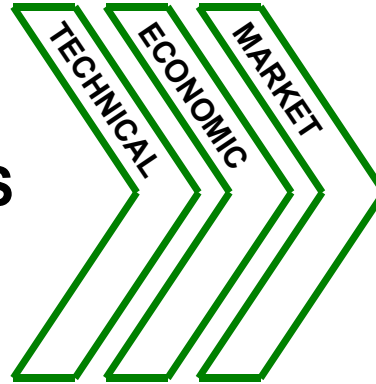


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**ANALYSIS**



**Management  
DECISIONS**

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**Robert Eller Associates LLC**  
CONSULTANTS TO THE PLASTICS AND RUBBER INDUSTRIES

# **EFFECTS OF GLOBAL ECONOMIC CONDITIONS ON AUTOMOTIVE TPOs**

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**PREPARED FOR:**

**SPE TPO 2009**

**Detroit, MI**

**October 6, 2009**

mydox/papers/SPE TPO 09 ppt.ppt

# PRESENTATION OUTLINE

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- **Global Macroeconomic Situation**
- **Automotive Market Impacts**
- **Fuel Price/Environmental/Demographic Effects**
- **TPO Materials/Fabrication Technology Responses and Growth Applications**
- **Future Vision/Summary**

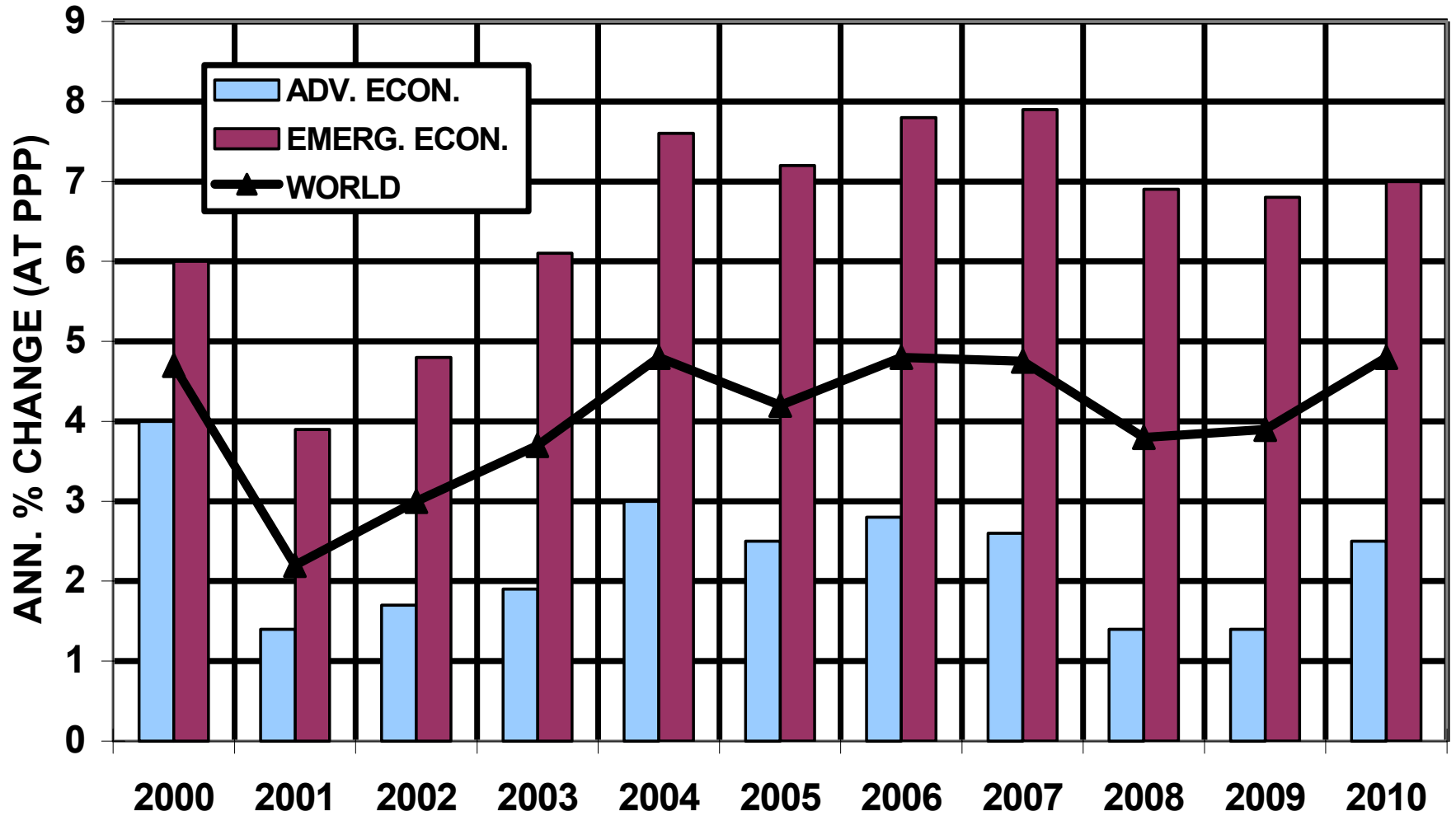
# MACROECONOMIC IMPACTS ON GLOBAL MARKETS

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- Global GDP slowdown – 2-year trough in West
- Wage deflation/high unemployment (Europe/U.S.)
- Credit lockdown (despite U.S. stimulus):
  - erosion of consumer purchasing power
  - lending re-starting slowly, under difficult terms

# GLOBAL ECONOMIC GROWTH: 2 YEAR TROUGH



SOURCE: IMF

# MACROECONOMIC IMPACTS: CHINA/INDIA

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- Slowed, but continued high growth
- Shift to domestic markets:
  - supported by strong exports to the West
  - impacted by recession conditions in West
- **Will previous rush to invest in China/India pay off for auto suppliers?**
- **Can Western transplant auto suppliers shift target to domestic (China/India) customers?**
- **Ability to compete with domestic (China/India) suppliers?**

