Opportunities in the Green Race: U.S. versus China

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Outline

• SWOT Analysis of Chinese Automotive Industry
• Green Race: U.S. versus China
• Opportunities for Collaboration
• Concluding Remarks
Key Statistics

- Annual production of degreed engineers over 1.6 millions
  - 0.6 million from 4-yr programs and
  - 1 million from 3-yr programs

- Manufacturing accounts for over 40% of China’s GDP (2009 data)

- Manufacturing employs 11% of total workforce and 90% of industrial workforce

- China became the second largest nation (15%) in global manufacturing output following US (21%)

- China became the largest automotive market in the world
Figure 1 Growth of Research and Development (GERD) in China, 1990-2009

Source: China Statistical Yearbook on Science and Technology (1992-2010), National Bureau of Statistics and Ministry of Science and Technology
China’s Manufacturing R&D Strategies

• National R&D Roadmap through a national long and medium range (5 to 15 years) planning exercise
• Curiosity-driven research supported by National Natural Science Foundation of China
• State key development projects funded by Ministry of Science and Technology’s 863 programs
• Basic key research projects funded by Ministry of Science and Technology’s 973 programs
• More emphasis on original innovations
• Encouragement of industry and university collaborations
• Incentives for setting up multinational R&D centers
16 National Priority S&T Initiatives
(1 Trillion RMB)

- Core Electronic Components
- High-end Chips and Fundamental Software
- Manufacturing Technologies and Equipment for VLSI
- High-end CNC Equipment and Fundamental Manufacturing Technologies
- New Generation Mobile Communication
- Development of Large Scale Oilfields and Gas Extraction in Coal Mines
- Advanced Nuclear Power Plant Core Technologies
- Water Pollution Control and Treatment
- Genetically Modified Crop Cultivation
- New Drug Discovery
- AIDS and Other Infectious Diseases Prevention and Control
- Large Aircraft
- High Resolution Earth Observation Systems
- Manned Space and Lunar Exploration
- Others
China’s Automotive Industry

Spent 40 years to reach 1,000,000; only 8 years to reach 2,000,000; just 2 years to reach 3,000,000; and 1 year to reach 4,000,000

1,000/yr
Needs and Wants

- Most Chinese OEMs \textit{want} to have their own brands.
- They also \textit{want} to be the innovators of high-value added products.

But,

- Chinese OEMs \textit{need} first to establish their core technical development teams.
- They \textit{need} to fully understand the know-hows, know-why's and establish vehicle integration capability.
SWOT Analysis for Chinese Automotive Manufacturers

(S-Strength):

• Market (World #1 market since 2009)
• Strong government support for R&D investment
• Strong government incentives for new energy vehicles
• Access to all major global suppliers
• Low cost manufacturing
(W-Weakness):

- Lack of key knowledge base, technical know-how and know-why
- Lack of system design and vehicle integration capability
- Weak in product innovation and development
- Weak in automotive engineering talent pool
(O-Opportunity):

- Strong economic development in China – plentiful capitals (e.g., Volvo, Saab purchases)
- Bonus of globalization -> MNCs move production facilities to China
- Emergence of global R&D centers in China
- Significant market expansion
- Competitive workforce
- Opportunity for global alliance (e.g., GM/SAIC)
SWOT Analysis for Chinese Automotive Manufacturers

(T-Threat):

• Complacency.
• Over expansion.
• Overly ambitious introduction of new energy vehicles.
Opportunity for U.S. Companies

• Double-digit growth auto market
• Global manufacturing center
  – Low labor and operational costs
  – Abundant labor and skilled resources
• Global purchase center
  – Competitive price
  – Quality products
  – Good logistic infrastructures
• R&D center
  – Large annual number of engineering graduates
• Emerging service sectors:
  – Financing, legal, trading, marketing, I.T., engineering, testing, after-market, education etc.
Green Race: U.S. Strength and Weakness

• Strength:
  – Profound knowledge base and technical foundation in automotive engineering and manufacturing
  – High concentration of automotive R&D talents, particularly in Michigan area
  – Strong fundamental research and innovations in universities
  – Government investment in clean energy technologies

• Weakness
  – Lack of supply chains for critical systems, such as battery
  – Inefficiency in establishing new public policies to promote the early adoption of clean vehicle technologies
Green Race: China’s Strength and Weakness

• Strength
  – Significant government support for clean vehicle technologies to make up for their lagging in conventional IC automotive technologies
  – Efficiency in government to establish incentives for adopting new clean vehicle technologies
  – Mass production capability to make products cheaply
  – Strong applied research at universities
  – Abundant labor and skilled resources

• Weakness
  – Lack of vehicle engineering and system integration capability
  – Weak in system-level design and optimization
  – Lack of skills to compete in global markets
By the end of 2010, China has achieved the following stunning new energy developments:
• Hydro-electrical power generation: 197 GW (#1 in the world)
• Wind power generation: 42 GW (#1 in the world)
• Nuclear power generation: 9.17 GW from 11 power stations
  – 30 newly approved power stations: 32.7 GW
  – 23 power stations under construction (#1 in the world)
• Solar water heating capacity (#1 in the world)
• PV solar cell production: 4 GW/yr (#1 in the world, 40% worldwide production)
• Biomass electrical generation: 4.5 GW
Green Race: Opportunities for Collaboration

• Complimentary strengths in clean vehicle technologies
  – U.S. innovations, system engineering and integration
  – Chinese productions, battery technologies and supply chains

• U.S. and Chinese auto markets are big enough for both countries to win.

• It might be easier for certain regions in China to be early adopter of clean vehicle technologies, which could serve as a pilot ground for wide adoption back in U.S.
Barriers for Chinese Auto Companies to Enter U.S. Market

- Sales, distribution and service network
- Quality, reliability and safety standards
- Psychological barriers to set up factories in U.S.
- Lack of managerial talents who have the trust from home headquarters and also the necessary executive skills and experience dealing with American workers
Challenges to Chinese Economy

- Inflation and rising commodity costs
- Rapid rise in labor costs
- Housing bubbles
- Weak world economy slows down exports
- Currency
- High unemployment
- Increased inequality between coastal and in-land regions
- Continuing reforms in financial institutions and state owned enterprises (SOE)
- Political and social stability
Opportunity for U.S. Companies

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• R&D center
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• Emerging service sectors:
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Joint U.S.-China Consortium on Clean Vehicles

• U.S. and China have signed bilateral governmental agreement to promote research collaborations in clean energy (building, coal, and vehicles).
• The University of Michigan has formed a large clean vehicle research consortium consisting of several leading US universities, national labs and key automotive OEMs and suppliers, as well as key Chinese universities and companies.
• This Consortium will address technical areas of (i) biofuels and clean combustion, (ii) vehicle electrification, (iii) energy storage and harvesting, (iv) lightweight structures, and (v) system integration and demonstration.
CERC-Clean Vehicle Consortium: a Research Center support by US-DOE, China-MOST and industrial funding

PI: Minggao Ouyang (Tsinghua University, China) and Huei Peng (UM, USA)

$50M over 5-year (2011-2015) to support six research areas critical for Clean Vehicles

- Vehicle Electrification
- Energy Systems Analysis, Technology Roadmaps and Policies
- Batteries and Energy Conversion
- Lightweight Structures
- Advanced Biofuels and Clean Combustion
- Vehicle-Grid Interface
Concluding Remarks

• Global green race will be very competitive.

• It is impossible to have exclusive winners.

• U.S. and China should and can collaborate in this green race to create win-win partnerships.

• By collaborating, both countries can achieve fast and better realization of wide adoption of clean vehicle technologies.
Thank You!

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