The Wise Abuse of Dominant Supply Chain Power

Paulo Gonçalves, Jim Hines, Jim Rice

CeB Workshop
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Agenda

- Introduction and relevance
- Understanding abuses of chain power
  - Categories of abuses
  - Characterizing the problem
  - Analyzing a category of abuse – causal loops
- Some Insights
- Potential solution sets
- Path Forward
- Summary Observations
Introduction & Relevance

- Project Overview, Status & Methodology
- Problem Statement & Motivation
- System Dynamics Process
Project Overview

- Center for eBusiness Vision Fund Grant
  - Funded 9-01 through 8-02
  - Currently ‘work in process’
  - Research team
    - Dr. Jim Hines – Sloan System Dynamics Group
    - Jim Rice – Integrated Supply Chain Management Program
    - Paulo Gonçalves – Sloan System Dynamics PhD Candidate

- Using system dynamics methodology to understand long-term behavior of the system
  - Reference modes characterizing the problem
  - Causal loop development*
  - Solution development
  - Modeling & analysis

* (“you are here”)
Supply Chain Tough to Manage

Goodyear acknowledges race tire shortage

By JIM ERICKSON Thatsracing.com

On the eve of NASCAR's two races this weekend at Lowe's Motor Speedway, Goodyear Tire & Rubber Co. officials tossed a curveball into what had been a weekend devoid of controversy.

Friday, NASCAR changed the right-side tires used by Grand National teams this weekend and shipped them over to the Winston Cup garage in hopes of preventing a shortage of tires in Sunday's UAW-GM Quality 500 Winston Cup race.

GM announces temporary layoffs to adjust inventory

Missed Signals
Behind Cisco's Woes Are Some Wounds Of Its Own Making
Company Pushed to Line Up

Palm cuts prices to deal with product glut

Intel Experiences Some Shortages In Pentium II Chips

Semiconductor manufacturers The great chip glut

Shortages of an Intel Microprocessor Create Backlogs, Headaches

USX's Net Income Declines 26% On Inventory-Related Oil Charge

Sources:
Pop Quiz!

- Does a dominant firm (almost) always benefit from exercising its power?
- To combat the negatives of chain power, should we try to make the powerful firm behave more competitively?
- Is the use of chain power basically about squeezing people upstream and downstream?
- Does it matter whether a dominant firm pushes its inventory on its suppliers vs. its customers?
- Does all the inventory risk shift to supplier when the dominant firm pushes inventory to supplier?
## Issues and the Wise-Abuse View

<table>
<thead>
<tr>
<th>Issue</th>
<th>Wise-Abuse View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does dominant firm always benefit from power use?</td>
<td>Maybe not: The slice vs. pie size problem</td>
</tr>
<tr>
<td>Make dominant firm behave “competitively”?</td>
<td>Dominant firm is a leverage point to improve chain perf.</td>
</tr>
<tr>
<td>Is use of chain power about squeezing costs?</td>
<td>Many ways of using power</td>
</tr>
<tr>
<td>Pushing inventory to customers vs. suppliers?</td>
<td>Pushing to customers adds risk, pushing to suppliers may benefit whole chain</td>
</tr>
<tr>
<td>Does all inventory risk shift to suppliers?</td>
<td>Only where dominant firm is located near supplier</td>
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Problem Statement

• A chain with a dominant firm could perform better than a chain without one.
• But, chains with dominant firms currently perform no better than chains without one.
Or said in another way….  

We suspect that most dominant firms don’t use their chain power to their best advantage, although they may abuse their power to provide some advantage. 

They don’t understand the chain dynamics, and so they **can’t** exercise their power wisely.
Wise and Unwise Abuse

- **Unwise Abuse of Dominant Firm Chain Power**
  - Use dominant firm power to exact short-term gains for the dominant firm at the expense of the chain
  - Zero-sum game

- **Wise Abuse of Dominant Firm Chain Power**
  - Use dominant firm power to so that the whole chain benefits & so the dominant firm benefits more than unwise use of power
  - Not zero-sum game, potential for growth
Why eBusiness & Wise Abuse?

