Who Profits from Innovation in Global Value Chains?
A Study of the iPod and notebook PCs

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Agenda

- Research questions
- Theoretical framing
- Methodology
- Results from iPod and notebook PCs
- Analysis
- Conclusions and implications

Innovation in global value chains

- Innovation is believed to be a key driver of economic growth and firm competitiveness.
- But what happens when innovation and production are disaggregated across firms and countries?
- Value created by innovation may be lost to other firms or countries

Research questions

- How do we measure the value of innovation?
- Who captures the benefits from innovation in a global value chain?
- What factors determine the distribution of value capture?

Critical issue for advanced tech industries

- Companies need to know
  - how much to invest and where to focus their own efforts
  - when and how to leverage global networks
  - where to retain control to capture value.
- Countries need to know
  - how to capture more value from participating in global networks
  - how to prepare their people to compete and benefit from innovation
  - how to create an environment for innovation

Theoretical framework

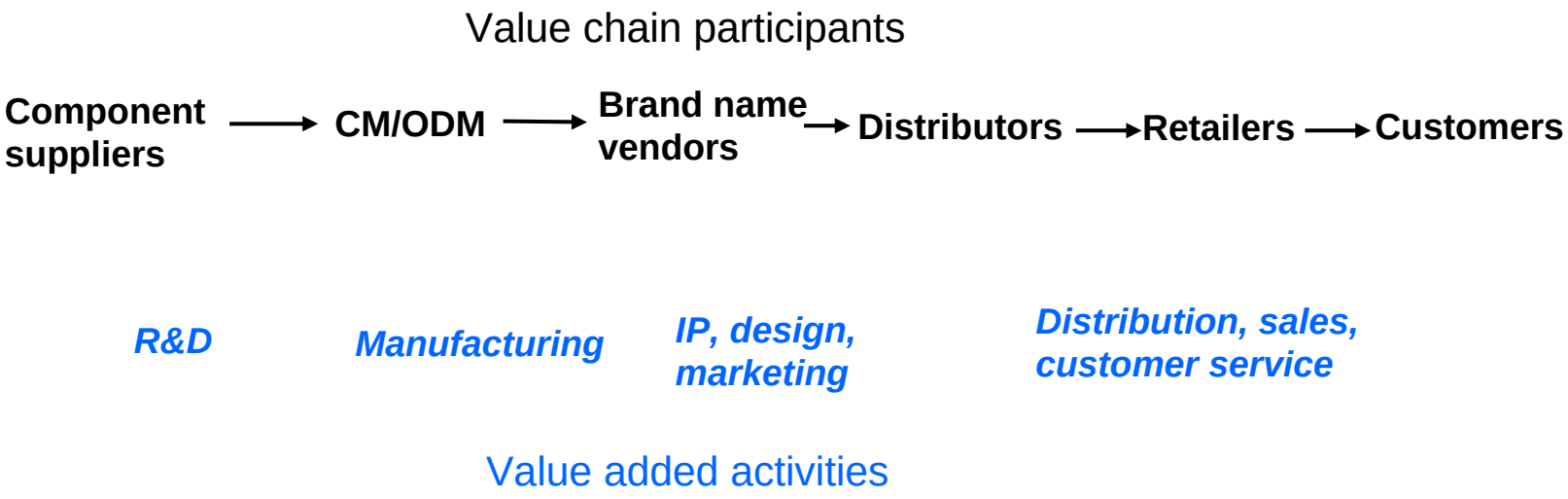
Profiting from innovation (Teece, 1986, 2006).

- Stages of technical evolution
- Appropriability regime
- Complementary assets
- Standards

The value of innovation

- Value created by innovation is shared across the value chain
  - Lead firms (brand names)
  - Suppliers
  - Retailers and distributors
  - Intellectual property owners
  - Complementary asset providers

Electronics industry value chain



Methodology: Measuring value capture

- Developed framework for estimating financial value
- Steps for calculating value capture:
  - Break down cost of inputs
  - For each input, estimate gross margin, in percent.
  - Multiply cost by margin to get value captured by firm
- Used teardown data from Portelligent, Inc., with cost and supplier names for components.

Case studies: iPods and notebooks

- Study two products built on a shared global value network—iPods and notebook PCs
  - Similar core technologies
  - Same electronics industry global supply base
  - Different product architectures, value chain structures
- Do they tell similar or different stories about profiting from innovation?

