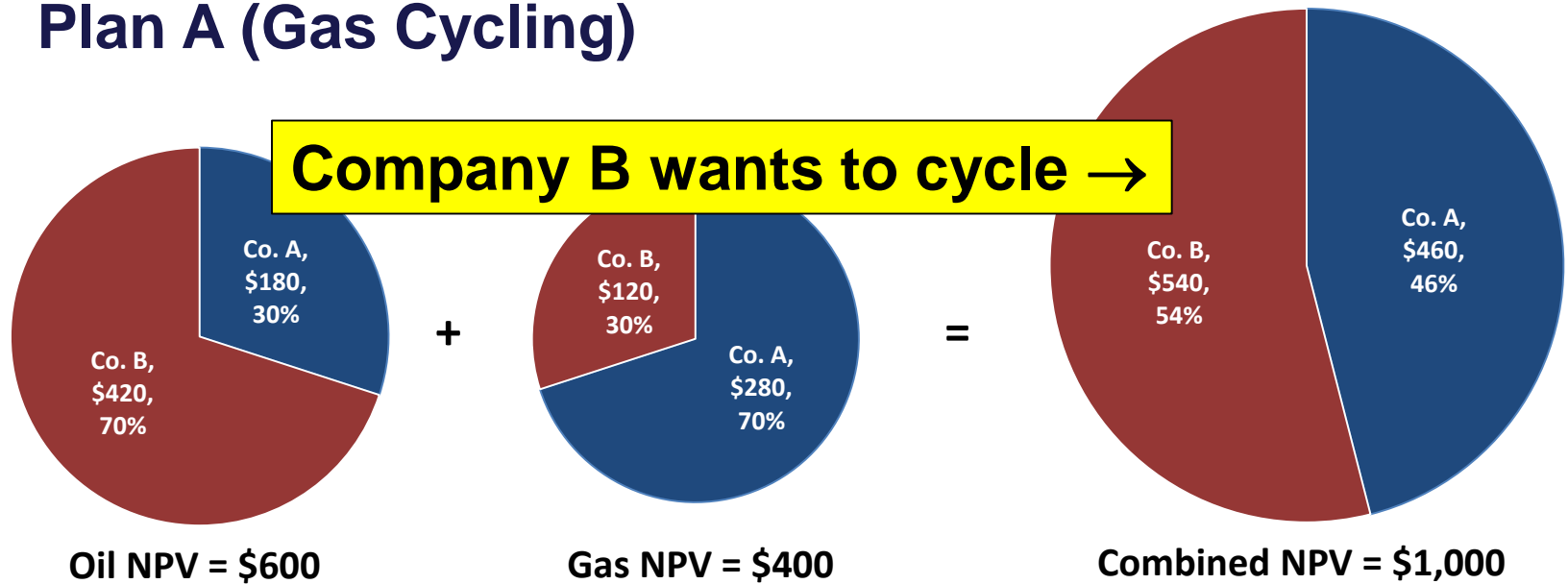
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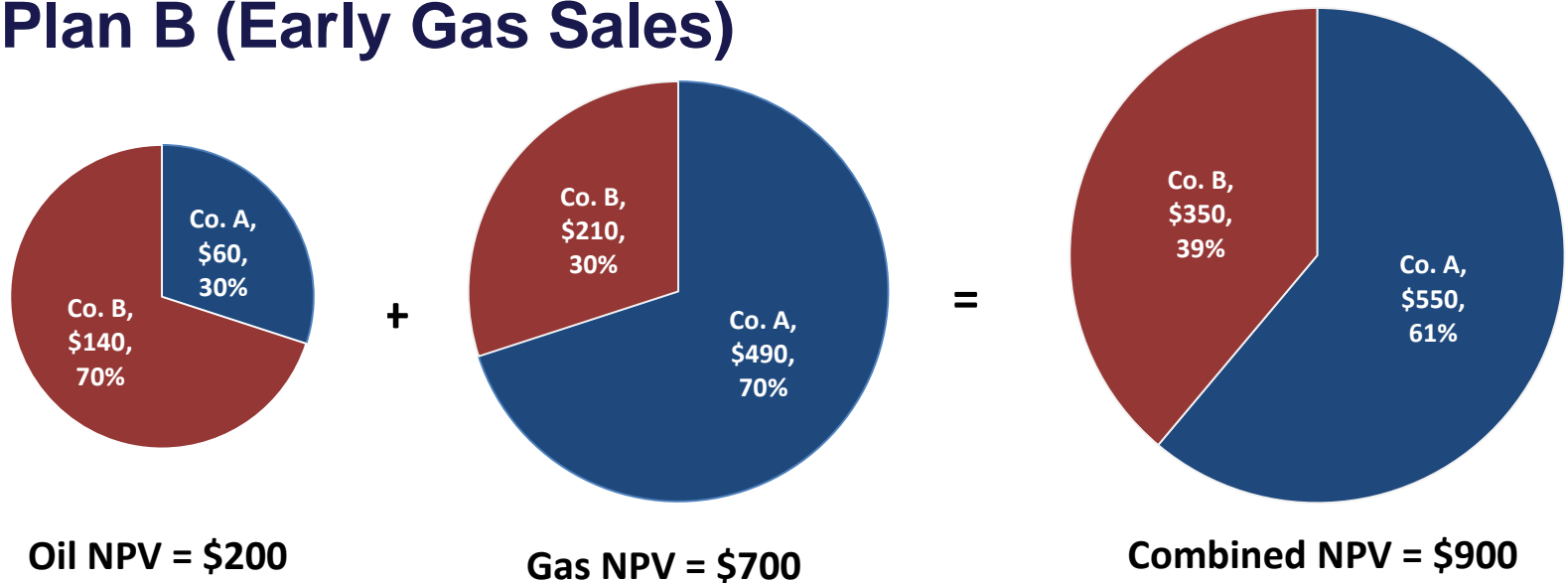
Plan B (Early Gas Sales)