- eBusiness capabilities....
  - May make it easier for a firm to dominate a chain
  - May facilitate the wise abuse of chain power
  - May uncover and enable new solutions and ways for using dominant chain power
  - May enable creation of consortia that can act as a dominant firm

- The study will consider eBusiness tools, applications and capabilities in enabling wise use/abuse of chain power
Understanding Abuses of Chain Power

• Multiple uses of dominant chain power
  • Beyond traditional ‘cost’ squeezing

• From abstraction to concrete: Categories of abuse
  • 1: Shift inventory costs along supply chain
  • 2: Constrain or direct supply and demand
  • 3: Set standards and technology
  • 4: Maintain standards and technology
  • 5: Force others to improve our process
  • 6: Take greater share of industry profit
  • 7: Extend power outside core domain
  • 8: Create demand
## Characterizing Abuses: Reference Modes

<table>
<thead>
<tr>
<th>Sales, Profit, Inventory, Innovation</th>
<th>Chain Performance</th>
<th>Compare Firm Performance</th>
<th>Dominant Firm Net</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graph" /> <code>No exercise of power</code></td>
<td><img src="image2" alt="Graph" /> <code>Usual use of power</code></td>
<td><img src="image3" alt="Graph" /> <code>Dominant Firm</code></td>
<td><img src="image4" alt="Graph" /> <code>Exercise of power</code></td>
</tr>
</tbody>
</table>

- **Sales, Profit, Inventory, Innovation**
  - Chain Performance: No exercise of power
  - Compare Firm Performance: Usual use of power
  - Dominant Firm Net: Exercise of power

<table>
<thead>
<tr>
<th>Production, Inventory</th>
<th><img src="image5" alt="Graph" /> Dominant</th>
<th><img src="image6" alt="Graph" /> Non-Dominant</th>
</tr>
</thead>
</table>

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Analyzing One Category of Abuse

- **Shift inventory costs along supply chain**
  - Dominant firm operates as
    - a ‘pull’ customer – requiring supplier to hold invty
    - a ‘push’ supplier – requiring customer to hold invty
  - Dominant firm demands that local inventory be owned by others in the supply chain
  - Dominant firm
    - Demands immediate payment from customers
    - Delays payments to suppliers
Causal Diagram 1: Shift Inventory

Supplier

Customer (Dominant)

Right positioning of costs,
profitability

Pressure to shift inventory to supplier

DP costs, leasing, storage space, material, handlers, salaries of managers, shrinkage

Replacing inventory lost

Inventory adjustments, stockouts, stock levels, stockouts to our customers

Systemability to risk pool, transportation with manufacturing, required coordinating, coercion and monitoring

Probability of failure to receive enough to produce, reducing revenue, profitability

System shipping costs

Sc shipping costs

Sc stability

To our customers
Dominant Customer Shifting Inventory

Profitability
PressureToShiftInventoryToSupplier
ReplacingInvLost
IndicatedDPRM
Obsolescence
DP=Dominant Player
RM=Raw Material

DP costs

Dominant Firm
Non-dominant Firm
Inventory obsolescence ...

- Pressure To Shift Inventory To Supplier
- indicated DPRM
- obsolescence replacing InvLost
- DP costs
- profitability

Dominant Firm
Non-dominant Firm
Inventory Shrinkage...

- PressureToShiftInventoryToSupplier
- indicatedDPRM
- DP RM
- Shrinksage
- replacingInvLost
- obsolescence
- DP costs
- profitability
- DominantFirm
- Non-dominantFirm
Inventory Space...

- PressureToShiftInventoryToSupplier
- indicatedDPRM
- DP RM
-DP costs
- replacingInvLost
- obsolescence
- Shrinkage
- LeasingStorageSpace
Inventory Handling Equipment …

Pressure To Shift Inventory To Supplier

indicating DPRM

DP costs

replacing InvLost

obsolescence

Leasing Storage Space

forkLifts etc

Shrinkage

DP RM

Profitability

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Inventory Handlers...