Key inputs of iPod and notebook PC

Purchased inputs as percentage of factory cost

	Video iPod	HP nc6230 notebook
Software	Developed inhouse	11%
Storage	50%	12%
Display	16%	16%
Processors	9%	27%
Assembly	5%	5%
Battery	2%	5%
Memory	2%	4%
PCBs	2%	2%
Enclosure	2%	1%
Input Device(s)	1%	2%
	89%	85%
Total Parts	451	2,196

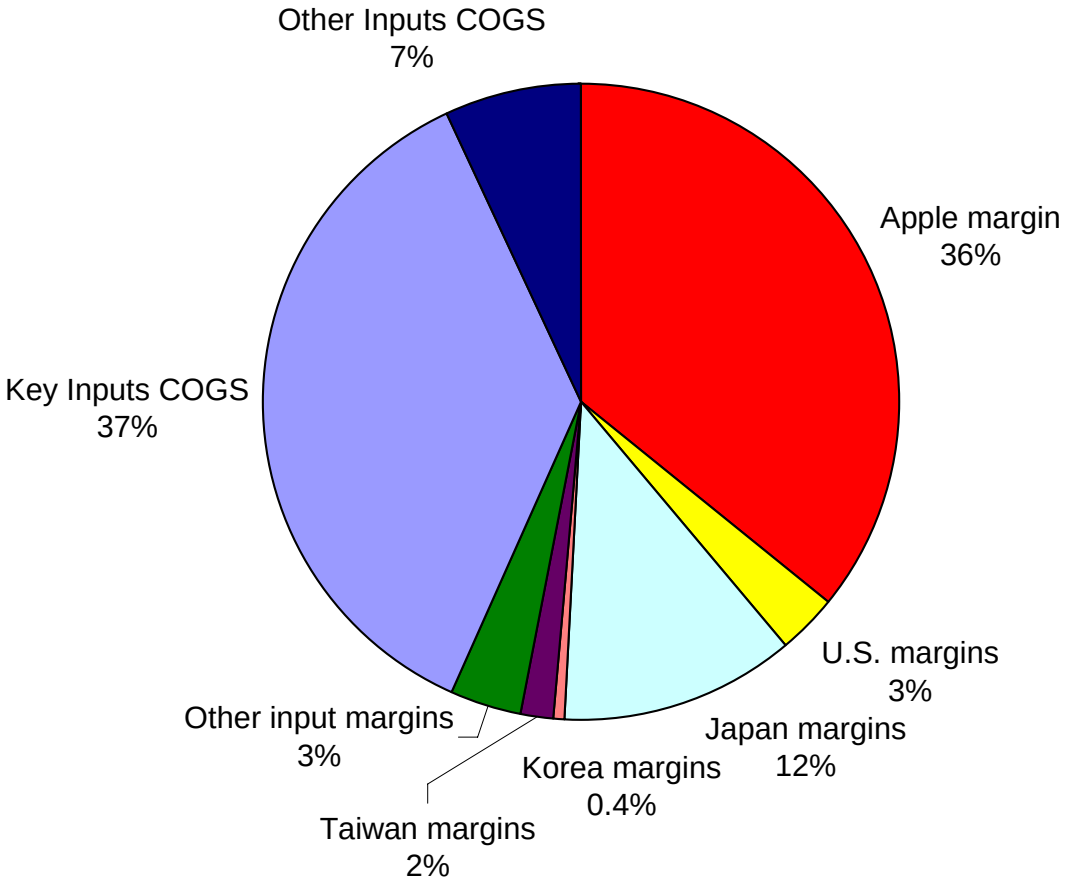
Value capture in the 30GB Video iPod, 2005

Type	Input	Supplier	Supplier HQ Country	Estimated Input Price	Gross Profit Rate	Value Capture
Storage	Hard Drive	Toshiba	Japan	$73.39	26.5%	$19.45
Display	Display Assembly	Toshiba-Matsushita	Japan	$23.27	28.7%	$6.68
Processors	Video/Multimedia Processor	Broadcom	US	$8.36	52.5%	$4.39
Processors	Controller chip	PortalPlayer	US	$4.94	44.8%	$2.21
Battery	Battery Pack	Unknown	Japan*	$2.89	30%*	$0.87
Memory	Mobile SDRAM Memory - 32 MB	Samsung	Korea	$2.37	28.2%	$0.67
Memory	Mobile RAM - 8 MBytes	Elpida	Japan	$1.85	24.0%	$0.46
Memory	NOR Flash Memory - 1 MB	Spansion	US	$0.84	10.0%	$0.08
		8 key parts sub-total		$117.91		
		433 other parts		$22.79		
		Estimated assembly and test		$3.86		$3.86
		Estimated factory cost		**$144.56**		**$38.66**

Source: Portelligent, Inc., 2006 and authors' calculations.

