Capability Building in China's Auto Supply Chain

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Background

- Development of China's auto sector must be viewed in context of larger process of capability-building in Chinese mfg that is affecting every sector
- Key: Combination of domestic and foreign sector reforms that have encouraged FDI, increased competition, forced firms to invest in capability building, and facilitated the transfer of tech and managerial know-how
- Process has integrated the Chinese economy to an unprecedented degree into the international economy for an economy of its size and population
  - China has become an integral part of global supply chains;
  - Major importer of intermediate and capital goods;
  - Major exporter of mfg goods
- Important role of rapidly expanding domestic market, which has become focus of increasing number of MNCs
- Emerging 100% Chinese owned firms in nearly every sector

China's Foreign Direct Investment Inflows & Outflows, 1990-2005, (Billion U.S. dollars)

Year	1990	1994	1998	2000	2001	2002	2003	2004	2005
FDI Inflow:	3.48	33.94	45.46	40.71	46.88	52.74	53.50	60.60	60.33
FDI Sources									
Asia:			31.33	25.48	29.61	32.44	34.10		
Hong Kong	1.91	19.82	18.50	15.50	16.72	17.86	17.70	19.00	17.9
Japan	0.50	2.09	3.40	2.92	4.34	4.19	5.05	5.45	6.5
Korea		0.23	1.80	1.49	2.15	2.72	4.49	6.24	5.2
Europe:			4.31	4.76	4.48	4.08	4.27	4.61	
Germany	0.02	0.26	0.74	1.04	1.21	0.92	0.86		1.5
UK	0.01	0.69	1.17	1.16	1.05	0.57	0.72		1.0
North America			4.33	4.78	5.10	6.49	5.16		
US	0.46	2.49	3.89	4.38	4.43	5.42	4.20	3.94	3.1
Canada	0.41	0.22	0.32	0.28	0.44	0.59	0.56		0.5
FDI Outflow:	0.83	2.00	2.36	0.92	6.88	2.7	2.9	5.5	12.3

Chinese Industry: 15 Sectors Receiving Largest FDI Inflows (%)

Manufacturing Sector	Sector Share of Industry FDI	Export Share of Sector Output	FIE Share of Sector Exports	Sector Share of Industrial Exports
Plastics	2.18	17.30	79.19	1.44
Metal products	2.73	19.60	84.80	2.18
Ferrous Metals	3.15	7.87	49.13	2.41
Food products	3.24	23.26	60.42	2.42
Electric equip. + mach.	3.35	16.25	81.84	2.79
Paper products	3.37	8.84	77.85	0.86
Textiles	3.52	27.16	50.41	5.54
Beverages	4.30	4.76	58.93	0.48
Garments	5.07	45.93	61.40	10.63
Ordinary machinery	5.56	18.82	58.13	4.66
Non-metal mineral	6.14	14.75	76.48	2.74
Transportation equipment	6.50	6.55	64.03	2.78
Medical + pharmaceutical	7.03	9.11	56.34	3.42
Electronics + telec.	7.88	32.16	91.12	19.01
Instruments and meters	10.64	30.45	93.83	13.11
Average (unweighted)	4.98	18.85	69.59	4.96
Total for top 15	74.66			74.47

Current Research Project

- Collect information directly from plants
- OEMs, brakes, exhausts, seats, and ECUs
- China (2006), Japan (2006), Korea (2007);
- Inquire about: productivity, quality, supply chain, engineering capability, relationships between firms

Plants visited in China and Japan, 2006

OEM	Number visited	Suppliers visited
China		
Domestic	1	3
JV with US	2	7
JV with Asia	4	11
JV with Europe	2	7
Japan		
	3	11

Key preliminary findings

- Accelerating competition in car market having significant impact on the domestic supply chain
  - WTO
  - New entry; Expansion in capacity
- Rapid improvement in supply chain, but uneven
  - Quality levels of 1st tier suppliers comparable; last few years, most noticeable among 2nd tier suppliers
  - Productivity appears to be rising
- Exports of parts and components rising rapidly
  - MNC …. Global supply chains
  - Domestic firms …. After-sales market
- Rising capabilities in product development and design among some 1st tier suppliers; often tied to strategies of the OEMs
- Emergence of domestic OEMs having significant impact on industry dynamics