- PressureTo
- ShiftInventoryToSupplier
- indicated
- DPRM
- profitability
- DP costs
- replacing
- InvLost
- obsolescence
- Shrinkage
- Leasing
- StorageSpace
- salaries
- DPRM
- Material Handlers
- forkLifts etc
- Dominant Firm
- Non-dominant Firm

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22
Inventory Planning and Purchasing

Pressure To Shift Inventory To Supplier

DP costs

replacing InvLost

Leasing Storage Space

Material Handlers

Managers

Inventory Planning

purchasing Mgt

Materials

forkLifts etc

salaries

obsolescence

Shrinkage

Dominant Firm

Non-dominant Firm

profitability

indicating DPRM

DP RM

invLost
Advantages for Dominant Firm
Disadvantages for Non-Dominant Firm

- Supplier’s Inventory
- Supplier’s InvRelated Costs
- PressureTo ShiftInventory ToSupplier
- indicated DPRM
- invLost
- obsolescence
- Material Handlers
- Managers
- Purchasing Mgt
- Leasing Storage Space
- forkLifts etc
- salaries

Dominant Firm

Non-dominant Firm
Savings: Ability to Postpone

- System Obsolescence
- InvRelated Costs
- Postponing Customization
- AbilityTo Postpone
- Supplier's Inventory
- SupCosts.
- PressureTo ShiftInventory ToSupplier
- Indicated DPRM
- Profitability
- DP costs
- Replacing InvLost
- Leasing StorageSpace
- Material Handlers
- Salaries
- Managers
- Purchasing Mgt
- Inventory Planning
- Shrinkage
- Forklifts etc
- Obsolescence
- InvLost
- Wise
- Usual
- No dominant firm

Dominant Firm
Non-dominant Firm
Savings: Risk Pooling

- risk Pooling against variation in demand mix and in mfg quality/TP
- system Shipping Costs
- system Obsolescence.
- postponing customization
- ability To Postpone
- ability To Risk Pool
- Supplier's Inventory
- SupCosts.
- invRelated Costs
- Pressure To Shift Inventory To Supplier
- indicated DPRM
- obsolescence
- replacing Inv Lost
- Shrinkage
- Storage Space
- Material Handlers
- fork Lifts etc
- salaries
- managers
- purchasing Mgt
- inventory Planning
- Dominant Firm
- Non-dominant Firm

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What if Dominant Firm is Customer?

- Right Place
- Risk Pooling against variation in demand mix and in mfg quality/TP
- SupCosts.
- System Shipping Costs
- InvRelated Costs
- Postponing customization
- Ability to Postpone
- Ability to Risk Pool
- Supplier's Inventory
- Pressure to Shift Inventory to Supplier
- Indicated DPRM
- Profitability
- DP costs
- Replacing InvLost
- Obsolescence
- Storage Space
- Salaries
- Managers
- Material Handlers
- Inventory Planning
- Purchasing Mgt
- Material
- Shrinkage
- Forklifts etc.
Loss: Risk Pooling

- Risk pooling against variation in demand mix and in mfg quality/TP
- systemShipping Costs
- rightPlace
- postponing customization
- system Obsolescence.
- abilityTo Postpone
- InvLost
- risk pooling transportation with mfg
- abilityToRisk Pool
- abilityTo Risk Pool
- SupCosts.
- Supplier's Inventory
- indicated DPRM
- DP RM
- DP costs
- replacing InvLost
- obsolescence
- Leasing StorageSpace
- Shrinkage
- forkLifts etc
- Material Handlers
- inventory Planning
- purchasing Mgt
- managers
- salaries
- bagi
- systemShipping
- purchasing Mgt
- material Handlers
- inventory Planning
- purchasing Mgt
Loss: Coordination Costs

- Losses related to coordination costs:
  - Supplier's Inventory
  - DP RM
  - Pressure to Shift Inventory to Supplier
  - Replacing InvLost
  - Leasing StorageSpace
  - ForkLifts etc.
  - Salary and Managers
  - Revenue
  - Risk Pooling against variation in demand mix and in mfg quality/TP
  - Postponing customization
  - Ability To Postpone
  - Ability To Risk Pool
  - System Shipping Costs
  - InvRelated Costs
  - Supplier's Costs
  - Pressure To Shift Inventory to Supplier
  - InvLost
  - Material Handlers
  - Inventory Planning
  - Mgt
  - Purchasing
  - Producing
  - Shrinkage
  - System Shipping Costs
  - Profitability
  - DP costs
  - Dominant Firm
  - Non-dominant Firm