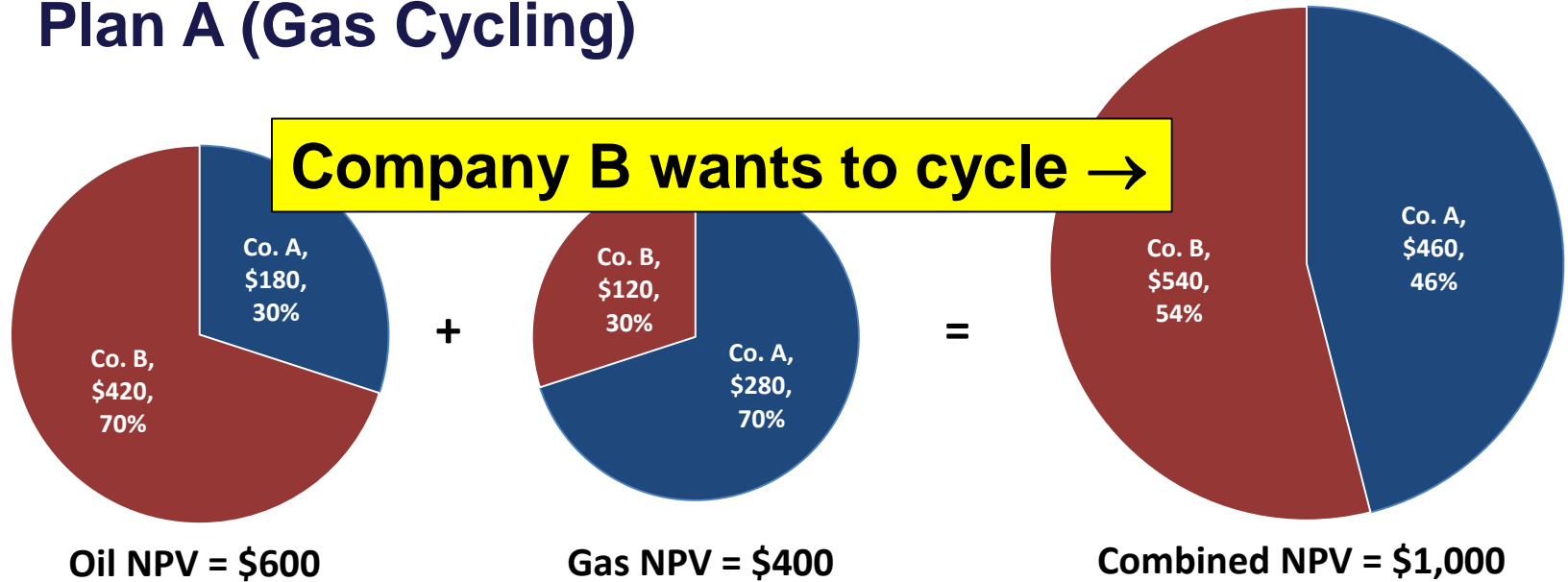
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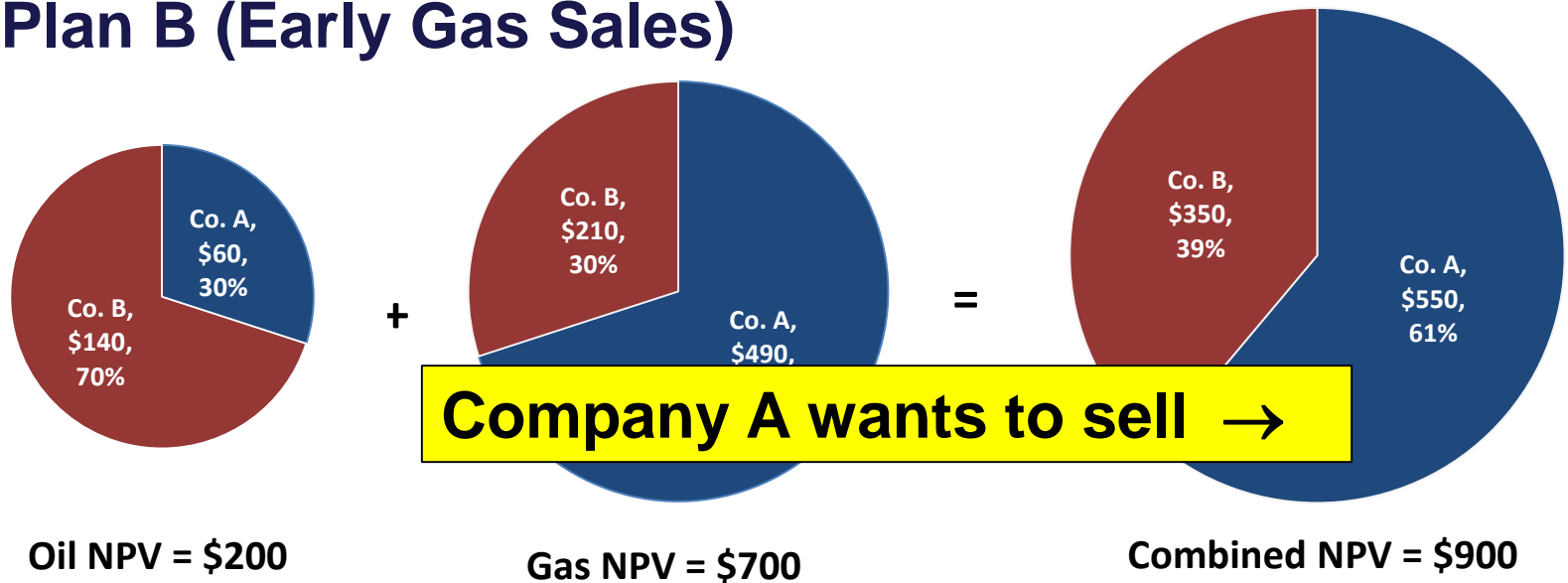
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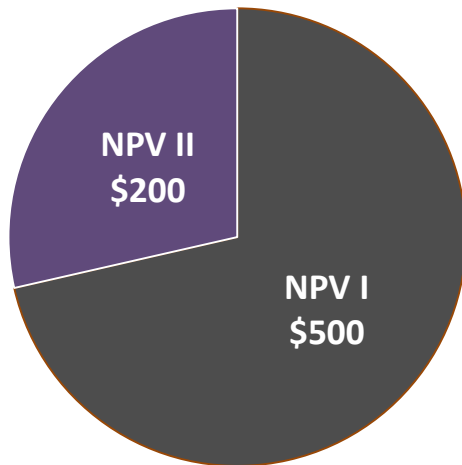