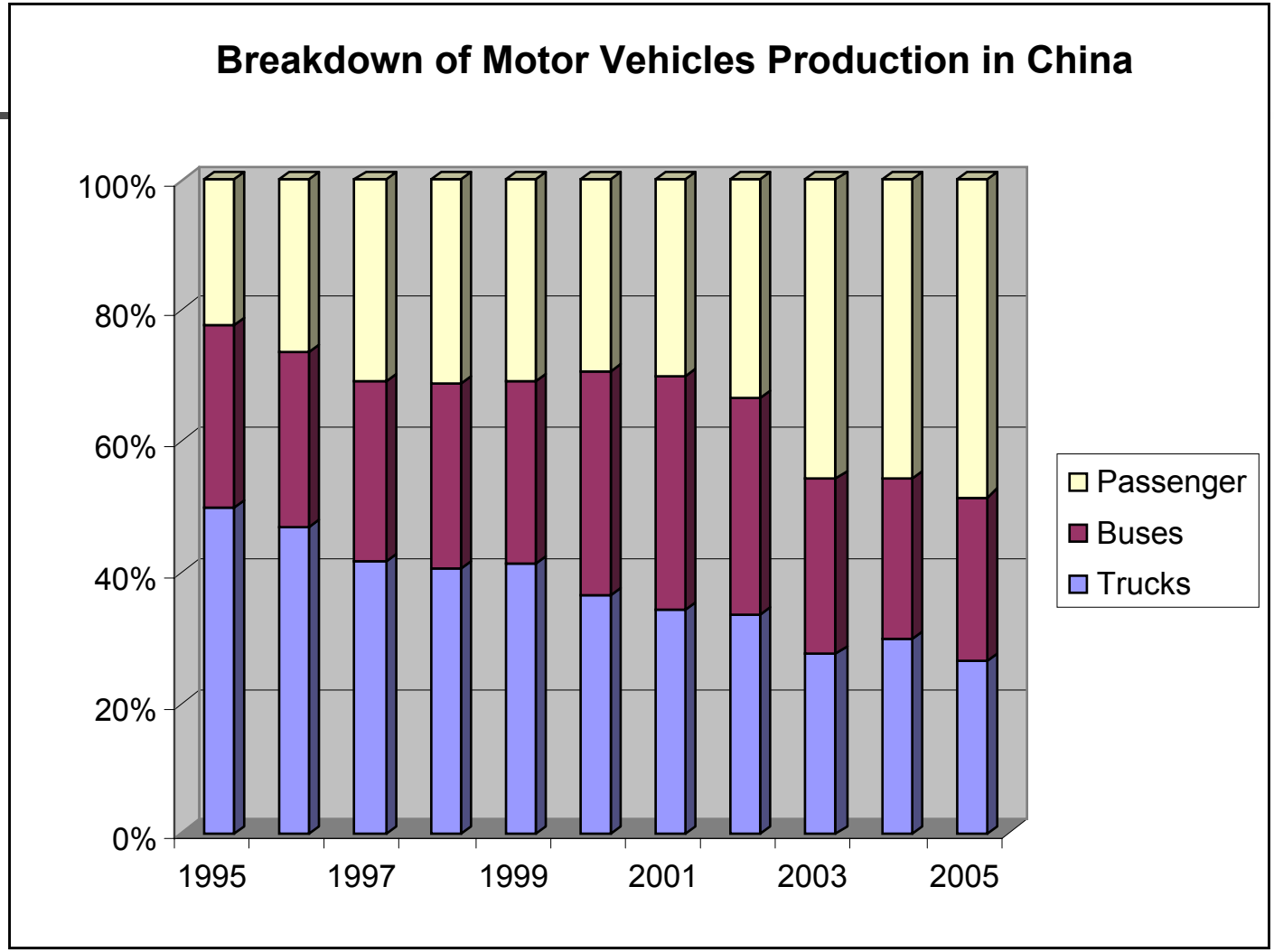
Auto Sector

- Key Policies in 1980s and 1990s
  - OEMs, entry limited to that through JVs for autos; no restrictions for auto-parts
  - Local content rules for autos
  - High protective tariff on the industry
- Nurtured emerging industry, but notable failures (Beijing Jeep and Peugeot)
- Heterogeneity in "depth" of regional supply chains (Thun, 2006)
- 1999: Total Vehicles, ~ 1.8 mn
  Passenger car production, ~ .6 mn
  JVs: two-thirds of passenger car production

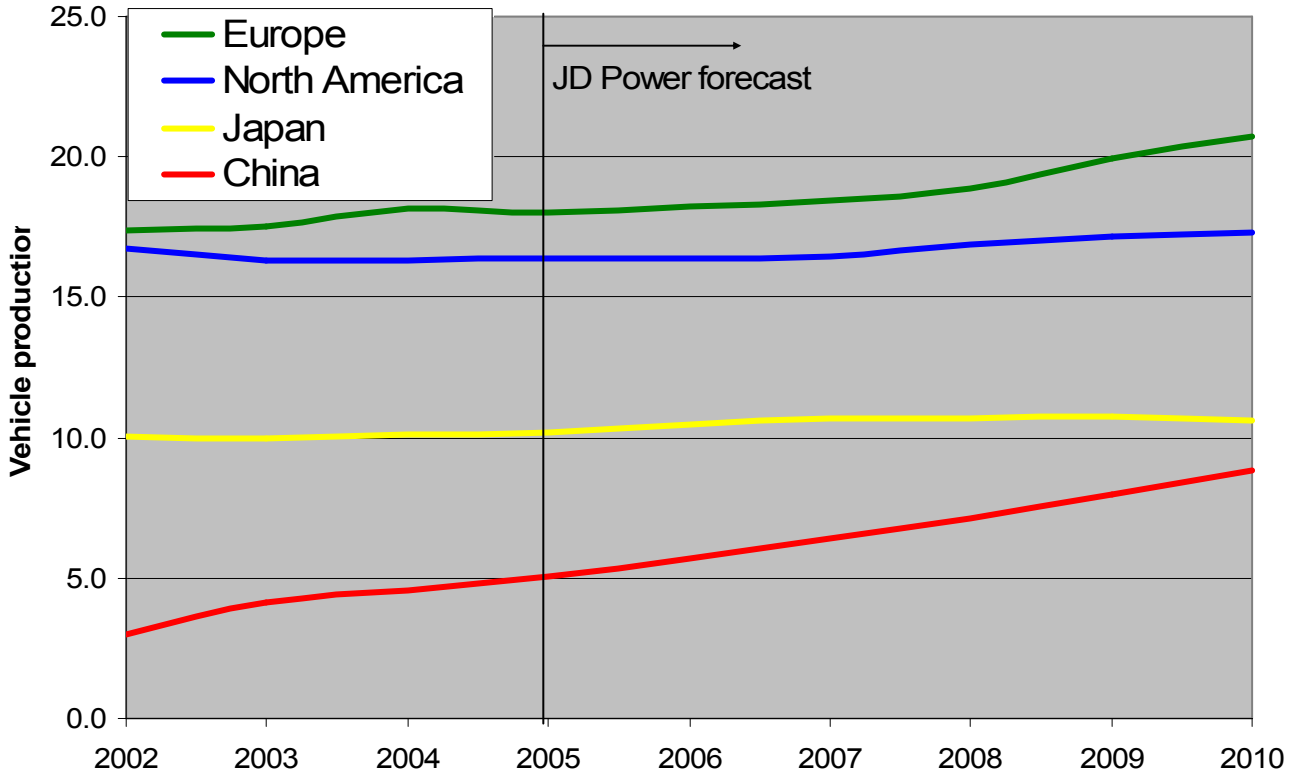
Countries producing 1+ million vehicles, 2005