Wise vs. Usual: No dominant firm
Gain: Stability

- System shipping costs
- Supplier's inventory
- Supplier's risk pooling against variation in demand mix and in mfg quality/TP
- Ability to postpone customization
- Ability to risk pool
- Downstream inventory adjustments
- Tendency toward pull system
- SC stability
- Pressure to shift inventory to supplier
- Indicated DPRM
- Risk pooling with mfg
- Required coordinating, coercion and monitoring supplier
- Probability of failure to c,c or m enough
- Revenue
- Material handlers
- Purchasing Mgt
- Leasing storage space
- Forklifts etc
- Managers
- Salaries
- Shrinkage
- Profitability
- DP costs
- Replacing InvLost
- Obsolescence
- System shipping costs
- Dominant Firm
- Non-dominant Firm
- Wise
- Usual
- No dominant firm
Gain: Fewer Stockouts

- Fewer Stockouts
- Supplier's Inventory
- DP RM
- PressureToShift InventoryTo Supplier
- indicated DPRM
- obsolescence
- replacing InvLost
- Leasing StorageSpace
- salaries
- forkLifts etc
- managers
- revenue
- purchasing Mgt
- inventory Planning
- Material Handlers
- risk pooling transportation with mfg
- required coordinating, coercion and monitoring supplier
- abilityToRisk Pool
- abilityTo Postpone
- Supplier's Inventory
- system Obsolescence.
- postponing customization
- rightPlace
- systemShipping Costs
- InvLost
- stockouts ToOur Customers
- probability of failure to c,c or m enough
- producing
- revenue
- wise
- Usual
- sc stability
- sc stability
- stockouts ToOur Customers
- probability of failure to c,c or m enough
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- riskPooling against variation in demand mix and in mfg quality/TP
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- systemShipping Costs
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- stockouts ToOur Customers
- probability of failure to c,c or m enough
- producing
- revenue
- wise
- Usual
- no dominant firm
Savings vs. Costs

- Savings
- Obsolescence
- InvLost
- System Shipping Costs
- Pressure To Shift Inventory To Supplier
- InvRelated Costs
- Shrinkage
- Risk Pooling against variation in demand mix and in mfg quality/TP
- Right Place
- System Obsolescence
- Postponing Customization
- Ability To Postpone
- Supplier's Inventory
- System Savings
- Trend Toward Pull System
- Sc Stability
- Risk Pooling Transportation with Mfg
- Required Coordinating, Coersion and Monitoring Supplier
- Dprm
- Leasing Storage Space
- Material Handlers
- Managers
- Inventory Planning
- Purchasing Mgt
- Revenue
- Production
- Customer Stockouts
- Failure to C, C or M Enough
- Probability
- Mfg
- Production
- Stockouts To Our Customers
Some General Insights

• Most people’s “solutions” involve reducing power of the dominant firm (DF)
• The wise-abuse solution is to figure how to best use the opportunity implicit when exercising power
Some “Shifting Inventory” Insights

- Normal Abuse vs. Wise Abuse: Don’t just shift costs, shift physical inventory.
- But, only if dominant firm is the customer
- Shifting inventory to supplier reduces obsolescence
- Shifting inventory to supplier reduces risk
  - Only to extent transportation risk is low relative to mfg risk
  - Only to extent transportation risk is more correlated with demand risk than is mfg risk
- Use e-tools to minimize cost of monitoring supplier, increase negative correlation between mfg and demand risk
Some Potential Solution Sets

- **The wise abuse of chain power**
  - Leveraged relationships via informed contracts (long-term, contingency, risk-sharing, risk-segmented)
  - Organizational evolution – Experiential learning for more effective policies
  - Answers that we don’t know yet…….

- **‘Standard’ solutions**
  - E-markets & Integrated Info Systems (ERP, etc.)
  - Mass customization, Outsourcing

- **Solutions that protect dominant chain power**
  - Litigation, extending patents, limiting licenses
  - Increase BTE through capital investments

- **Solutions that help a firm to become dominant**
  - Technology and/or Process lock-in, develop patents
  - Increase brand-value, bundling & tie-in sales
Path Forward

• **Possible directions**
  - **Broad view**: Map out entire supply network
    - Illustrating various categories of abuse
    - Uncover unique observations from the analysis
    - Develop case studies to inform the research
    - Engage with CeB sponsors to guide project work
  - **Narrow view**: Focus on “Shifting Inventory Costs” category and continue through modeling and analysis of that category

• **Input from CeB sponsors welcome**
  - Case examples
  - Insight on causal loops
Summary Observations

- Ineffective use of chain power results in performance that is less than what is possible
- Multiple categories of chain power abuse exist
- Single-category focus and limited causal loop development resulted in useful observations
- Initial assessment proved to be opposite of our current analysis
  - Originally thought that abuse of chain power resulted in performance that was sub optimal
  - Now believe that wise abuse of chain power can improve overall chain performance and dominant firm performance as well
The test of a person’s character is not how he or she deals with misery
But how he or she deals with power.