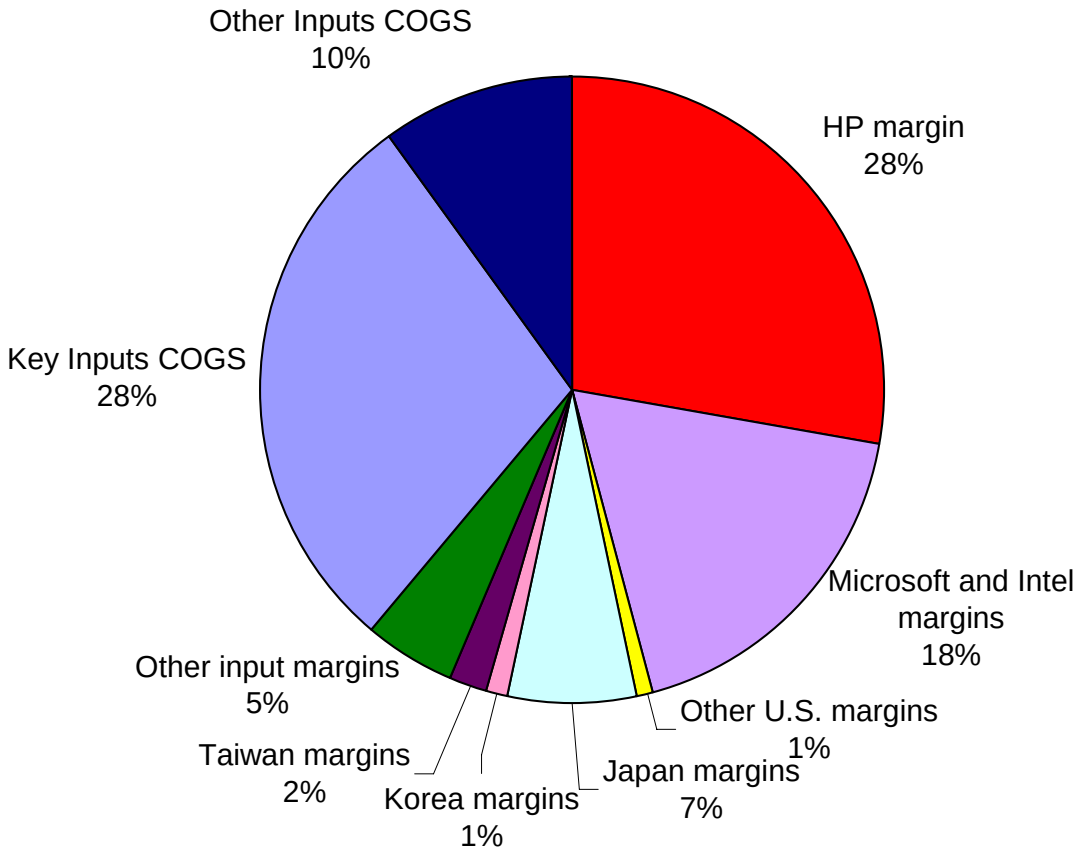
Value capture in 30G Video iPod

Wholesale price = $224



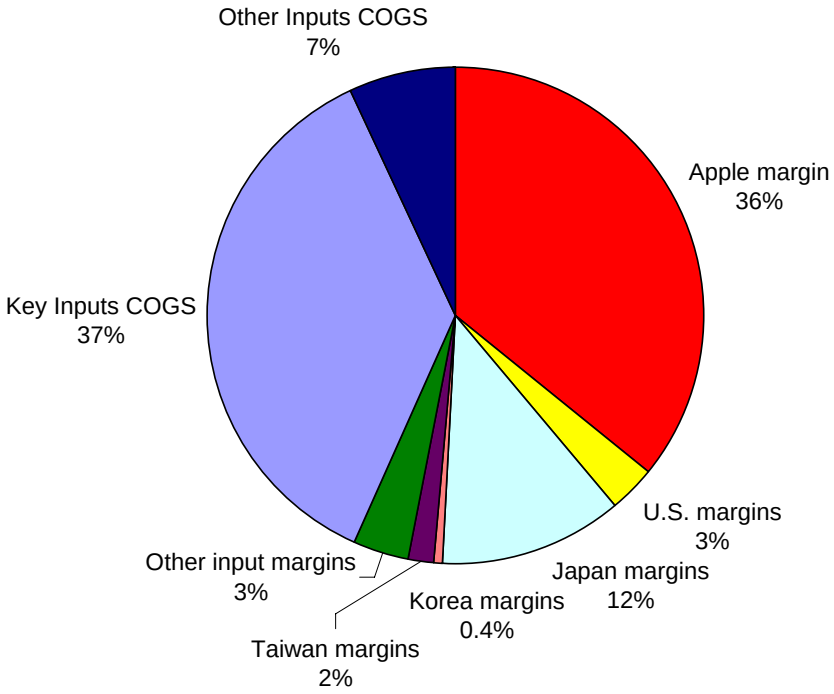
Value capture in HP nc6230 notebook

Wholesale price: $1189



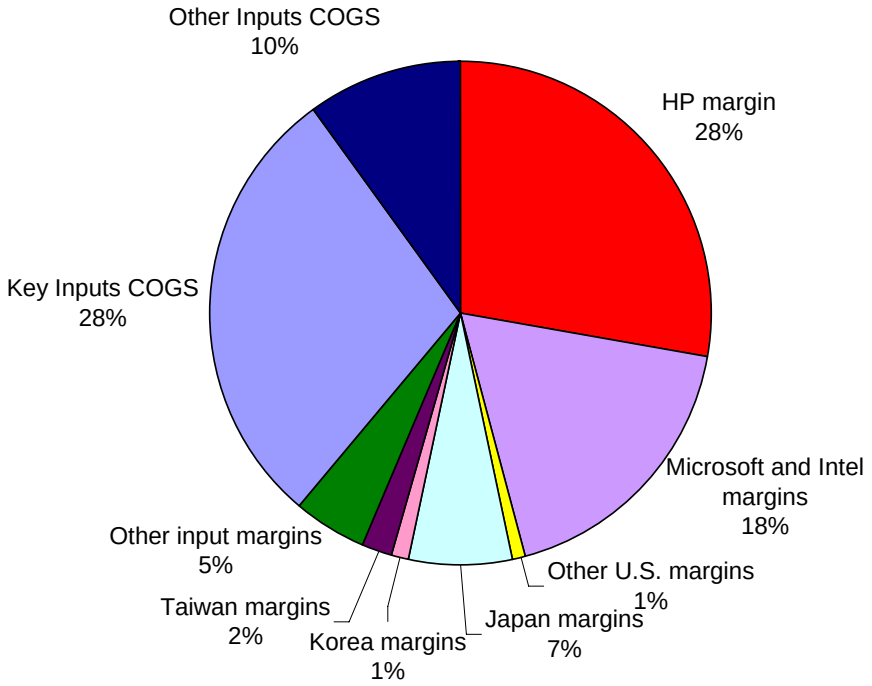
iPod versus Notebook

Wholesale price: $224



iPod Video 30G

Wholesale price: $1189



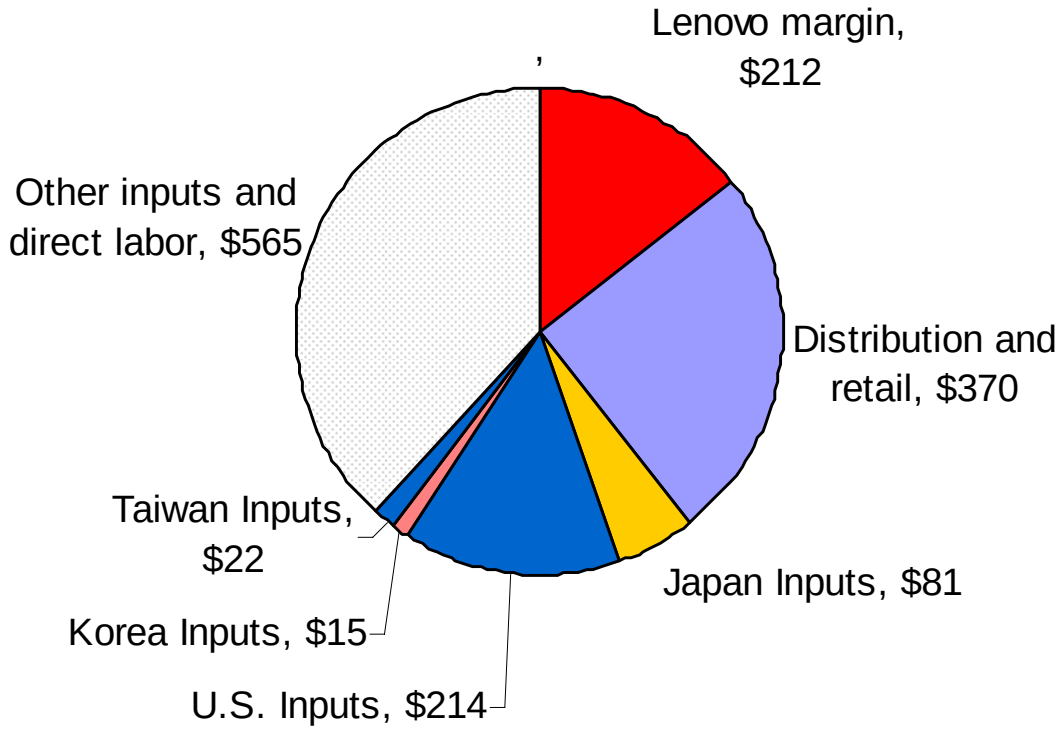
HP nc6230 notebook

Where's China

- Value added
  - iPods and notebooks assembled in China
  - Value added from final assembly a few dollars of direct labor
  - Additional assembly of components and subassemblies in China
  - Total less than 5% of final value
- Value capture
  - No Chinese firms in major suppliers
  - Assembly done by Taiwanese and multinational companies in China, who capture value in gross profit