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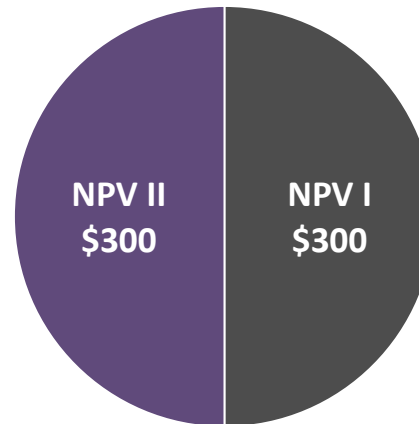
Ex. 2: Reservoir Development Dilemma: When to Initiate Secondary Recovery?

Normal Timing



Overall NPV = \$700

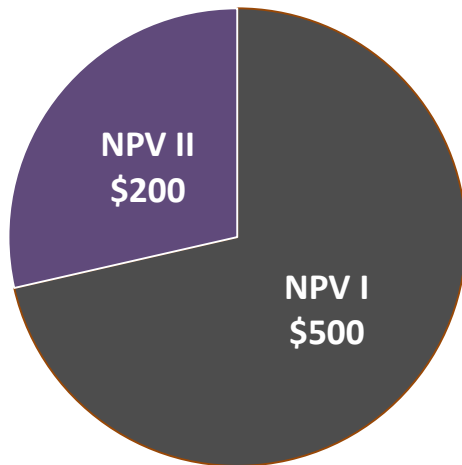
Premature Timing



Overall NPV = \$600

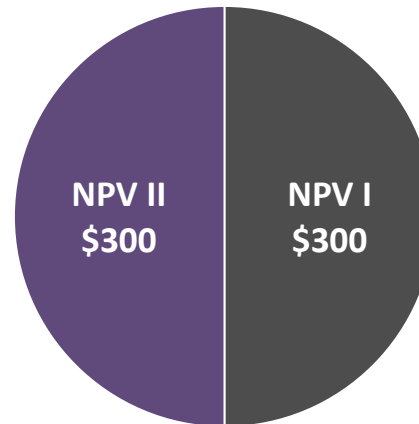
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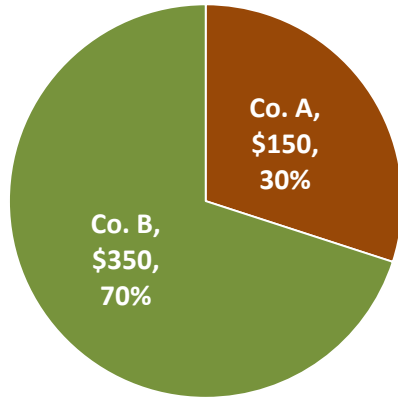
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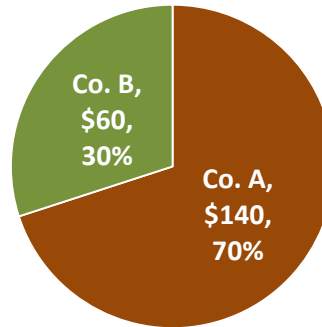
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Plan A: Efficient Reservoir Development