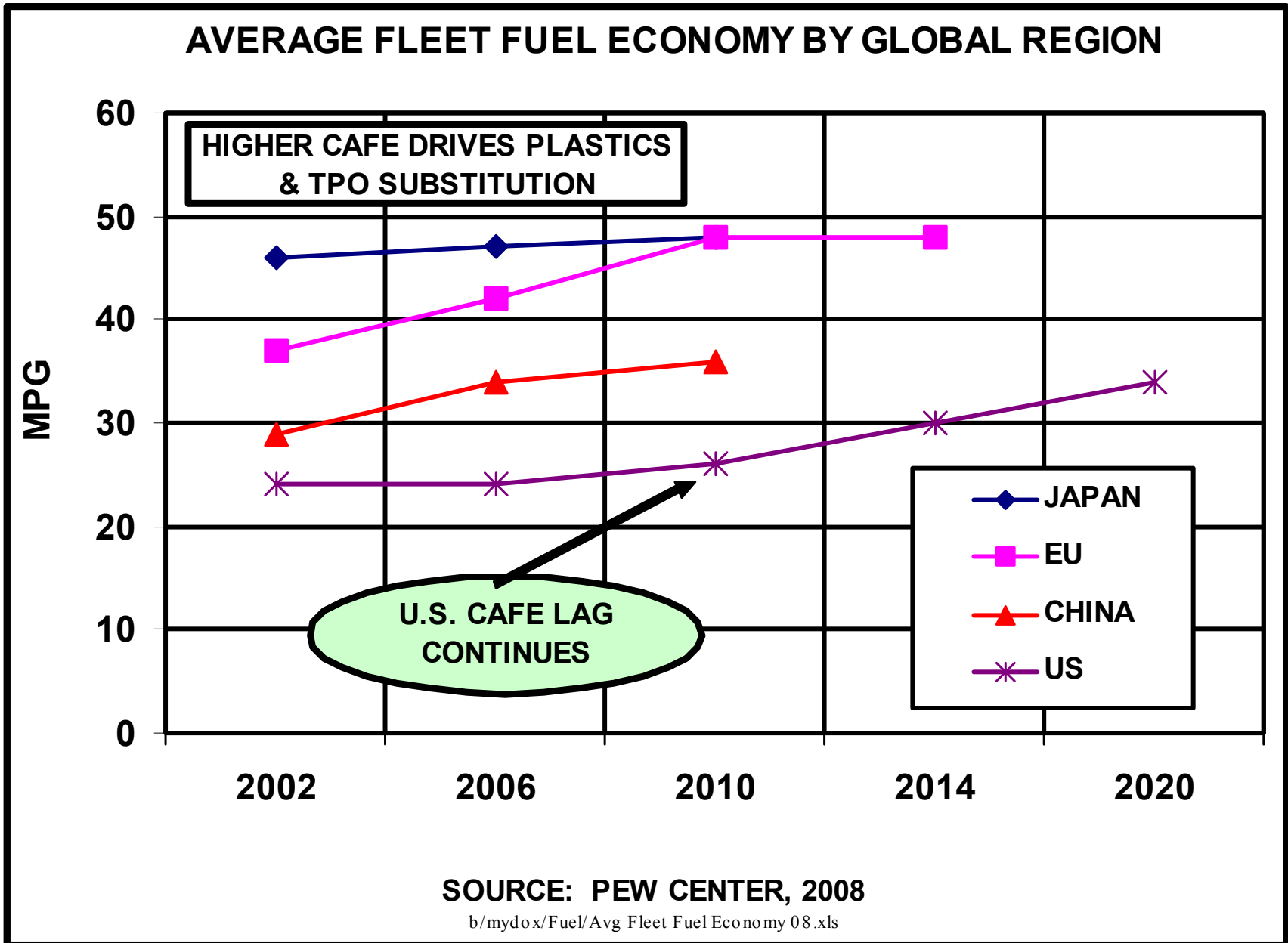
# MACROECONOMIC IMPACTS ON AUTO MARKETS

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- Petrodollar export/oil consumption:
  - terrorism
  - economic impacts
  - environmental impacts
- Responses:
  - alternative energy investments  
(battery/electric drive programs)
  - U.S. CAFE rise
  - CO<sub>2</sub> legislation (Europe)
- Substantial auto OEM/supplier overcapacity in West

# U.S. CAFE SHIFT: MINIMAL (FLEET MIX & MATERIALS IMPLICATIONS)



# MACROECONOMIC IMPACTS ON AUTO MARKETS



- Cash for Clunkers vehicle demand effects:
  - stimulated 2009 vehicle demand
  - 2010 Clunker hangover?

**Can your liquidity and working capital sustain 2010 sluggish recovery?**

- N. American auto market share shift to Asian/ European OEMs continues; supply chain follows

**Your competitive position?  
Which Tier 1s will survive?**

- Fleet composition shift to smaller vehicles

**Is your materials/fabrication technology suitable for smaller vehicle components?**

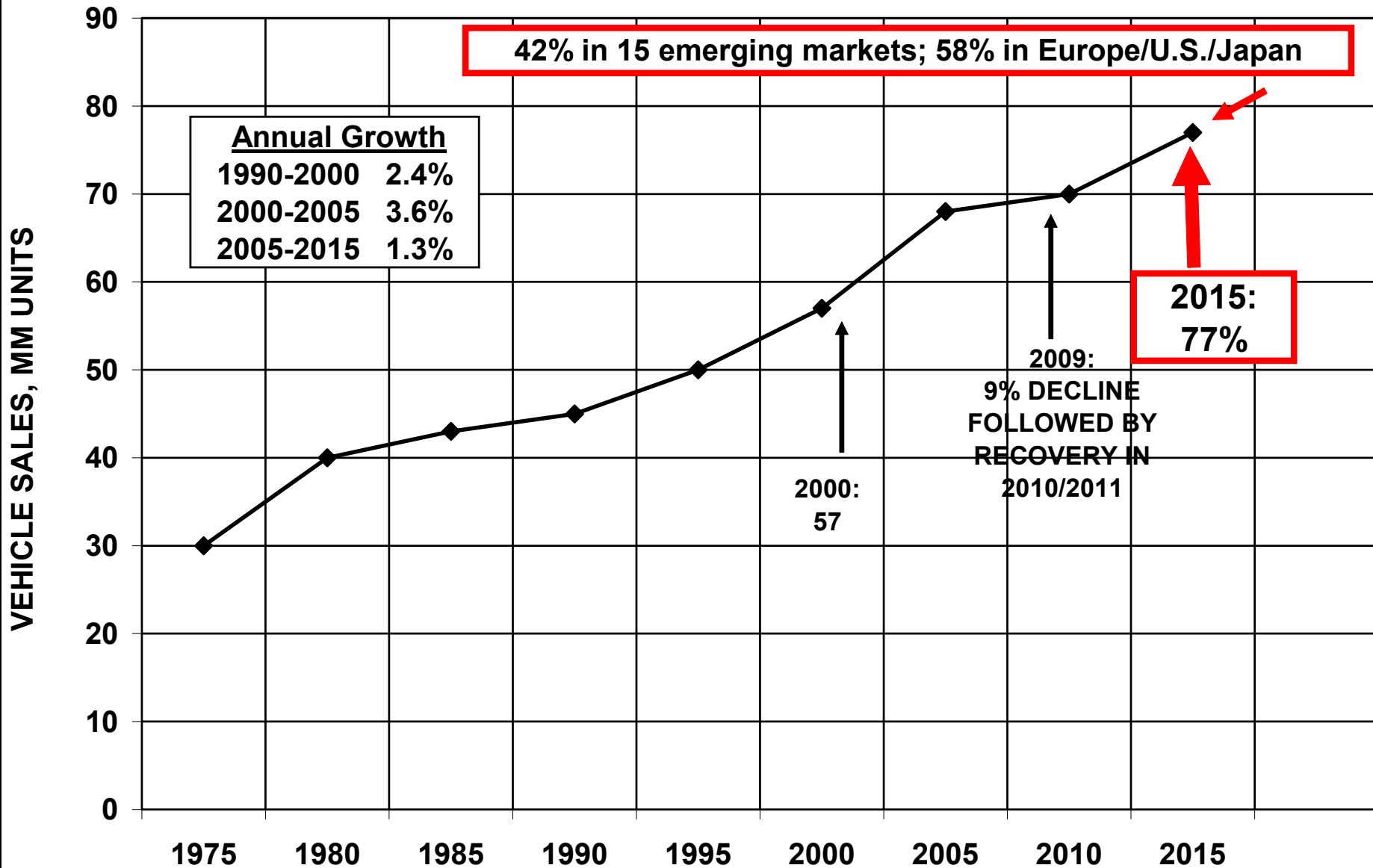
# SUPPLY CHAIN WINNER CHARACTERISTICS

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- Lean path to market
- Favorable (global) raw materials technology/  
purchasing position
- Critical mass/global marketing reach?
- Advanced fabrication technologies
- Efficient parts consolidation technologies
- Liquidity position
- Viable position in consolidated supply chain