Country	2000	2005	% change
USA	12,770,714	12,018,043	-5.90%
Japan	10,144,847	10,799,659	6.50%
Germany	5,526,615	5,757,710	4.20%
China	2,008,500	5,648,972	181.30%
South Korea	2,858,378	3,699,350	29.40%
France	3,351,929	3,547,839	5.80%
Spain	3,032,874	2,753,856	-9.20%
Canada	2,961,636	2,664,749	-10.00%
Brazil	1,671,093	2,458,469	47.10%
UK	1,813,739	1,806,359	-0.40%
Mexico	1,922,889	1,691,878	-12.00%
India	866,863	1,553,194	79.20%
Russia	1,202,589	1,351,194	12.40%
Thailand	458,415	1,097,300	139.40%
Italy	1,738,315	1,038,352	-40.30%
Iran		1,005,650	


MONGOLIA
KYRGYZSTAN
Xinjiang
Inner Mongolia
Heilongjiang
Jilin
Liaoning
Beijing
Tianjin
Hebei
Ningxia
Shanxi
Shandong
CHINA
Qinghai
Gansu
Shaanxi
Henan
Jiangsu
Anhui
Shanghai
Tibet
Hubei
Sichuan
Chongqing
Zhejiang
NEPAL
Guizhou
Hunan
Jiangxi
Fujian
INDIA
Yunnan
Guangdong
Taiwan
Guangxi
Hong Kong
VIETNAM
MYANMAR
LAOS
Hainan
JAPAN
PHILIPPINES


Breakdown of Motor Vehicles Production in China
100%
80%
60%
40%
20%
0%
1995
1997
1999
2001
2003
2005
Passenger
Buses
Trucks

Trends in automobile production



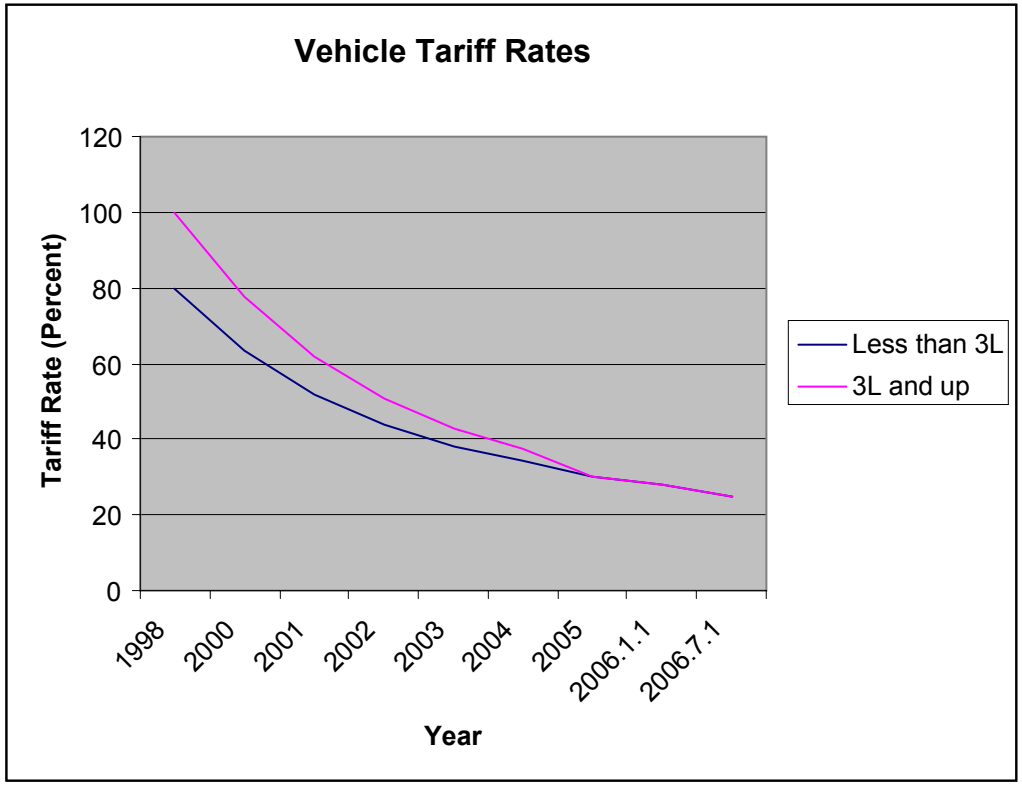
What is driving changes in China's auto sector?