-- Abraham Lincoln*

*Modified to fit this screen and this audience
Thank You

- Questions and discussion
  - Relevance
  - Examples
- Offline input welcome
  - Please contact us
    - Paulo Gonçalves: paulog@mit.edu or 617.258.5585
    - Jim Hines: jhines@mit.edu or 617.253.0413
    - Jim Rice: jrice@mit.edu or 617.258.8584
Categories of Abuse
Shift inventory costs along supply chain

- Operate as:
  - Pull customer
  - Push supplier
- Demand that local inventory be owned by others in the supply chain
- Demand immediate payment from customers
- Delay payments to suppliers
Constrain or direct supply and demand

- Require supplier only sells to you (supplier exclusivity)
- Require customer can only buy from you
- Require suppliers to sell inferior products to other customers
- Limit supply to suit dominant firm’s choice
  - For producer: forcing demand to match supply
  - For retailer: forcing supply to match demand
Set standards and technology

- Impose your systems on suppliers and customers
  - Info systems, info mgt practices, order entry/order fulfillment, production schedules…
- Help formation of standards
- Support industry-level R&D so emerging technologies work well with firm’s own technology
  - Electronic product code (ePC) to replace UPC bar code
- Foster/drive educational skill development
  - Hamburger Univ.
Maintain standards and technology

- Exercise control to retard or push technological advance to firm advantage
- Exercise control over competitive landscape and dynamics
  - Barriers to entry, vertical integration for control
Force others to improve your process

- Help (AKA ‘force’) suppliers to improve
  - Mandate cost cut, quality and design improvements, cycle time reductions, yield improvements
- Insist that other parties provide information
- Demand greater customization by suppliers
- Give standard products to customers
Take greater share of industry profit

- Eliminate layers of the supply chain
  - E.g. cut out the middleman
- Set (thin) margins for other parties in the supply chain
- Demand share of supplier’s cost savings/cost reductions
Extend power outside core domain

- Convert one chain power to another
- Assure a market for ancillary product or service
  - Investment Banks as market makers
Create demand

- Require customers to “brand” or label customer products with your brand
- Ability to extend/leverage a brand
  - to create pull for own core products
  - to create pull for unrelated products
Detail – Potential Solution Sets
Standard Solutions

- E-markets
- Integrated Information Systems
  - ERP, VMI, CRM, POS
- Mass customizations
- Outsourcing
- Yada, yada, yada ….
Protect Dominant Chain Power

- Litigation
- Extending patents
- Limiting licenses
- Increase BTE through capital investments
- Multiple suppliers / customers
- Control industry standards
Eliminate / Mitigate chain Power

- Anti-trust enforcement
- Reduce length of patents / force licensing
- Buyer / supplier consortia
- Internet (increase market access, reduce barriers to entry)
- Reduce import barriers
- Multiple suppliers / customers
- Open-source industry standards
Creating a dominant firm
(or becoming more dominant)

- Technology lock-in
- Process lock-in
- Increase brand-value
- Develop patents
- Bundling / Tie-in sales
The Wise Use of Chain Power

- Leveraged relationships
- Informed contracts
  - Long-term contracts
  - Contingency contracts
  - Risk-sharing with supply chain parties
  - Existence of ‘hostages’
- Organizational evolution
  - Experiential learning that create more effective policies
- Answers that we don’t know yet……
Some Potential Solution Sets – Alternative to previous slide

- Overview of potential solution sets
  - Referred to as Momentum Policies or Solutions
  - General sets of solutions including current
- Broad range of potential solutions need to be developed and examined
  - ‘Standard’ solutions
  - Solutions that eliminate or mitigate chain power
  - Solutions that help a firm to become dominant
  - The wise abuse of chain power
Some Potential Solution Sets

- ‘Standard’ solutions
  - E-markets & Integrated Info Systems (ERP, etc.)
  - Mass customization, Outsourcing
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  - Litigation, extending patents, limiting licenses
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- Solutions that help a firm to become dominant
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