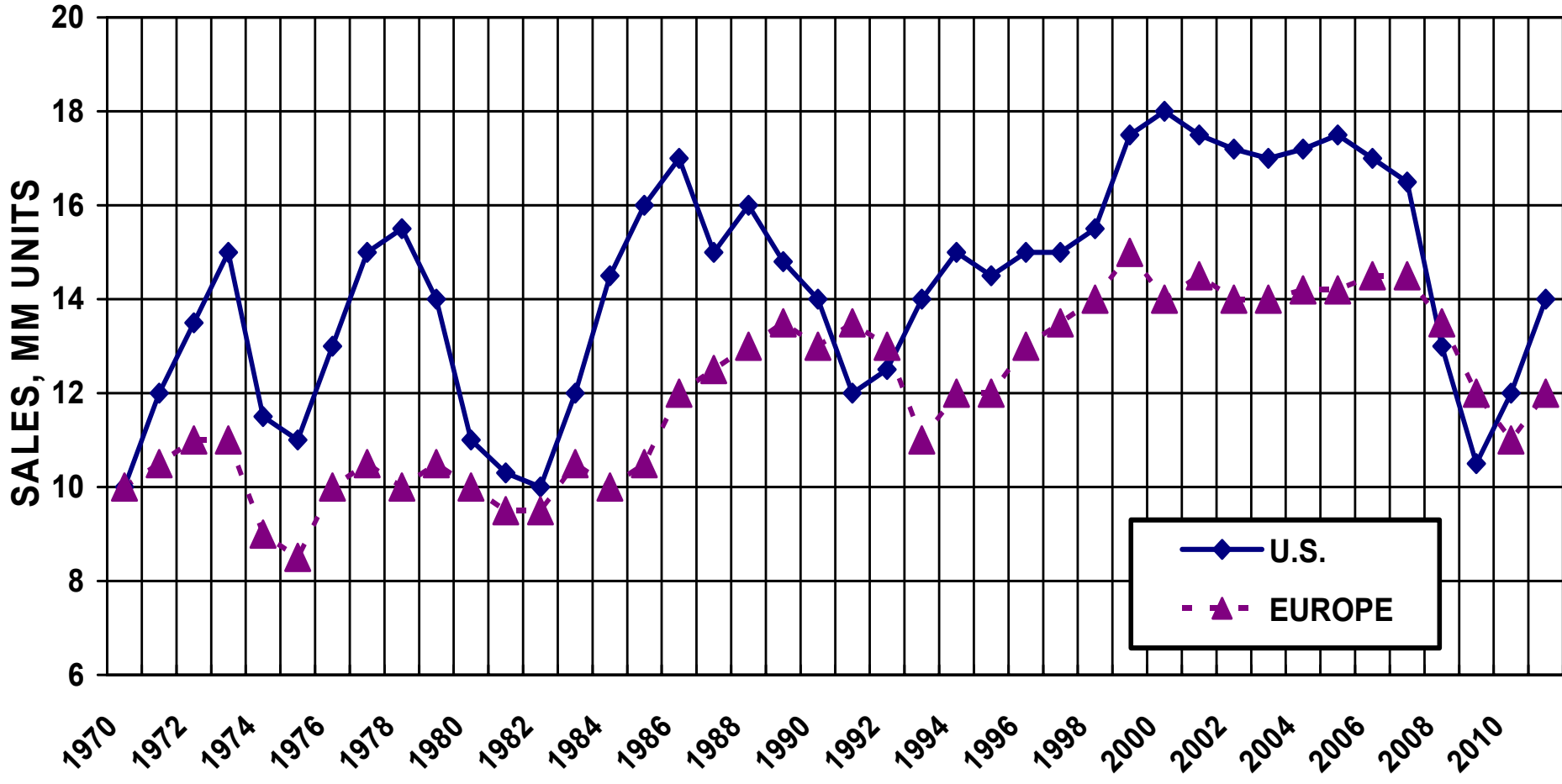
# GLOBAL VEHICLE SALES OUTLOOK



SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009

r/mydox/Auto Industry/Global Ind Volume TW 081209.xls

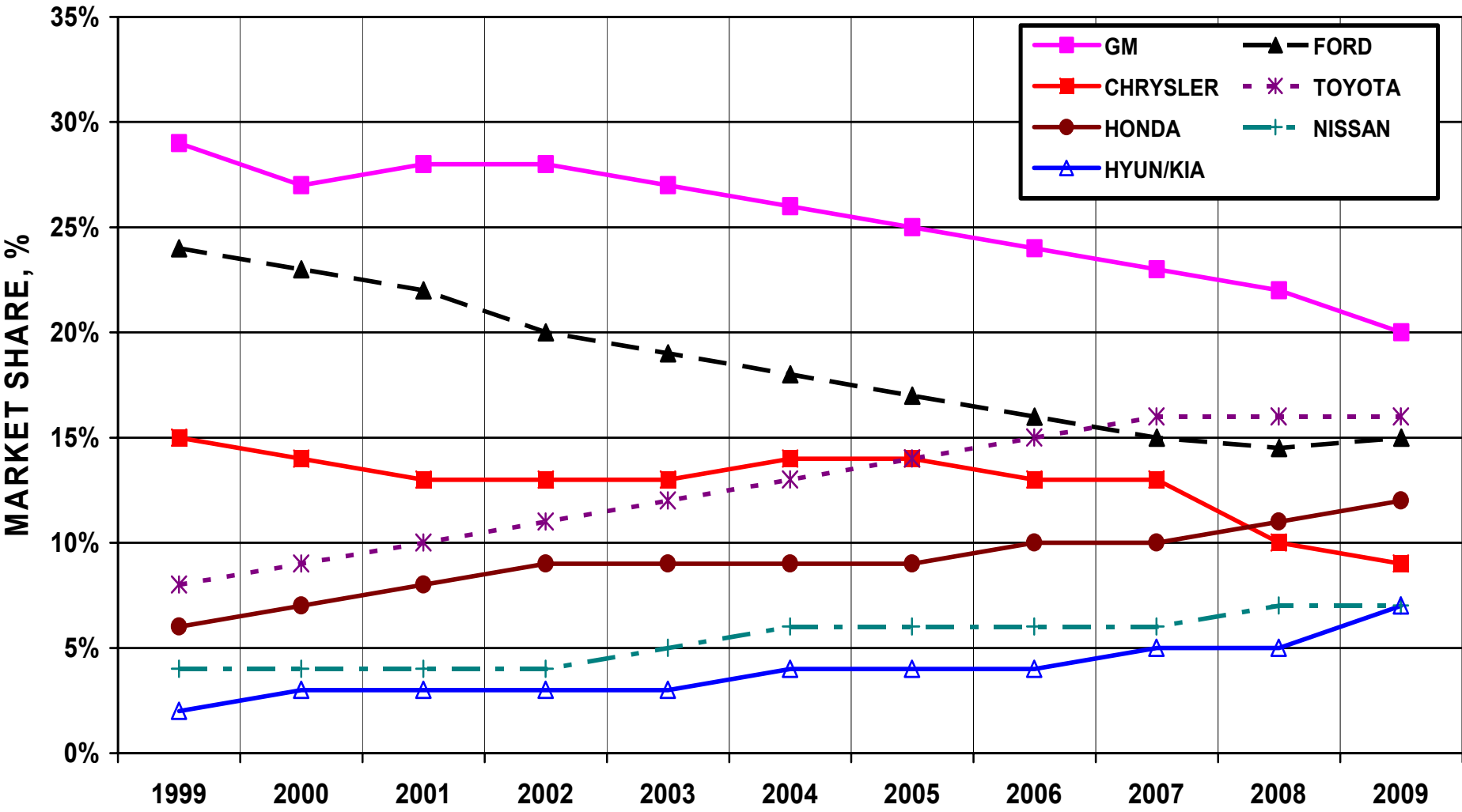
# U.S. AND EUROPE LIGHT VEHICLE SALES



SOURCE: DEUTSCHE BANK, 2009

B/mydox/auto industry/NA and EUR sales.xls

# U.S. MARKET SHARE BY OEM



SOURCES: MOTOR INTELLIGENCE; ROBERT ELLER ASSOCIATES LLC, 2009

B/mydox/auto industry/US mkt share by OEM.xls

# THE AUTOMOTIVE MARKET

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## **Wilbur Ross' Predictions for ('08/'09) On Target –**