1. Competition in final goods market has intensified significantly
2. Sharply falling car prices: same cost pressures throughout the supply chain as in the West
3. Quality convergence with the West in the supply chain
4. Export potential is appearing

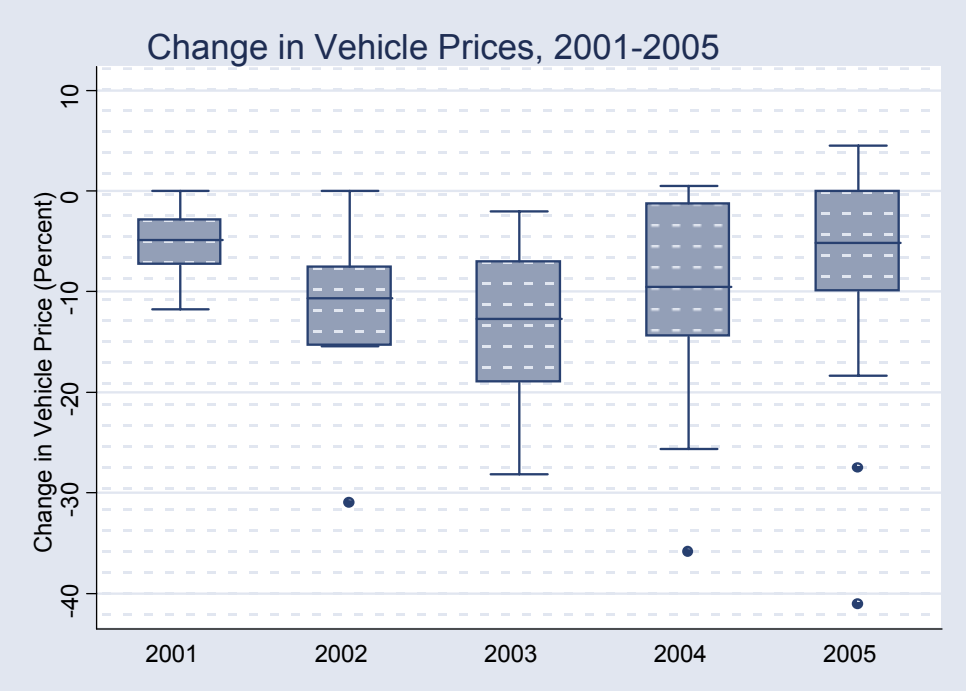
1. Competition in the final goods market

- Tariff cuts on passenger vehicles (WTO): 80% ('98) → 60% ('00) → 25% ('06)
- Capacity expansions: 0.95 mn (2000), 4.44 (2006) and 6.21 mn (2007)
- Emergence of domestic firms, e.g. Chery, Geely, with rapidly improving capabilities and capacity
- Difficulty of industry leaders, e.g. SVW, FAW-Audi

Falling Auto Tariffs in China



Changes in Passenger Vehicle Prices: 2001-2005



Market Shares, Top 10, 2005

Firm	Type	Sales	Market
Shanghai GM	JV	328,842	10.5
FAW-VW Audi	JV	240,120	7.7
Shanghai-VW	JV	250,061	8.0
Guangzhou Honda	JV	230,773	7.4
Beijing Hyundai	JV	233,688	7.5
Xiali (FAW)	D	190,019	6.1
Qirui (Chery)	D	189,158	6.0
Changan	D-JV	168,269	5.3
DFM_Nissan	JV	157,516	5.0
Geely	D	149,869	4.8
Sub-total (top 10)		2,138,295	68.2
Total (all firms)		3,131,950	100.0