- But, for Lenovo laptop, China's share is much bigger

Value capture for Lenovo notebook

Value capture for $1479 Lenovo notebook



Distribution of value capture

- Lead firms (Apple and HP) capture the greatest share of value
- Followed by suppliers of major components
- Microsoft and Intel carve out a large piece of the pie in PCs

Profitability in the iPod value chain

Profit margins of primary firms in the Video iPod value chain, 2005

Function	Supplier	Gross Margin	Operating Margin
Controller chip	PortalPlayer	44.8%	20.4%
Lead Firm	Apple	29.0%	11.8%
Video chip	Broadcom	52.5%	10.9%
Memory	Samsung	31.5%	9.4%
Battery	TDK	26.3%	7.6%
Retailer	Best Buy	25%	5.3%
Display	TMD	28.2%	3.9%
Hard Drive	Toshiba	26.5%	3.8%
Assembly	Inventec Appliances	8.5%	3.1%
Distribution	Ingram Micro	5.50%	1.3%

Profitability in the notebook value chain

HP nc6230 supply chain, 2005

Function	Supplier	Gross Margin	Operating Margin
Operating System	Microsoft	84.8%	36.6%
Processor, chipset	Intel	59.4%	31.1%
Controllers	Texas Instruments	48.8%	20.8%
Ethernet Controller	Broadcom	52.5%	10.9%
Main memory	Samsung	31.5%	9.4%
Retailer	Best Buy	25.0%	5.3%
DVD-ROM/CD-RW	Matsushita	30.8%	4.1%
Lead Firm	H-P	23.4%	4.0%
Display	TMD	28.2%	3.9%
Hard Drive	Fujitsu	26.5%	3.8%
Graphics Processor	ATI Technologies	27.6%	1.1%

Summary of firm profitability

- Apple and HP earn normal gross margins on iPod and notebook.
- Apple margins are higher than HP relative to suppliers. Also earns much higher operating margins
- Suppliers of a few components earn supernormal profits
- How to explain the results?