- 2009 N. American production decline to < 9MM
- U.S. highly saturated: replacement market, little growth potential
- Unemployment: ~ 10%
- U.S. median per capita income: stalled at ~ \$45K
- Housing foreclosures
- Net worth decline

# AUTOMOTIVE MARKET: NEXT 10 YEARS

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- U.S./Europe driving age population 496MM:
  - 1/2 the number in China
  - 2/3 size of the same population in India
- High demographic/middle class growth rates in China/India
- Auto industry growth/volume will benefit China/India
- Regional market shift accelerating

# GLOBAL REGION MARKET SHIFT UNDER WAY



LOCATION	2009 YTD SALES GROWTH/DECLINE
Europe*	-18%
N. America*	-26%
Japan*	-21%
Brazil	+ 5%
India	+ 5%
China	+42%

\* = Mature markets represent about 60% of global sales

Source: Robert Eller Associates LLC, 2009

# AUTOMOTIVE MARKET: FUEL PRICE EFFECTS

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- Fuel price tipping points:
  - shifts in vehicle preference
  - 2008:\$3.50-4.00/gal. → 100BN fewer miles driven (U.S.)
- Likely fuel price rise? → Changes auto and autoplastics paradigms:
  - rising oil demand/decreasing production?
  - easy-to-get oil has gotten harder to find
  - economic recovery
  - global population jump by 1.0BN in next 12 years
  - “middle class” increase by 1.8BN (600MM in China)
  - gas taxes in U.S. (remain constant at 0.18/gal.?)
  - diesel pricing policy

# THE OIL PRICE ROLLER COASTER



**Have the 2008 fuel price spike and tipping point permanently shifted:**

- **fleet composition**
- **lightweighting incentives**
- **Break-even volumes**



Source: Foreign Affairs, Sept./Oct. 2009

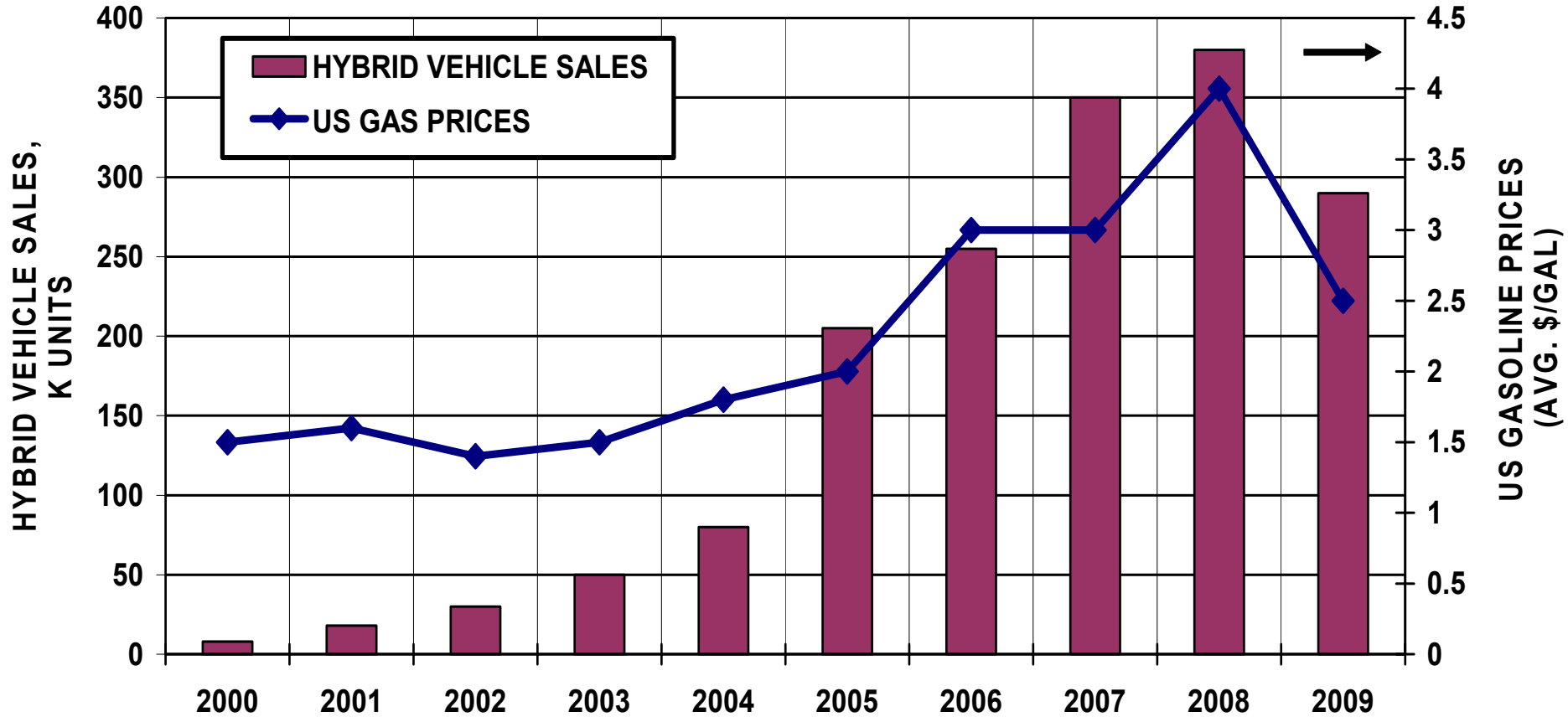
# AUTOMOTIVE MARKET: FUEL PRICE EFFECTS

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- Plug-in hybrids: bridge to a (composite intensive) electric car/alternative propulsion world
- Diesel future: still uncertain
- Global Li-ion auto battery sales:
  - \$12BN in 2010
  - \$35BN in 2015
- Fuel price increases/environmental legislation increases:
  - emphasis on light weight solutions
  - \$/kg saved increases
  - TPO demand via new applications

**Are you positioned for new opportunities?**

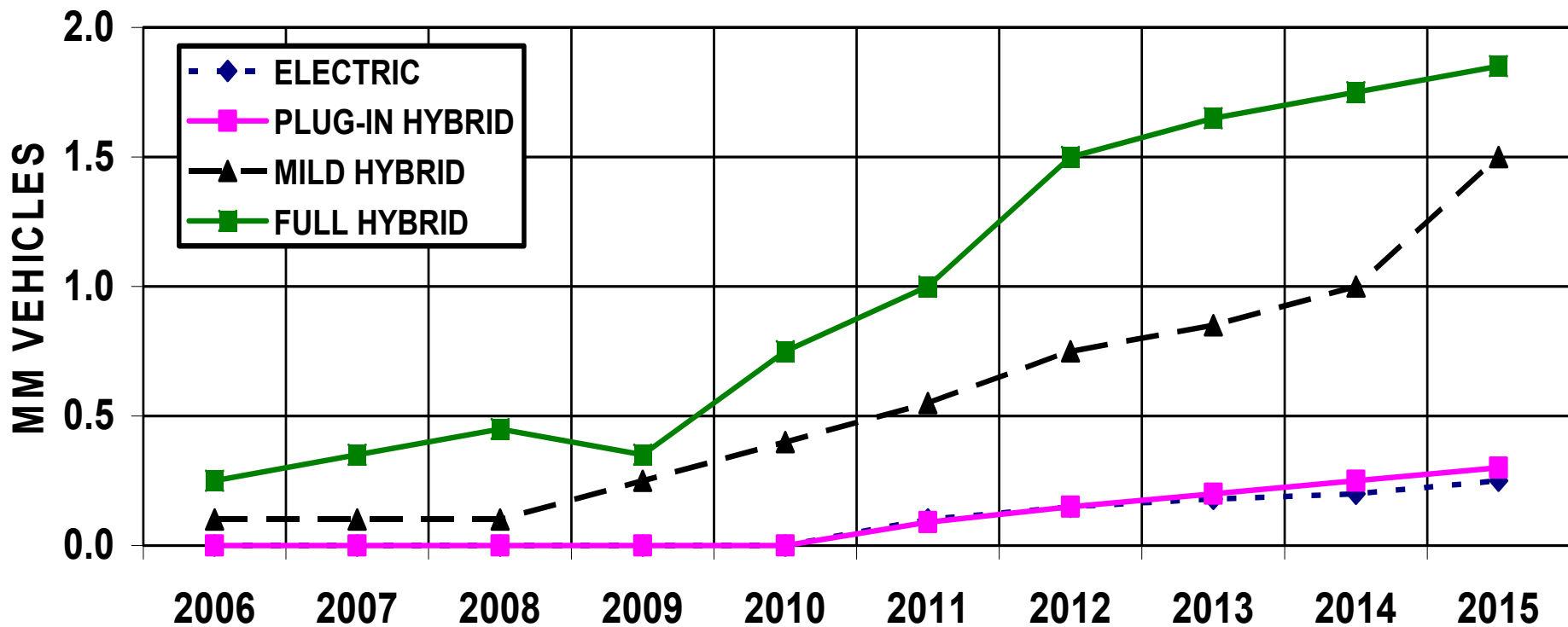
# U.S. HYBRID VEHICLE DEMAND vs. FUEL PRICES



SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009

<b/mydox/auto industry/hybrid and electric cars.xls>

# CURRENT AND FORECAST HYBRID AND ELECTRIC VEHICLE SALES - N. AMERICA, 2006-2015



SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009

b/mydox/auto industry/hybrid and electric cars.xls

# POST-RECESSION PARADIGM SHIFT

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- Restructured OEM market shares (esp. N. America)
- Restructured autoplatic supply chain
  - emphasis on leaner manufacturing
  - shorter path to market
  - narrowed supplier selection
- Shifted vehicle sourcing towards OEMs with smaller, fuel efficient vehicles

**Have you shifted your business  
planning paradigm?**

# AUTO TPO DEMAND



- TPO fabrication economics substantially improved last 5 years
- Auto TPO demand (N. America): severe 2009 decline, recovery by 2012-2015
- New applications (despite small-vehicle share gain) → increased kg/vehicle
- TPO demand shares:
  - Exterior fascia/cladding: major share, mature
  - Exterior panels: growth target (material innovations)
  - Interior: process innovation opportunity

# AUTO TPO DEMAND: N. AMERICA



YEAR	VEHICLE PROD'N., MM UNITS	AUTO TPO DEMAND		NOTE
		MM LBS.	kT	
2007	15.3	500	227	
2009	8.8	300	136	<ul style="list-style-type: none"> <li>- Continued OEM share shift</li> <li>- Depressed market</li> </ul>
2015	15.0	550?	250?	<ul style="list-style-type: none"> <li>- Vehicle fleet shift to smaller vehicles</li> <li>- Increased TPO penetration in exteriors/<b>thermoset competition?</b></li> <li>- TPO synergy from LGF-PP compounds</li> <li>- Interiors penetration continues</li> </ul>