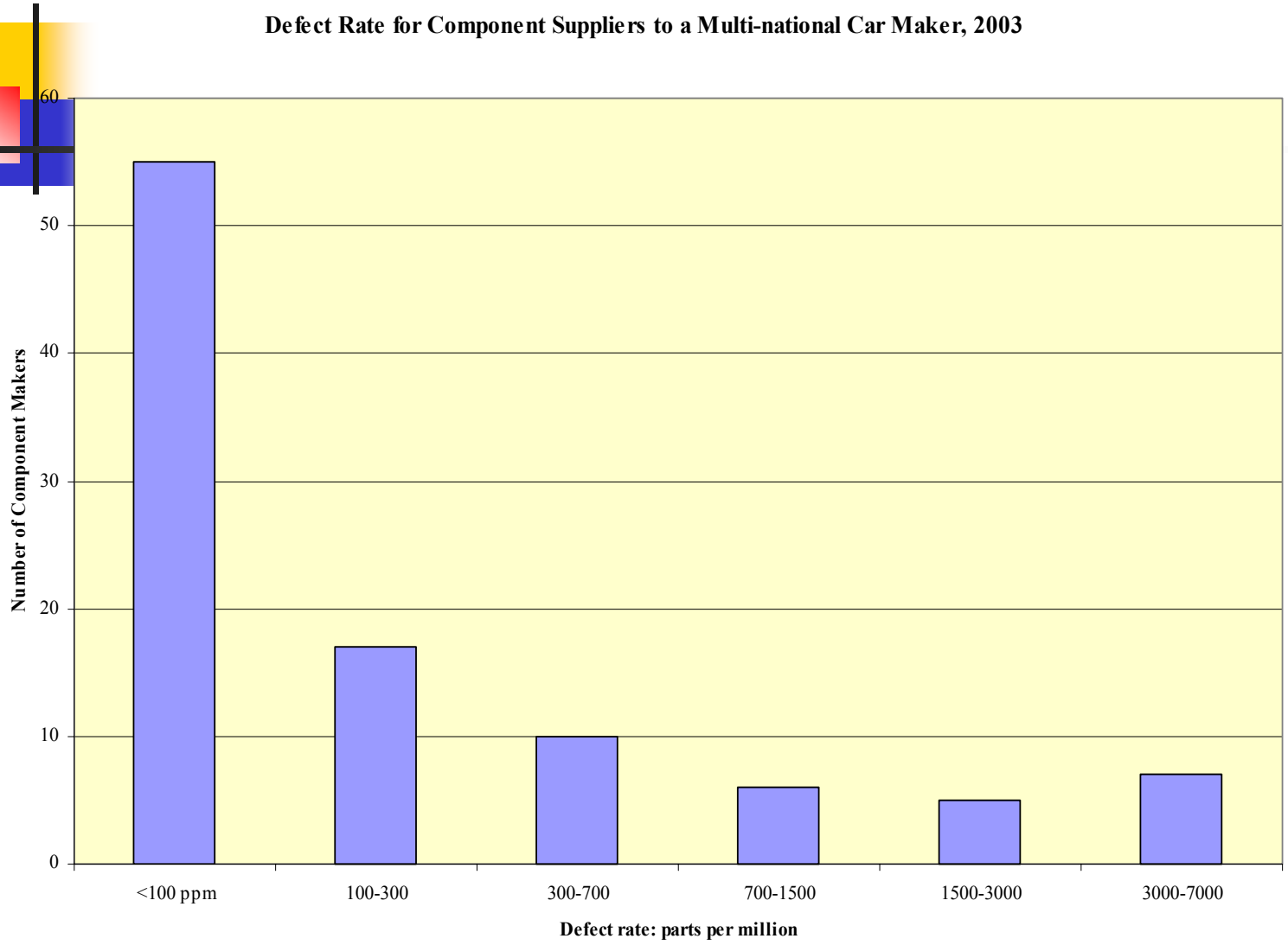
JV = joint venture, D = domestic firm

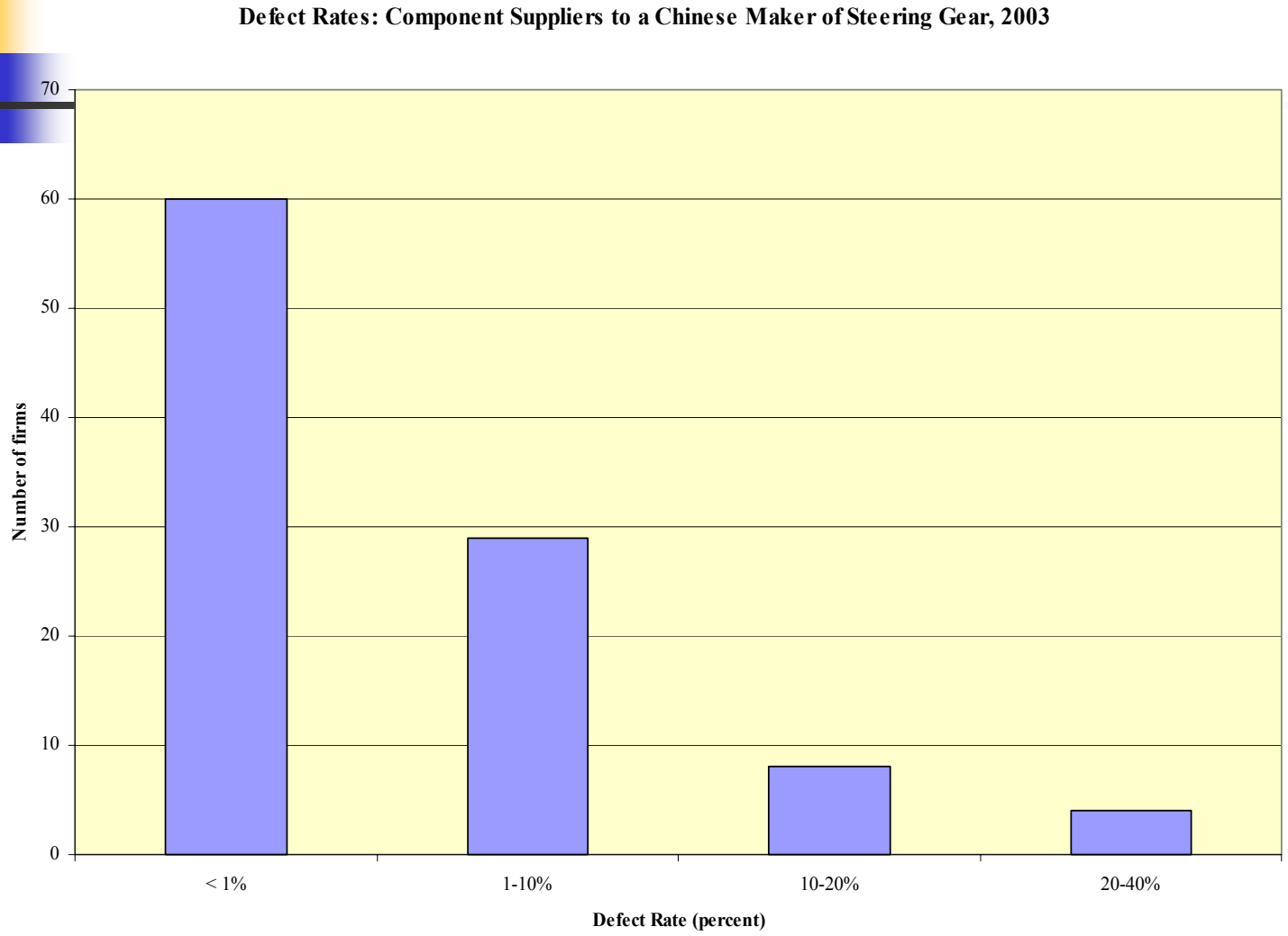
2. Cost pressures in the supply chain

"As margins thin and pricing competition intensifies, an efficient and developed low-cost assembly and supply base will be essential for financial success"