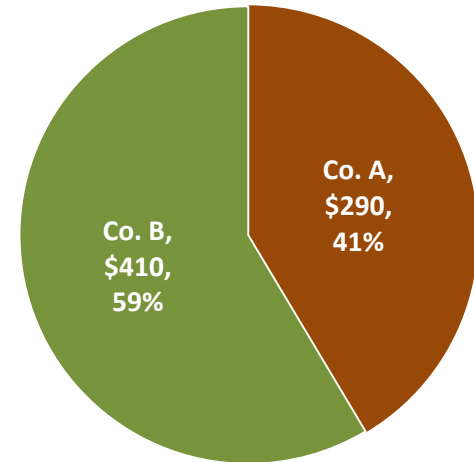
Primary NPV = \$500

+



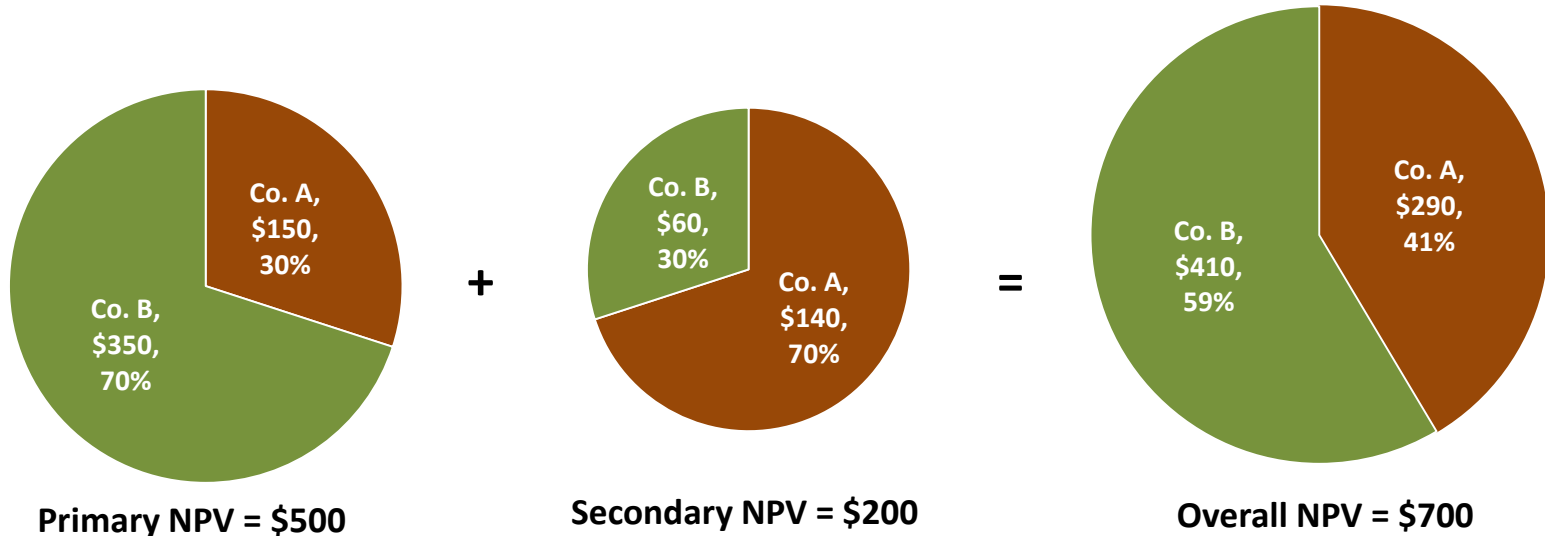
Secondary NPV = \$200

=

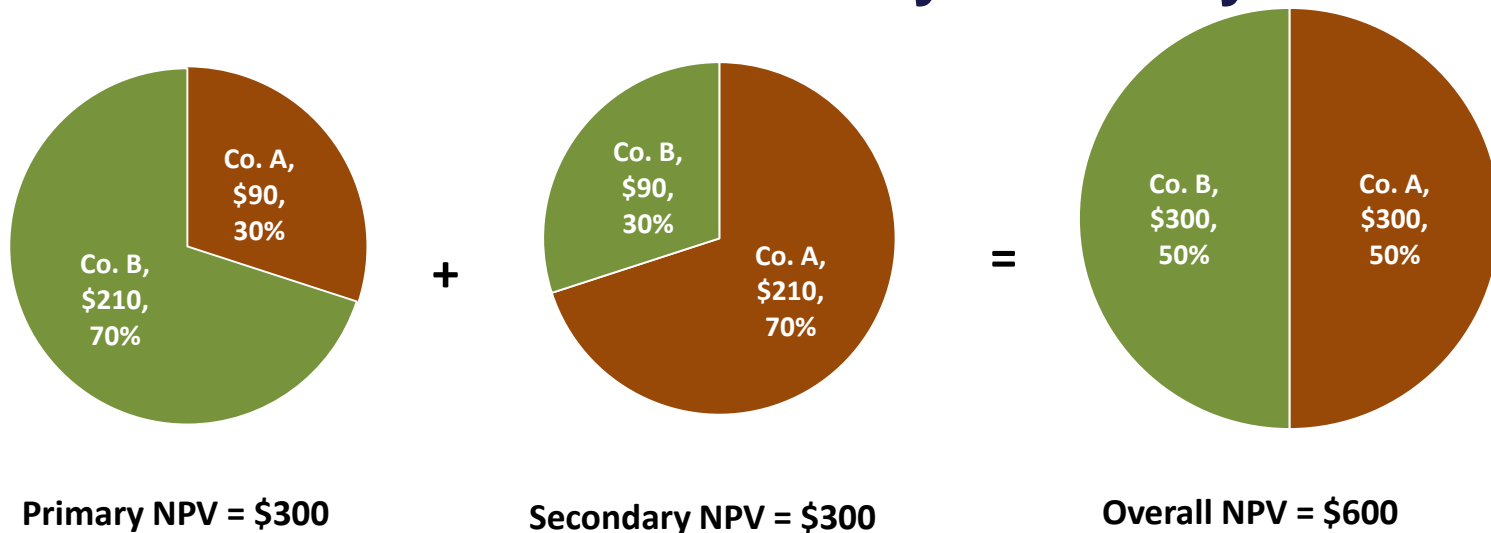


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Plan A: Efficient Reservoir Development