# GLOBAL RECESSION DRIVERS FOR AUTO TPO



**GLOBAL RECESSION DRIVERS FOR AUTO TPO**

**AUTO SALES DECLINE, SLUGGISH RECOVERY**

**OEM MARKET SHARE SHIFT**

**SUPPLY CHAIN CONSOLIDATION, REORGANIZATION**

**SHIFT OF TECHNICAL CHOICES**

**AVOID CAPEX**

**LEAN SUPPLY CHAIN CHOICES (REDUCE UNIT OPERATIONS)**

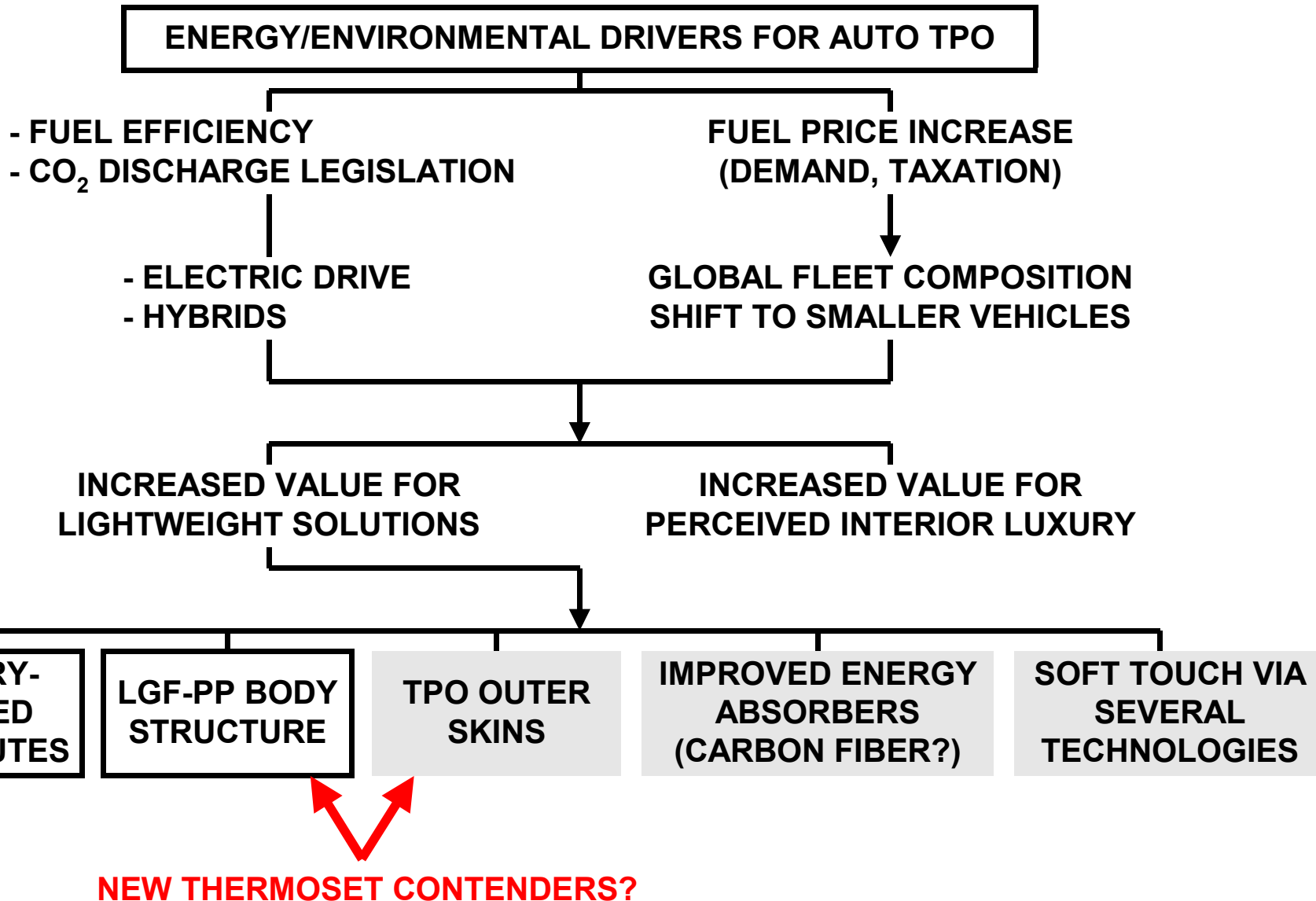
**MAXIMIZE EXISTING TECHNOLOGY**

**IN-MOLD DECORATION  
SURFACING METHODS**

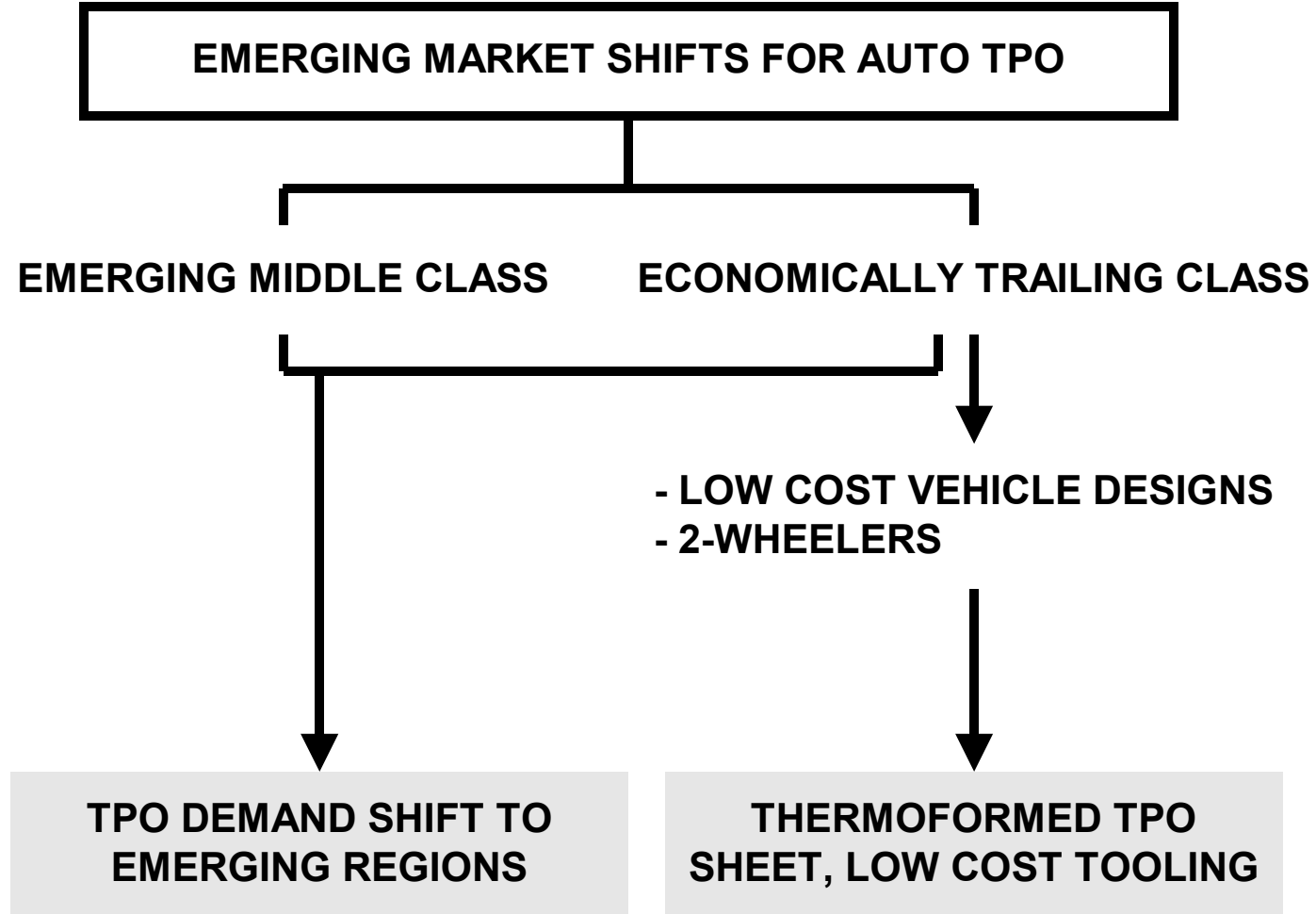
- **DIRECT COMPOUNDING(a)**
- **2-SHOT MOLDING**
- **IN-MOLD FOAMING**

**NOTE: (a) DIRECT COMPOUNDING = D-LFT, AT-PRESS FILLER ADDITION, ETC.**

# ENERGY/ENVIRONMENTAL DRIVERS FOR AUTO TPO



# EMERGING MARKET SHIFTS FOR AUTO TPO



**SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009**

# MAJOR FACTORS AFFECTING AUTO TPO DEMAND



**FUEL PRICES,  
CO<sub>2</sub> LEGISLATION**



**LIGHT WEIGHT**



**FLEET SHIFT TO  
SMALLER VEHICLES**



**LUXURY**



**GLOBAL MARKET  
SHIFT**



## **AUTO TPO OPPORTUNITIES:**

**MULTIPLE APPLICATIONS;  
COMPLEMENT LGF-PP**

**SOFT TOUCH, SMALLER  
PARTS, SURFACE DECO-  
RATION COST SAVE**

**- MARKET SHIFT TO  
CHINA/INDIA  
- THERMOFORMED SHEET**

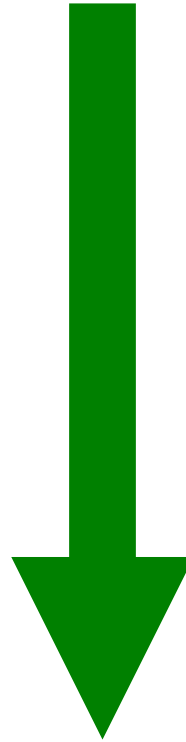
**SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009**

# TPO EMERGING FROM HIGH AUTO CONCENTRATION?

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## **AUTO TPO COMPOUND TECHNOLOGIES**



**NEW NON-AUTO MARKETS,  
e.g., BUILDING/CONSTRUCTION**

# AUTO TPO SUPPLY CHAIN SHIFTING

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- Resin supplier share gain (reactor TPOs, captive compounding)
- Regional resin production shift (to petroleum-rich regions)
- Lean (direct) fabrication technologies
- Direct compounding
- Non-domestic OEMs importing suppliers (to U.S., Mexico)
- Supplier shifts to low cost regions

# TPOs AND FIBER-REINFORCED PLASTICS



- Fiber-reinforced plastics (esp. long-glass reinforced PP [LGF-PP]) will increase share and be among the drivers for TPO demand for:
  - hatchback doors
  - front end modules
  - under body shields
  - door hardware modules
- LGF-PP structural inner panel/micro talc-TPO exterior skin (e.g., Ford Kuga)
- Movement into monocoque construction  
**(thermoset competition?)**

## HATCHBACK DOOR: GROWTH APPLICATION FOR TPOs



**Vehicle:** Ford Kuga (2010)  
**Application:** Roof spoiler, tailgate outer panel  
**Grade:** LyondellBasell Hifax TRC 280X  
**Molder:** Plastal

**REA Notes:**

- Inner panel is LGF-PP compound (Stamax from SABIC)
- Design transfer to U.S. (2010)

**Photo:** Robert Eller Associates LLC  
r/myd ox/p apers/spetpo 2009pix.ppt

# HATCHBACK DOOR INNER: GROWTH APPLICATION FOR LGF-PP



**Part:** Hatchback door inner panel  
**Material:** 40% LGF-PP  
**Status:** Prototype  
**Molder:** Plastal  
**Process:** D-LFT (injection)  
**Equipment:** Krauss Maffei  
**Note:** Competes with LGF-PP compound