3. Quality convergence with the West

- Quality level of 1st tier suppliers roughly comparable to that overseas; narrowing in gap for 2nd tier
- Latest VW and Toyota retooling brought the 2006 Jetta and Camry into China at the same time as in N.A; Nissan launching new global car in Shanghai
- Exports (JVs): Honda Fit & CR-V, Toyota engines, engines for CAMI plant in Ontario

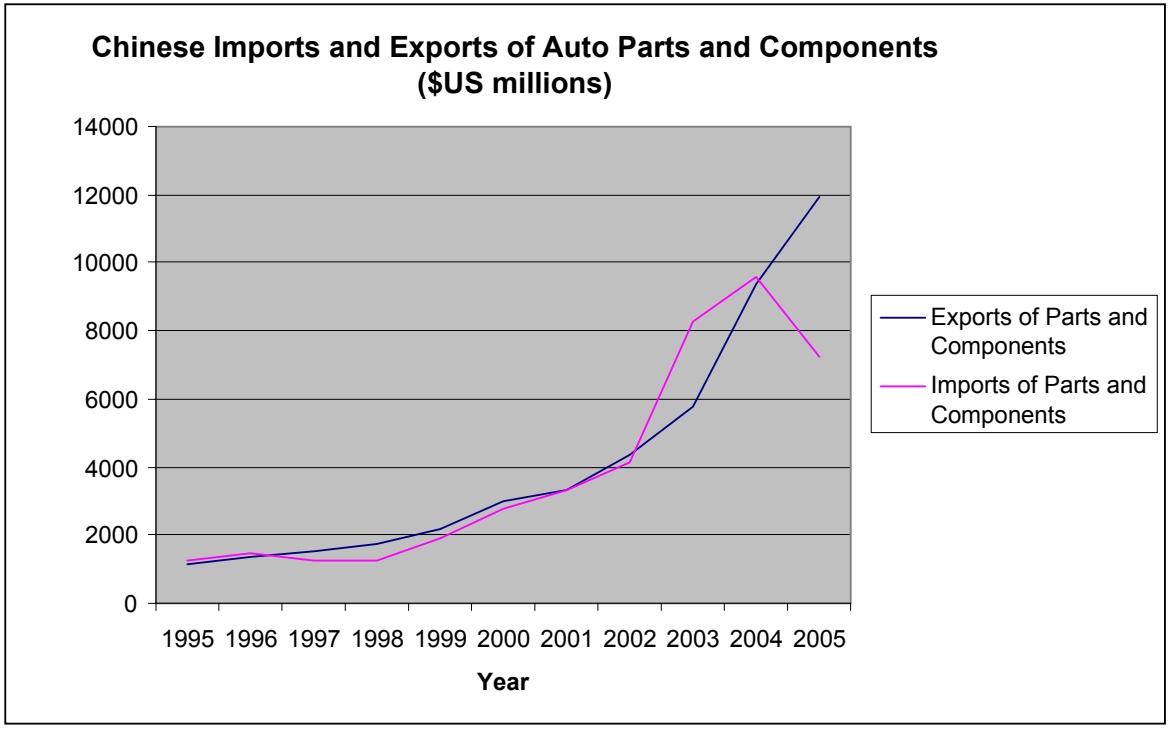

Defect Rate for Component Suppliers to a Multi-national Car Maker, 2003
Number of Component Makers
60
50
40
30
20
10
0
<100 ppm
100-300
300-700
700-1500
1500-3000
3000-7000
Defect rate: parts per million


Defect Rates: Component Suppliers to a Chinese Maker of Steering Gear, 2003
70
60
50
40
30
20
10
0
Number of firms
< 1%
1-10%
10-20%
20-40%
Defect Rate (percent)

Defect Rates for Suppliers to Two 1st-tier Braking Systems Mfgs						
Location		Coastal			Interior	
Year		2006	2003		2006	2003
PPM		% of Firms	% of Firms		% of Firms	% of Firms
< 50		58	8		30	5
50-100		22	20		10	7
100-300		5	21		15	8
300-500		10	22		15	25
500-1000		1	14		10	14
1000-2500		4	9		8	18
2500-5000			6		4	8
5000+					8	15
Average PPM		158.5	634.5		1070	1967.5