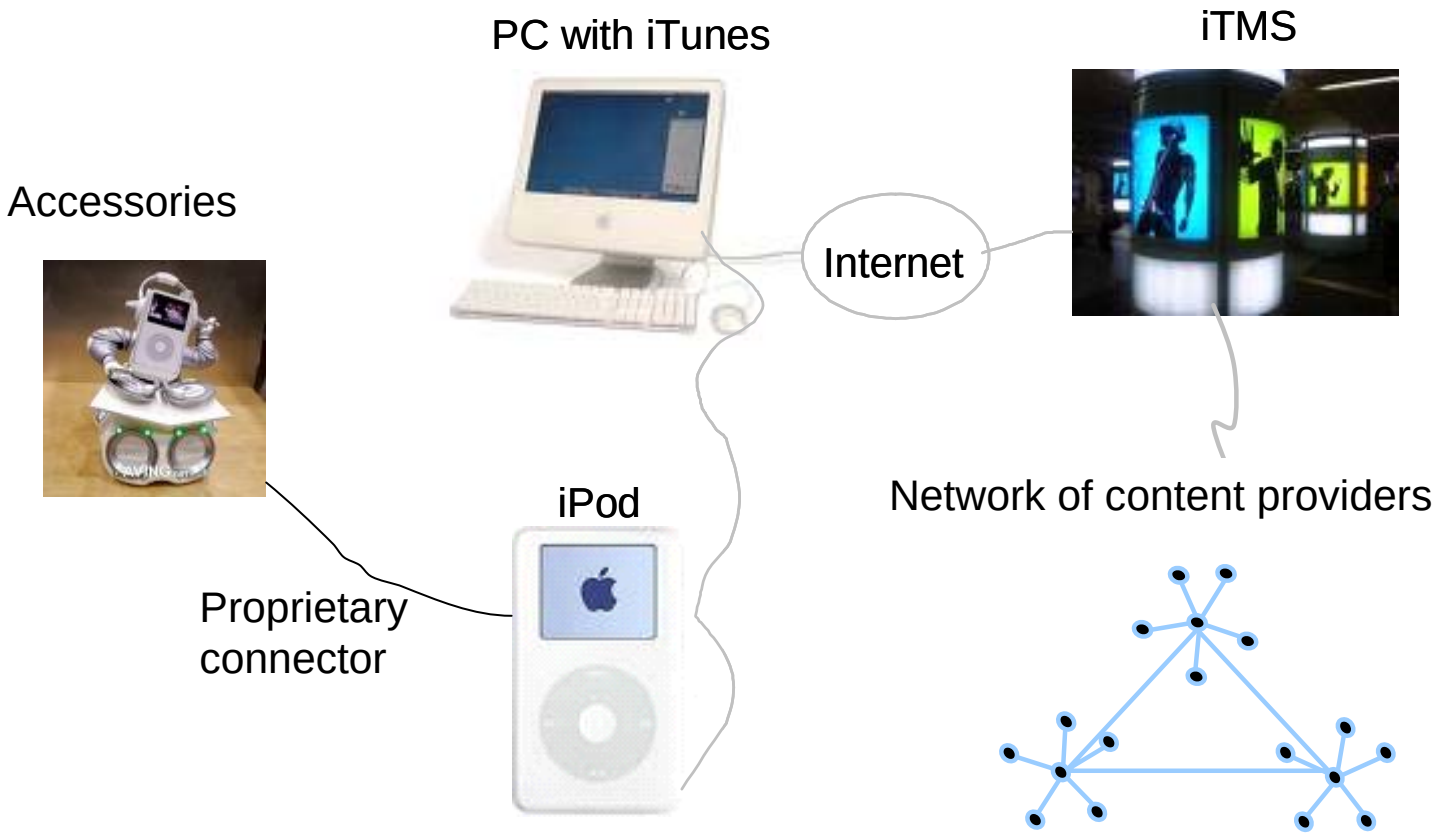
Explaining the results

- Innovation factors: compare iPod and notebook results
- Bargaining power: explain distribution of profits along the value chain

Innovation factors in the iPod

- Stage of evolution: Emerging market; Apple created dominant design
- Appropriability regime: Brand, proprietary technologies
- Complementary assets:
  - MP3s on users CDs and online.
  - Add-on products
- Standards: Apple controls key interface standards

The iPod ecosystem



Innovation factors in PCs

- Stage of evolution: Mature product with established dominant design
- Appropriability regimes: Limited differentiation in Wintel products
- Complementary assets: highly competitive markets for most peripherals, software, services
- Standards: Microsoft and Intel standards control leads to supranormal profits

Bargaining power and value capture

- Apple consciously limits power of suppliers
  - Controls key standards: no MS or Intel
  - Suppliers compete for each new design win.
- HP captures profits in “commodity” PC business
  - Size and scope gives HP bargaining power
  - Compete on design, brand, operating efficiencies
- Supplier position can be tenuous
  - PortalPlayer was a big winner in early iPod, but then replaced.
  - Toshiba dominated in 1.5 inch hard drives, but HDDs replaced with flash memory in most iPods and in iPhone.