**Photo:** Krauss Maffei

r/myd ox/p apers/spetpo 2009pix.ppt

# MERCEDES SMART FORTWO TAILGATE: PRECURSOR FOR LGF-PP AND TPO IN BODY STRUCTURES?

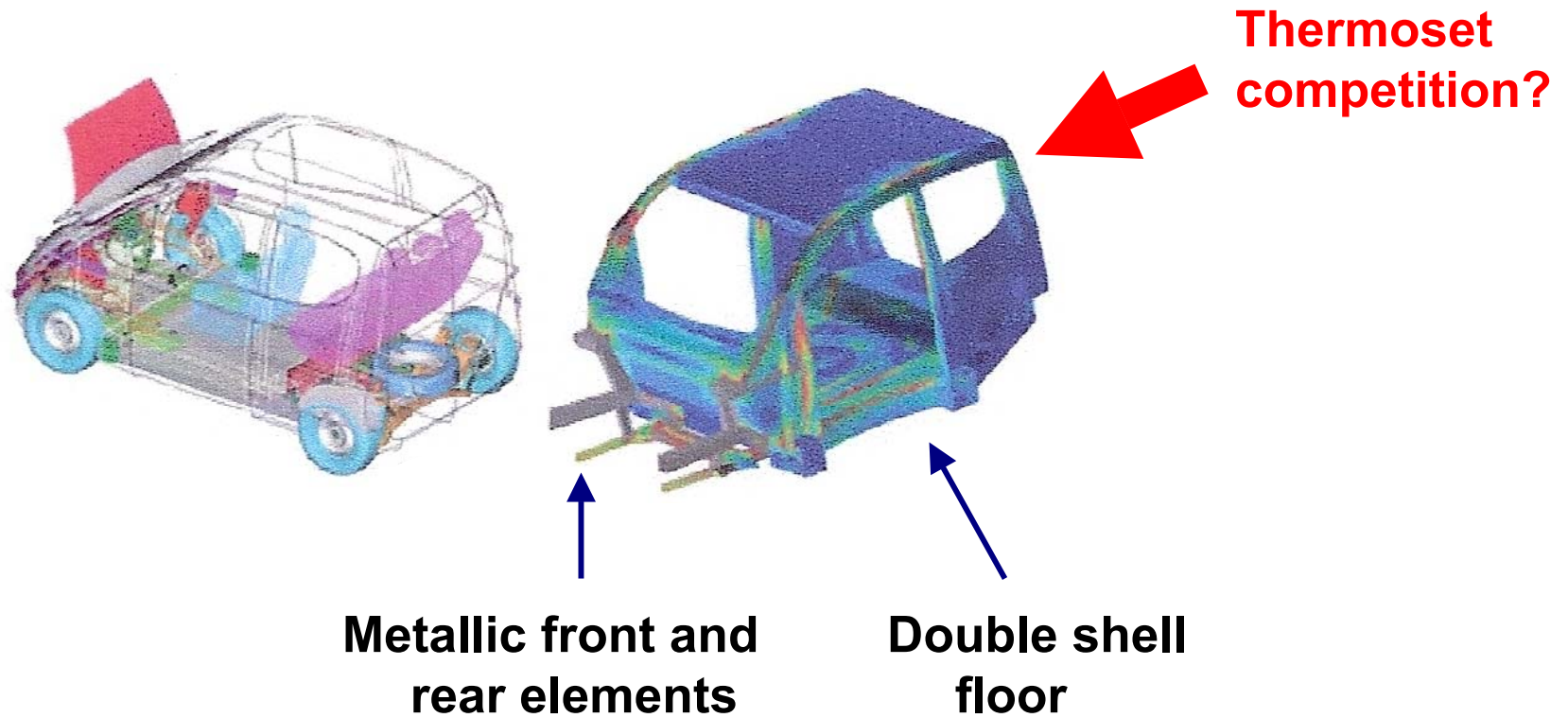


- 20% stiffness increase vs. earlier version
- LGF-PP move into body structures
- Early use of E-LF-PP (endless long fiber polypropylene)
- Mineral-filled TPO exterior skin

- E-LF-PP gives high load bearing and impact absorbency
- Translation potential for rear seat backrest

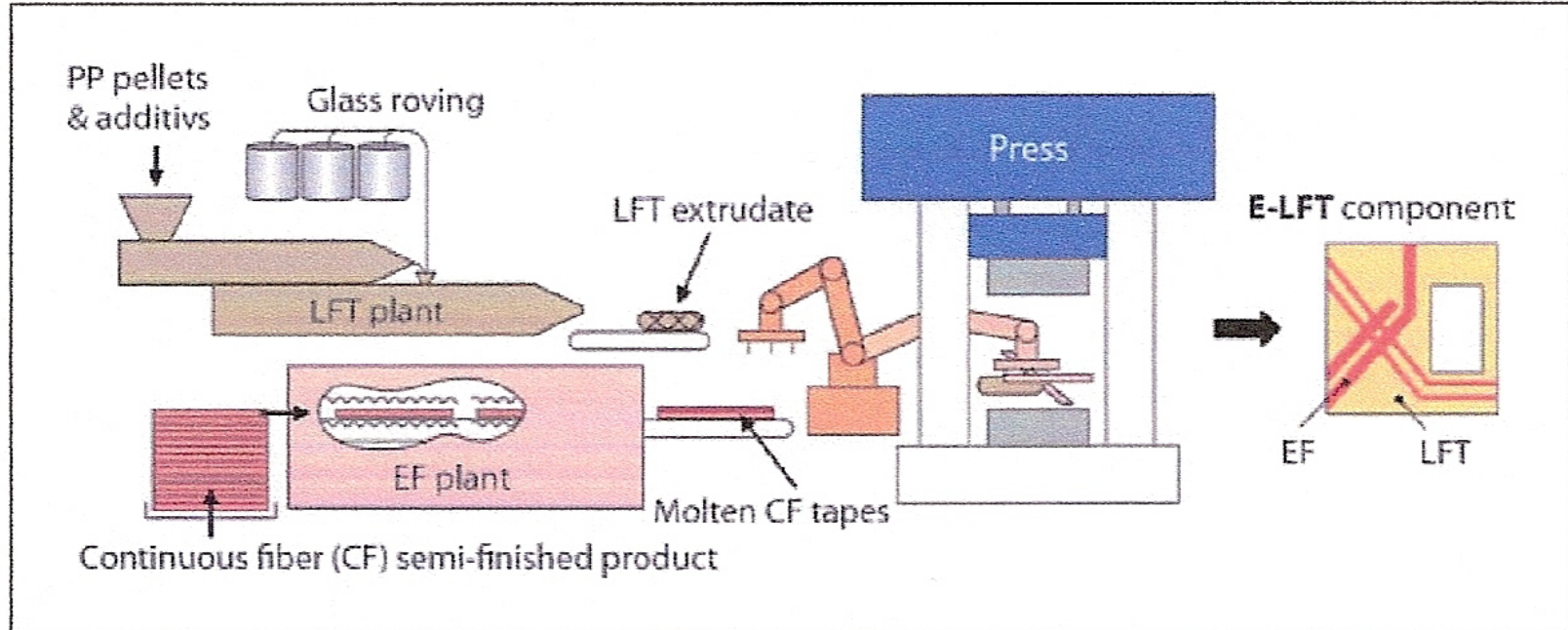
Source: Weber Automotive; ESORO AG

# DESIGN CONCEPT FOR E-LGF-PP BASED COMPACT CAR BODY STRUCTURE



Source: Weber Automotive; ESORO AG

# EXAMPLE OF LGF-PP & E-LF-PP DIRECT PROCESS



Source: Robert Eller Associates LLC, 2009

# 2-SHOT MOLDING AND SOFT TOUCH

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- 2-shot molding:
  - established in consumer/health care
  - widely used in auto (lighting, lenses, multi-color)
  - auto soft touch starting
- 2-shot/TPO growth resulting from:
  - high flow grades
  - 3 layers (skin/foam/substrate) in 2 shots
- In-mold forming of TPO skin/back injection gaining share in capex constrained economy