Source: Brandt, Rawski and Sutton, 2007

4. Export potential is appearing



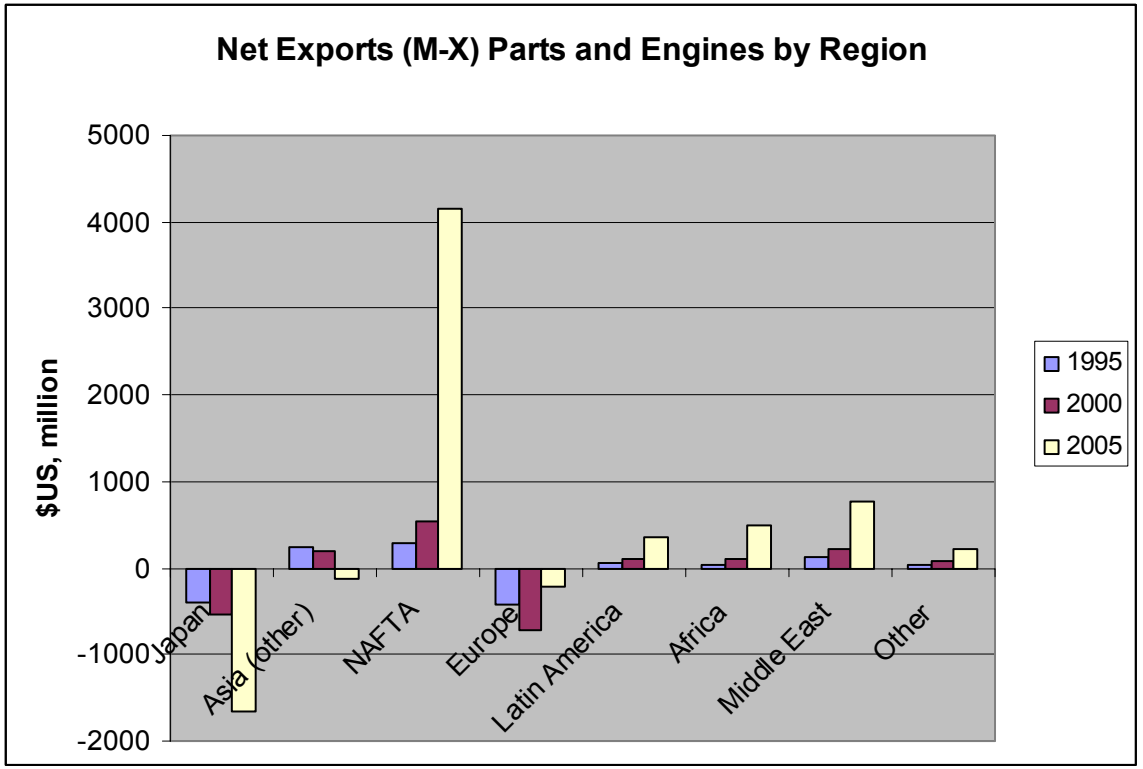
Summary Information for Parts and Components Firms Supplying Motor Vehicles Industry

	1998	1999	2000	2001	2002	2003	2004	2005
Number of firms	2320	2349	2496	2724	2968	3605	5625	5604
Total Revenue (mn RMB)	81291.22	88518.33	108760	138783.59	185483.8	247633.1	354131.8	404419.5
Avg Revenue (mn RMB)	35.04	37.68	43.57	50.95	62.49	68.69	62.96	72.17
Export Ratio (%)	7.83	9.51	11.13	9.58	10.02	11.02	NA	14.38
Profitability	0.054	0.066	0.073	0.081	0.089	0.09	0.07	0.057
% $\pi > 0$	68.1	70.97	74.76	77.02	81.23	82.22	79.45	80.96
Profitability/>0	0.093	0.097	0.098	0.1	0.103	0.104	0.09	0.076

Export Ratios and Contribution to Total Exports: By Ownership

	1998	1999	2000	2001	2002	2003	2004	2005
Export Ratios: (Exports/Sales)*100								
All Firms	7.83	9.51	11.13	9.58	10.02	11.02	NA	14.38
FIE	19.27	21.13	22.86	17.71	17.75	15.95	NA	19.63
of which: WOS	76.46	69.77	61.43	38.8	36.26	27.81	NA	29.54
SOE	2.83	2.53	2	1.88	2.45	3.64	NA	5.4
Other	4.22	5.11	5.81	6.43	6.54	8.36	NA	10.39
Contribution to Total Exports (in percent)								
FIE	64.21	68.13	71.22	65.58	64.67	58.81	NA	62.16
of which: WOS	35.11	39.3	38.18	38.28	38.6	31.16	NA	40.87
SOE	8.29	5.23	2.79	3.68	3.66	2.99	NA	1.66
Other	27.5	26.63	25.99	30.75	31.67	38.19	NA	36.17

China's net exports of auto parts by region



How are firms responding to these pressures?