Implications for theory

- Profiting from innovation framework supported
  - Opportunities come early in technology evolution, before dominant design is established.
  - Sustained success depends on appropriability regime.
  - Complementary assets key to success of an innovation.
  - Importance of standards control confirmed, but standards battles are unpredictable.
- Bargaining power is key to distribution of profits in the value chain of an innovative product.

Implications for firms

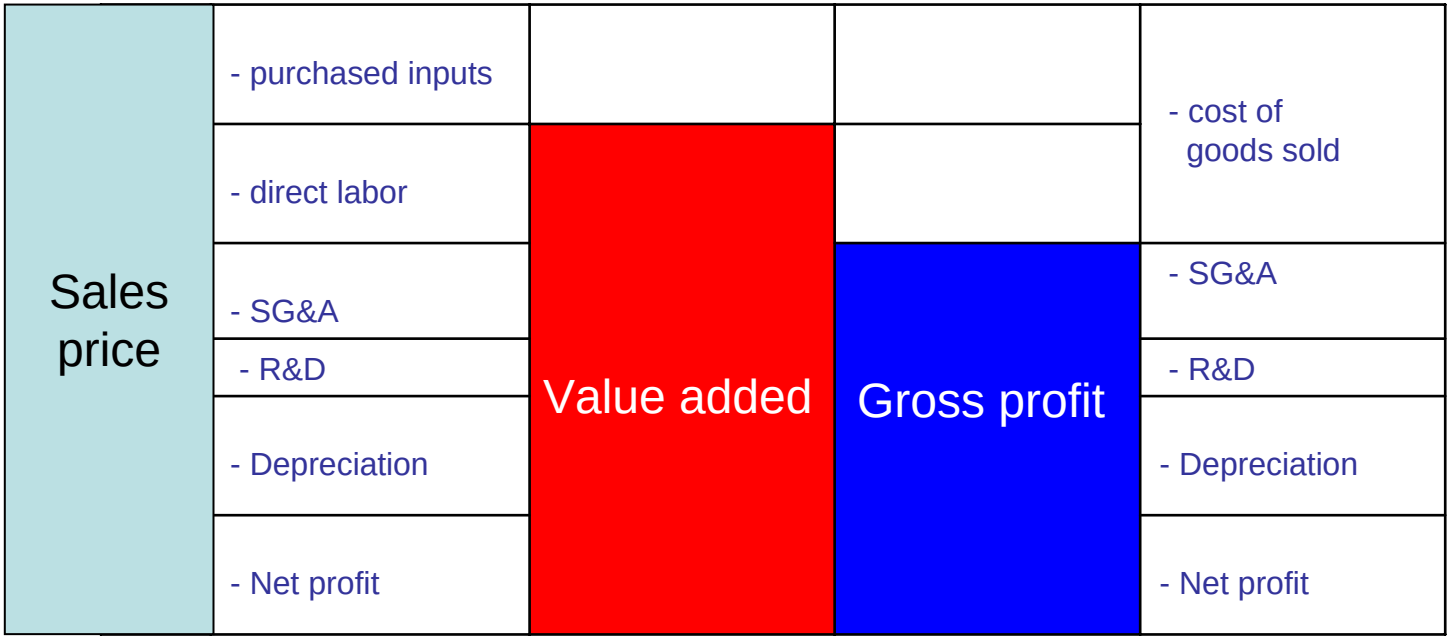
- Firms need to ensure they can capture value from innovation.
  - Different innovation strategies at different stages
  - Consciously define appropriability regime
  - Need to establish or leverage complementary assets without allowing providers to walk away with profits.
  - Standards strategy is biggest gamble.