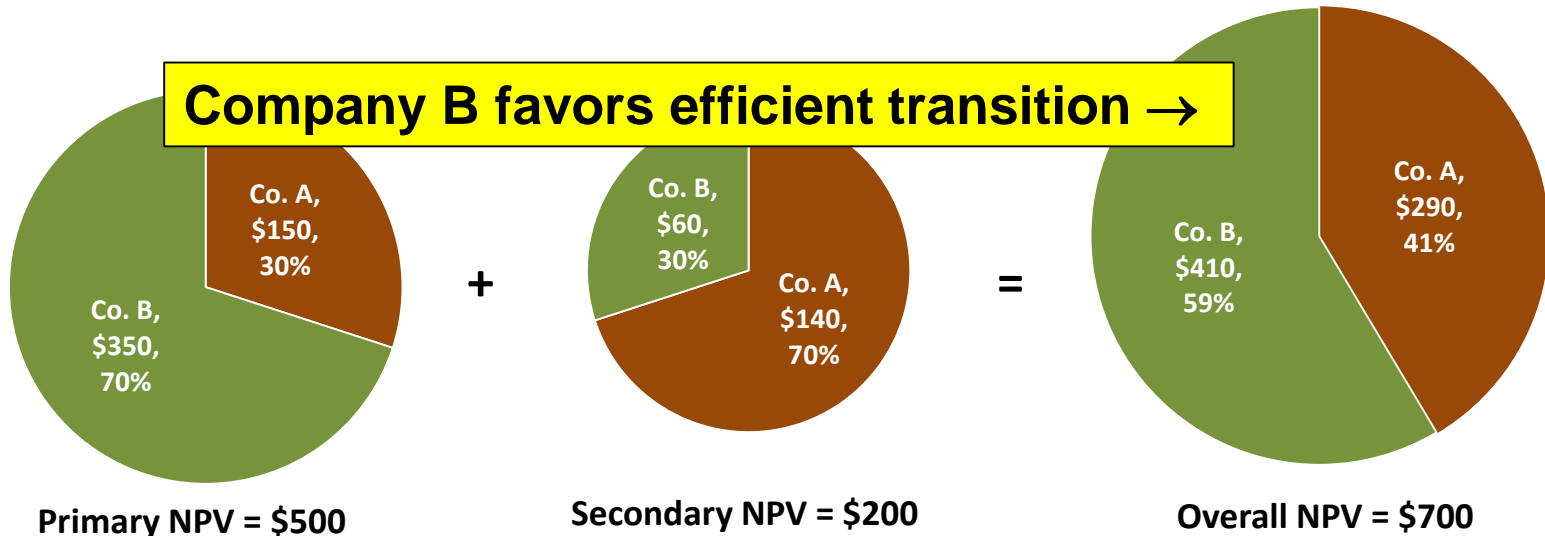


Plan B: Premature Secondary Recovery

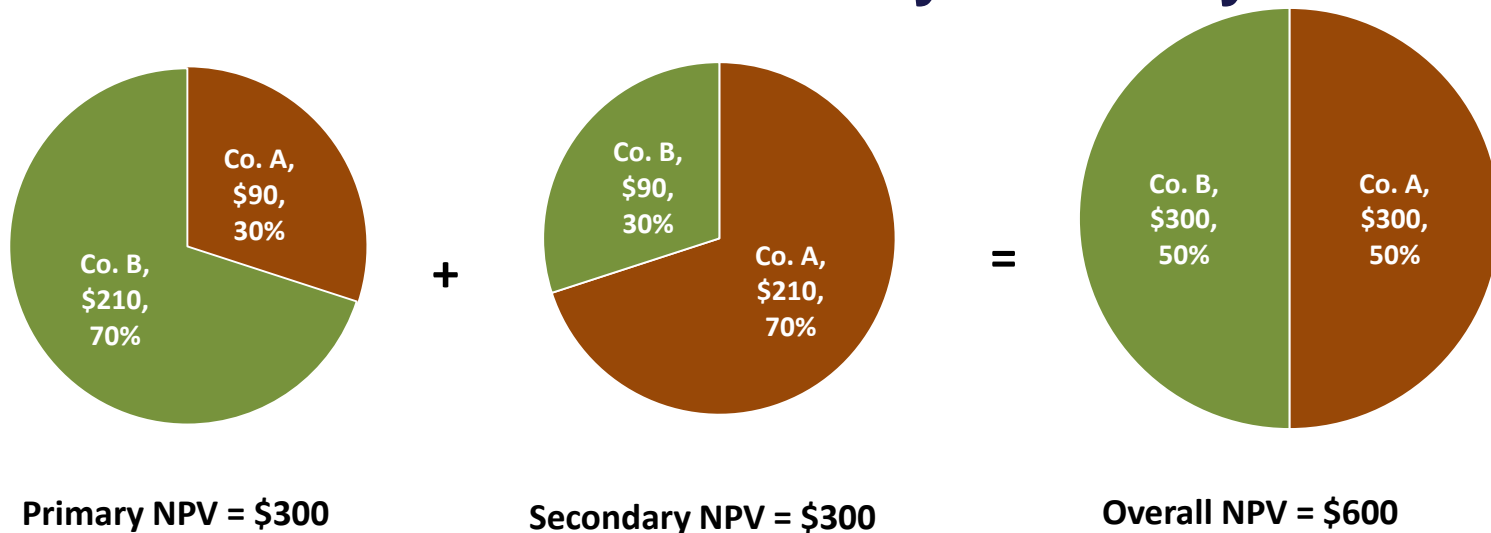


Plan A: Efficient Reservoir Development

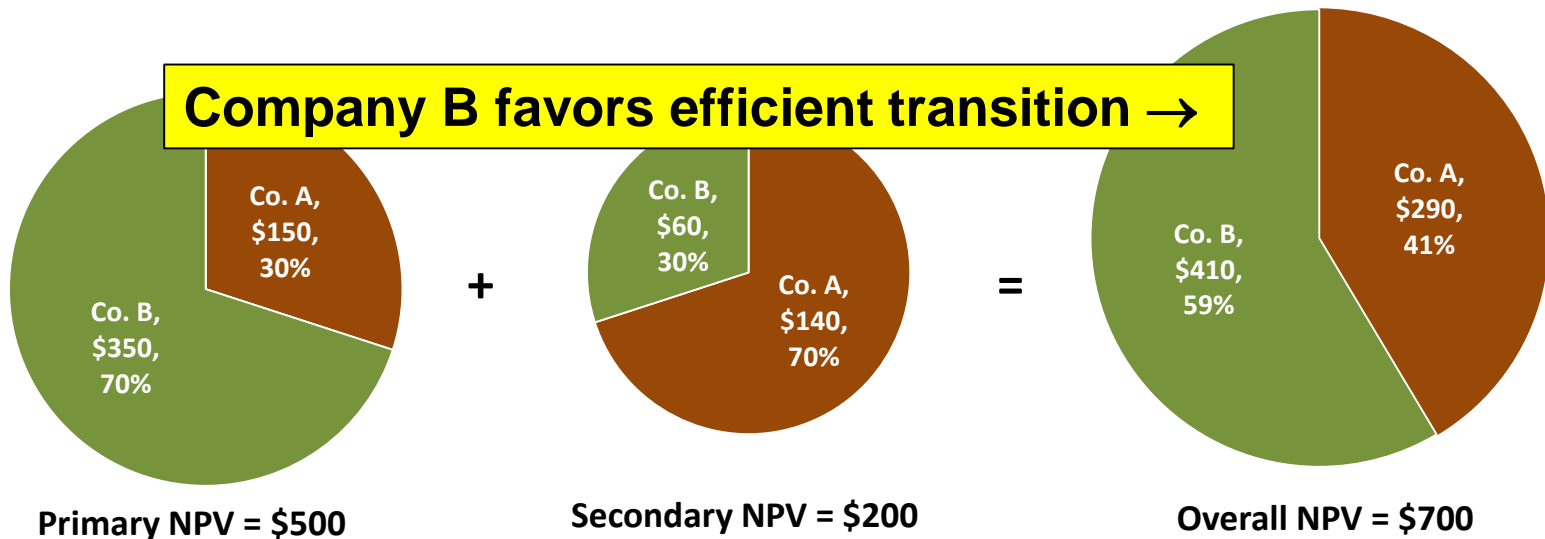
Company B favors efficient transition →



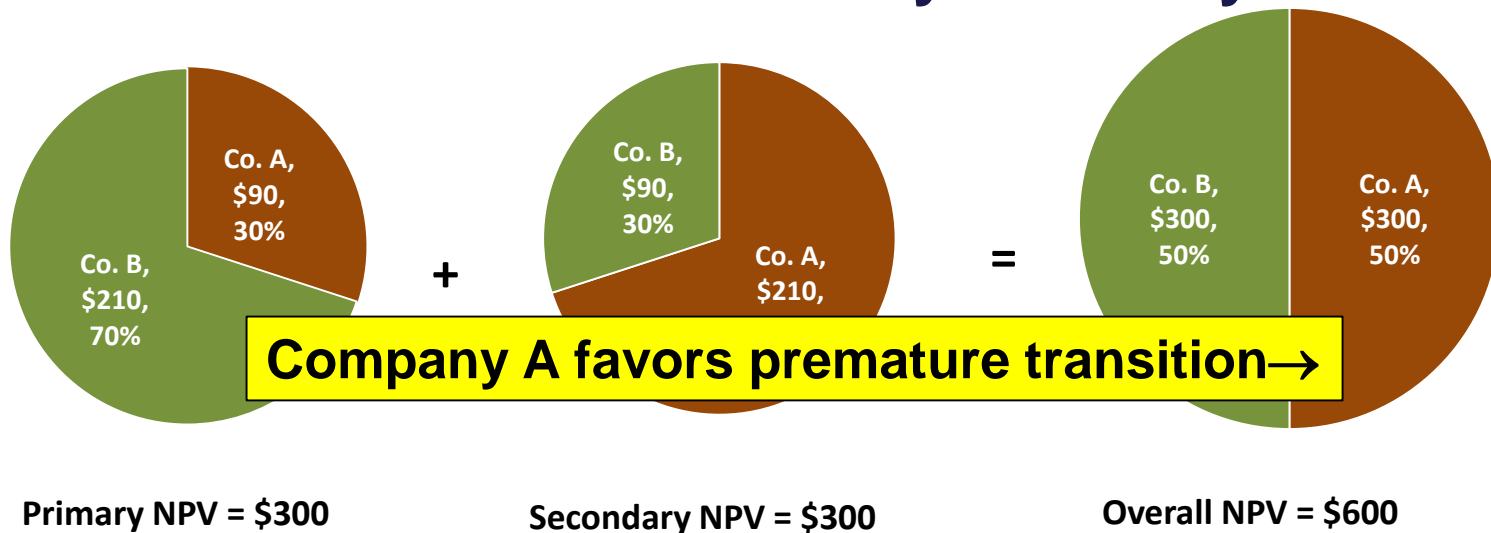
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Plan A: Efficient Reservoir Development



Plan B: Premature Secondary Recovery



Ex. 3: Divergent Fiscal Regimes ??

- **Question: Can royalty and production-sharing leases be combined (voluntarily) into one unit?**

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 - That uncertainty fosters disagreement among owners re: future fiscal burdens under the two regimes. (don't know, but this is conceivable)
- In confronting this question, Brazil is on a new frontier in the development and adaptation of unitization schemes to an imperfect world.

***Thank
You!***