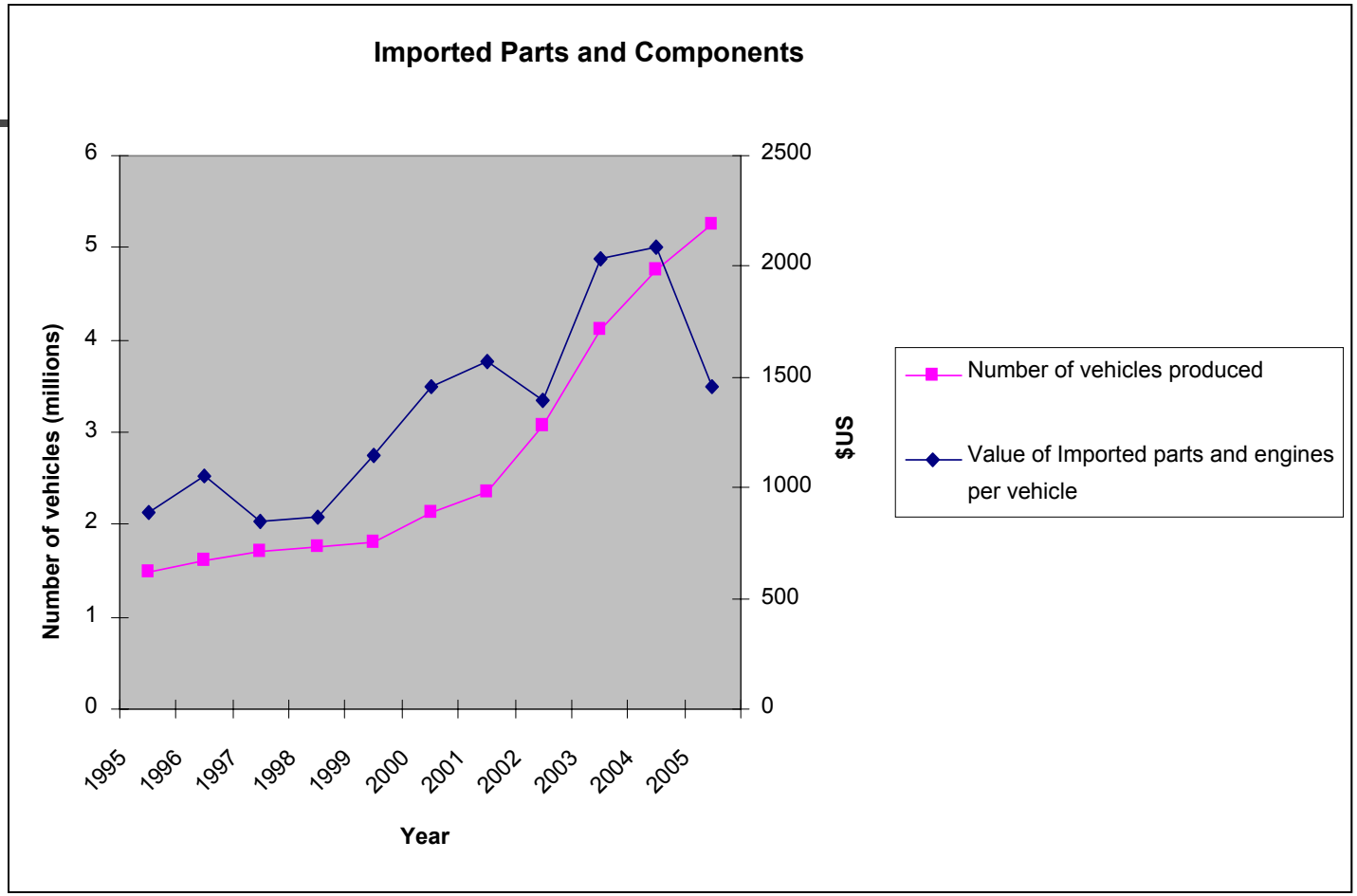
1. Cut consumer prices
   → and pay suppliers less
2. Improve productivity
   → modest room in numerous firms
2. Bring in better products
   → and insist on production quality
4. Localize production and supply base
   → to exploit low-wages
5. Localize development
   → fit vehicles to local tastes

Localize supply chain

- Speed determined by OEMs
  - Imports → Domestically sourced
  - In house → Outsource
  - JV → 100% domestic firms
  - Some 1st-tier suppliers express frustration (especially given pressures to reduce prices) in delays in release for local sourcing
- Brake-calipers: ’02-20%, ’03-83%, ’06-93%
- Greater scope for cost reductions than by improving productivity

Sourcing by OEMs in China (% of 1st tier suppliers)

OEM	JV/WOS	Domestic	Overseas (imported)
US	57.1	14.3	24.5
US	58.5	39.6	3.8
Japan	64.4	2.2	33.3
Japan	88.3	5	10
China	41.8	58.2	0
European	84	16	0
Korea	67.9	9.4	22.6
Average	**66.0**	**20.7**	**13.5**


Imported Parts and Components
Number of vehicles (millions)
$US
Year
0
1
2
3
4
5
6
0
500
1000
1500
2000
2500
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Number of vehicles produced
Value of Imported parts and engines per vehicle

Localization Rates in China, 2006		
	OLS	Median
Variable		
Intercept	53.38* (6.70)	56.20* (6.42)
Years since launch	3.43* (2.73)	3.05* (0.75)
Engine size (L)	-3.96 (2.73)	-3.97 (2.63)
Manual trans.	4.38 (2.75)	5.68** (2.54)
Europe	-24.64* (8.98)	-26.08* (4.72)
Japan	4.05 (3.30)	3.17 (2.98)
Korea	22.74* (3.26)	20.27* (2.95)
N	39	39
R2		0.60

Localize design and development

- Tied to vehicle programs
  - More potential with domestic OEMs, but also happening for some of the JVs
- Change designs for manufacturability
  - Long history in automotive sector
- Modest design modification to help meet local tastes
  - With some localization of design, requirements of 1st tier suppliers rising; significant investments in capabilities required

5-year plan of a major JV OEM in China

- Reduce production costs by 40% through
  - Increase local sourcing for parts and components to 90-95%
  - Increase local sourcing of tools, die and other capital equipment
  - Invest heavily in local R&D/product development capabilities, and require suppliers to do the same

Implications for North American suppliers

1. Three strategies have emerged for JVs in China
2. Domestic Chinese firms should not be ignored
3. Exports from China are on their way
4. OEMs (and now 1st tier suppliers) want global suppliers

1. Three strategies for JVs in China

- aggressive localization
- cautious localization
- Integrate in global supply chain

→ Each means very different things for North American suppliers

2. Domestic (Chinese) firms

should not be ignored:

- Source even more domestically
- Outsource much design work
- ➔ Piggy-back on supply-chain developed by JVs
- ➔ Provide impetus for local capability building

3. Vehicle exports are on their way

- Geely was present at the Detroit Motor Show
- Chery has teamed up with DaimlerChrysler (they were already in the process of setting up a dealer network)
- SAIC (partner of VW and GM in Shanghai): Set up an independent venue for export
- Jiangling (Landwind) and Great Wall (Hover) have tried in Europe
- Honda exports the *Jazz* from Guangzhou

4. OEMs (and some 1st tier suppliers) want suppliers with global reach

Nissan uses (only) the following criteria to put you in its 'potential suppliers' pool:

(note that their keiretsu was largely abolished)

- World class production quality at lowest cost
- World class design and redesign capabilities
- Worldwide reach (production and design)

→ Chinese presence or partners will aid on each count

→ Chinese parts suppliers looking overseas for M&A