# SOFT TOUCH REINFORCED TPO

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- Small vehicle share increase:
  - drives towards higher quality interiors
  - without high cost of multi-step processes
  - new generation of glass fiber reinforced, MIC TPOs with soft touch surface for interiors:
    - improved scratch and mar
    - low knit line visibility
    - low gloss
    - compete with soft touch paints/  
thermoformed or slush molded skins

# RENEWED EMPHASIS ON PAINT COST REDUCTION

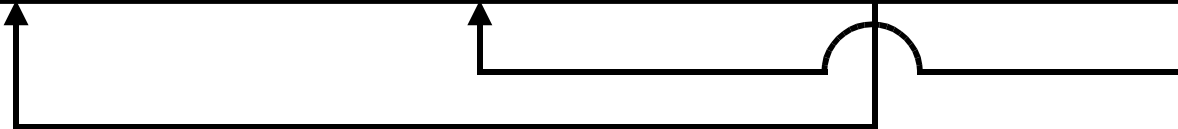


## Adpro elimination . . . Are we finally there?

### Basis:

- Part size: 8 ft<sup>2</sup>/part
- Cost/gal. for base coat, clear coat, and PC-25 are equal
- Equal cost for labor to apply each coat

	Adpro + SB Treatment + SB Base Coat + SB Clear Coat	Adpro Treatment + SB Base Coat	SWT-PC- 25 + Clear Coat	SWT-PC- 25
<b>Total Cost: \$/Part</b>	<b>5.39</b>	<b>3.00</b>	<b>4.76</b>	<b>2.38</b>



### Notes:

SB – solvent based  
Gallon – US gallon

# RENEWED EMPHASIS ON PAINT COST REDUCTION

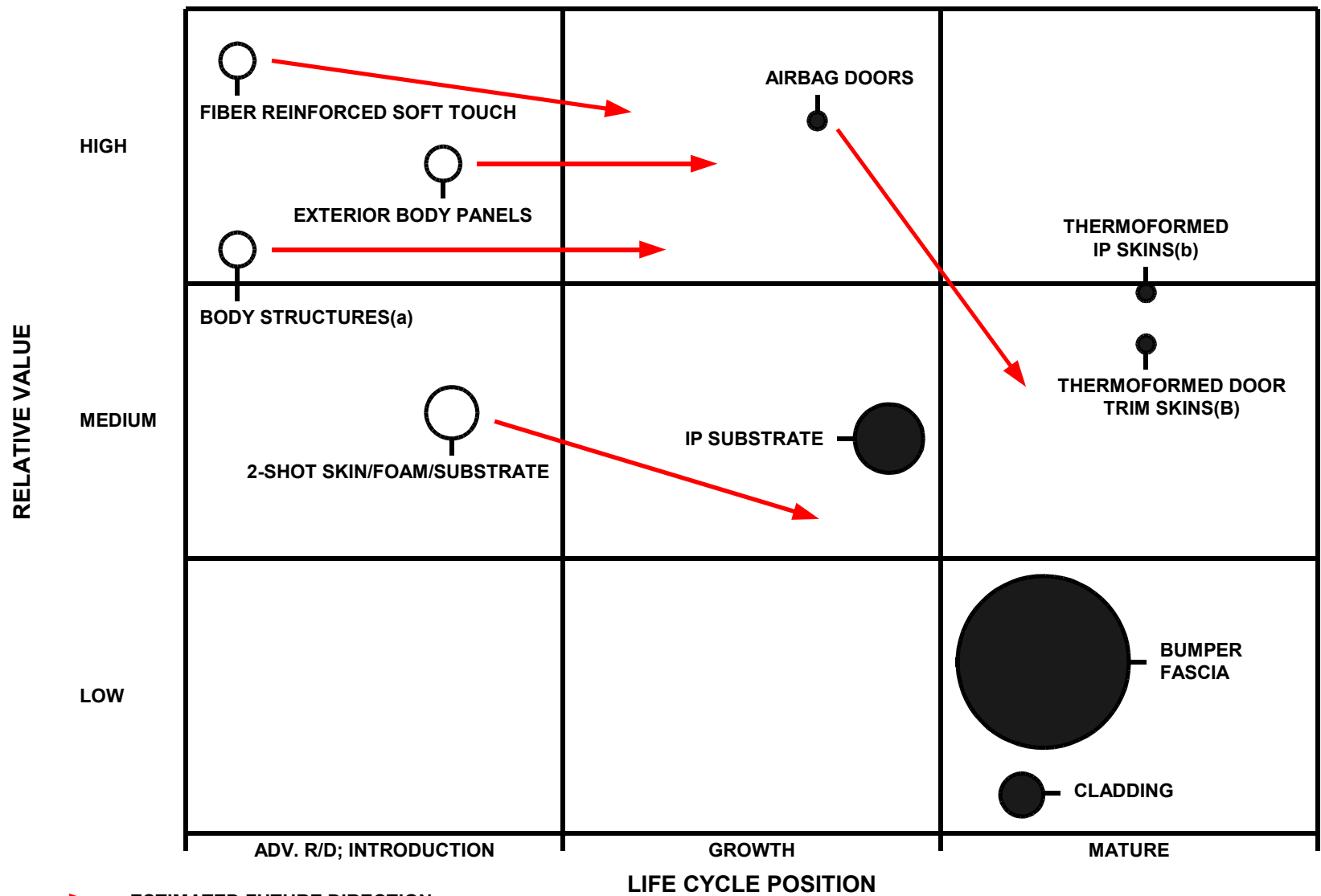


		Adpro	Base Coat	Clear Coat	PC-25
<b>Inputs</b>	<b>Solids, %</b>	<b>10</b>	<b>35</b>	<b>35</b>	<b>35</b>
	<b>Dry film thickness, mils</b>	<b>0.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>
	<b>Transfer efficiency, %</b>	<b>60</b>	<b>70</b>	<b>70</b>	<b>70</b>
	<b>Cost: Coating + Labor, \$/ gallon</b>	<b>25</b>	<b>90</b>	<b>90</b>	<b>90</b>
<b>Outputs</b>	<b>Coverage, ft.<sup>2</sup> / gal.</b>	<b>320.8</b>	<b>302.3</b>	<b>302.3</b>	<b>302.3</b>
	<b>Gallon/part</b>	<b>0.025</b>	<b>0.026</b>	<b>0.026</b>	<b>0.026</b>
	<b>Cost: \$/part</b>	<b>0.62</b>	<b>2.38</b>	<b>2.38</b>	<b>2.38</b>

Source: SWT Group

r/mydox/SWT/paint cost reduc.ppt

# AUTO TPO LIFE CYCLE POSITIONS



NOTES: (a) LGF-PP = LONG GLASS FIBER PP; E-LF-PP = ENDLESS (E.G., TAPE REINFORCED) LONG FIBER PP

(b) INCLUDES THIN PP (TPO) FILM TECHNOLOGY INTRODUCED IN EUROPE (BY JCI, OTHERS)

# FUTURE VISION/SUMMARY

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- Global vehicle sales recovering slowly:
  - much faster in China/India
  - future volume shares shifting toward Asia
- TPO supply chain restructuring
- Supplier reduction programs continue, e.g., Ford's Aligned Business Framework (ABF)

# FUTURE VISION/SUMMARY (Cont'd.)

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- TPO demand affected by:
  - shift to smaller vehicles, hybrids, electric vehicles
  - likely fuel price increases
  - CO<sub>2</sub> and CAFE legislation
  - increased value for lightweighting
  - new generation of TPO applications
  - synergy with fiber reinforced PP
  - new opportunities from micro-talc compounds
- Approaches to reducing/eliminating surface coating costs continue to gain share