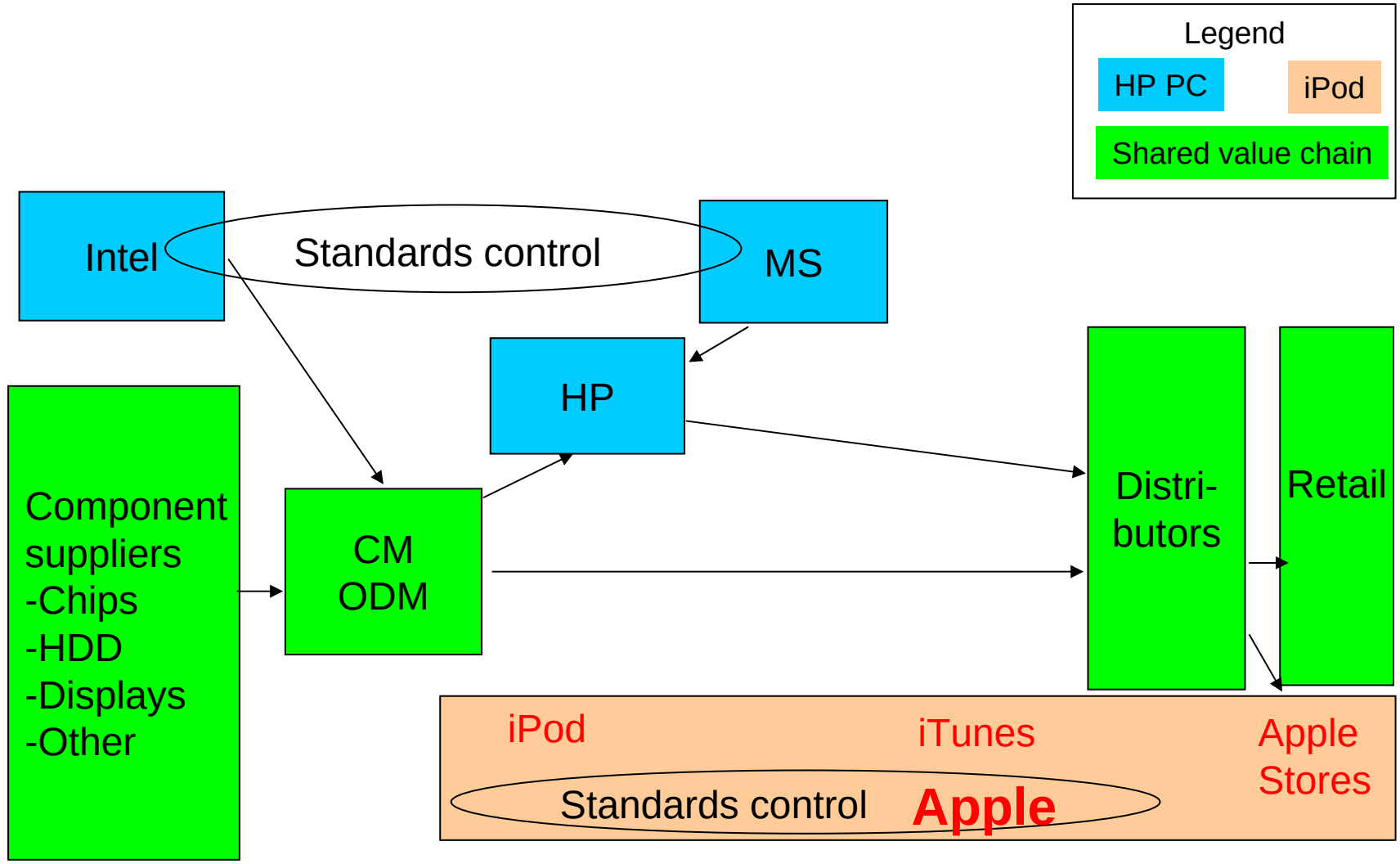
Policy considerations

- Bilateral trade statistics can be misleading
  - Bilateral U.S./China trade deficit increases by the factory cost of imported iPod or notebook
    - U.S. trade deficit is increased by $150 for each $299 iPod, but China gets only a few dollars
  - On balance, trade with China in electronics appears to be a net positive for U.S. in terms of financial value.
- Countries need to position themselves and help their companies to compete in global value chains

Accounting methodology

- Value added = sale price - purchased inputs = direct labor + gross profit
- Value capture = gross profit = value added - direct labor




Legend
HP PC
iPod
Shared value chain
Intel
Standards control
MS
HP
Component suppliers
-Chips
-HDD
-Displays
-Other
CM
ODM
Distri-butors
Retail
iPod
iTunes
Apple Stores
Standards control
Apple
Components
Mfg
System HW
Software/ Content
Dist
Retail

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China value capture: Lenovo

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