



How is Technology Adopted? A Discussion of Hybrid-Electric and Diesel Technology Consumer Preferences

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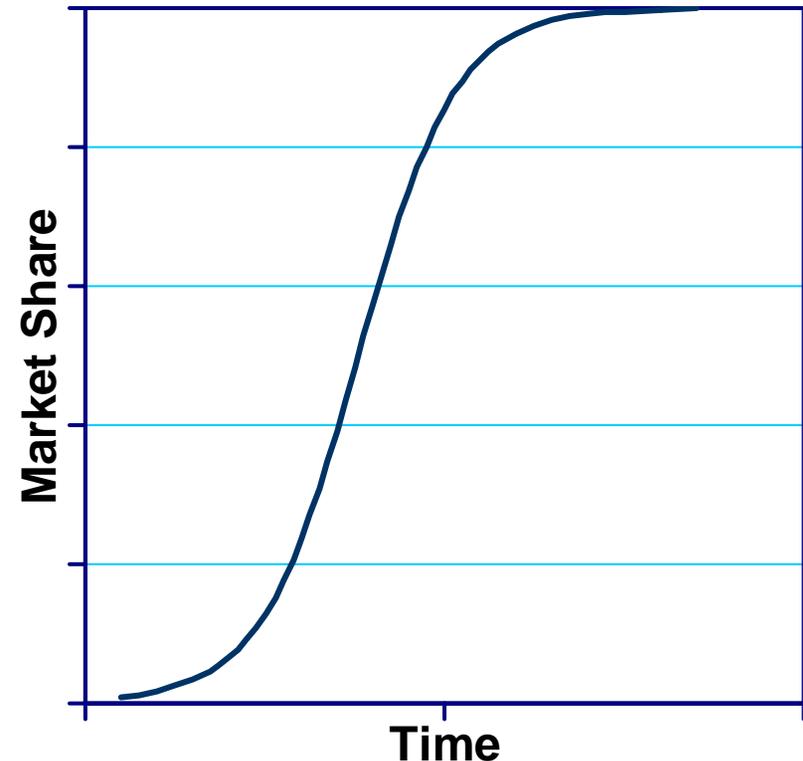


Buyers Insensitive to Price May be Important to Get HEVs Started

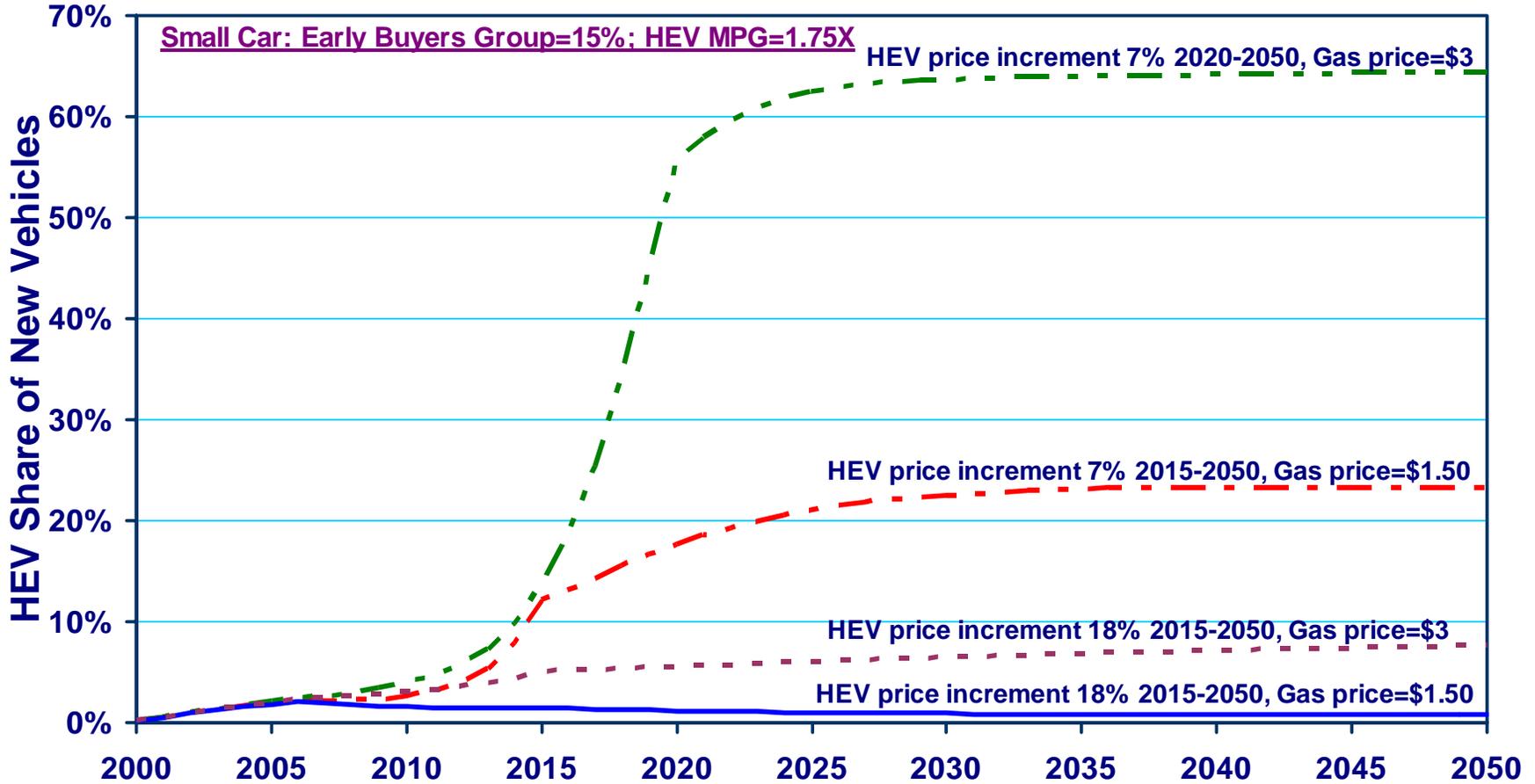
- ❖ Prior stated preference studies implied that consumers would pay “too much” for advanced and alternative fuel technology
- ❖ Revealed preference is much more consistent with “rational” buying, but very different
- ❖ NEMS currently uses revealed preference coefficients, one buyer group
- ❖ Should models with more buyer groups be constructed? Is it important for HEVs, FCVs?

Base Assumptions About Market Share Posit a Smooth “S” Penetration Curve, via Cost Dominated Rational Decisions

- ❖ **A slow initial growth:**
high product price due to
low volume, inexperience
- ❖ **A period of rapid rise:**
product costs drop sharply
with production volume
- ❖ **A period of reduced
growth:** slow reduction in
prices at high volume
- ❖ **Attainment of a
saturation level**



The Multiple-Buyer Class AVID Model Can Result in an “S”, But Has Turmoil Within (3 Buyer Groups, Producer Response Lag)



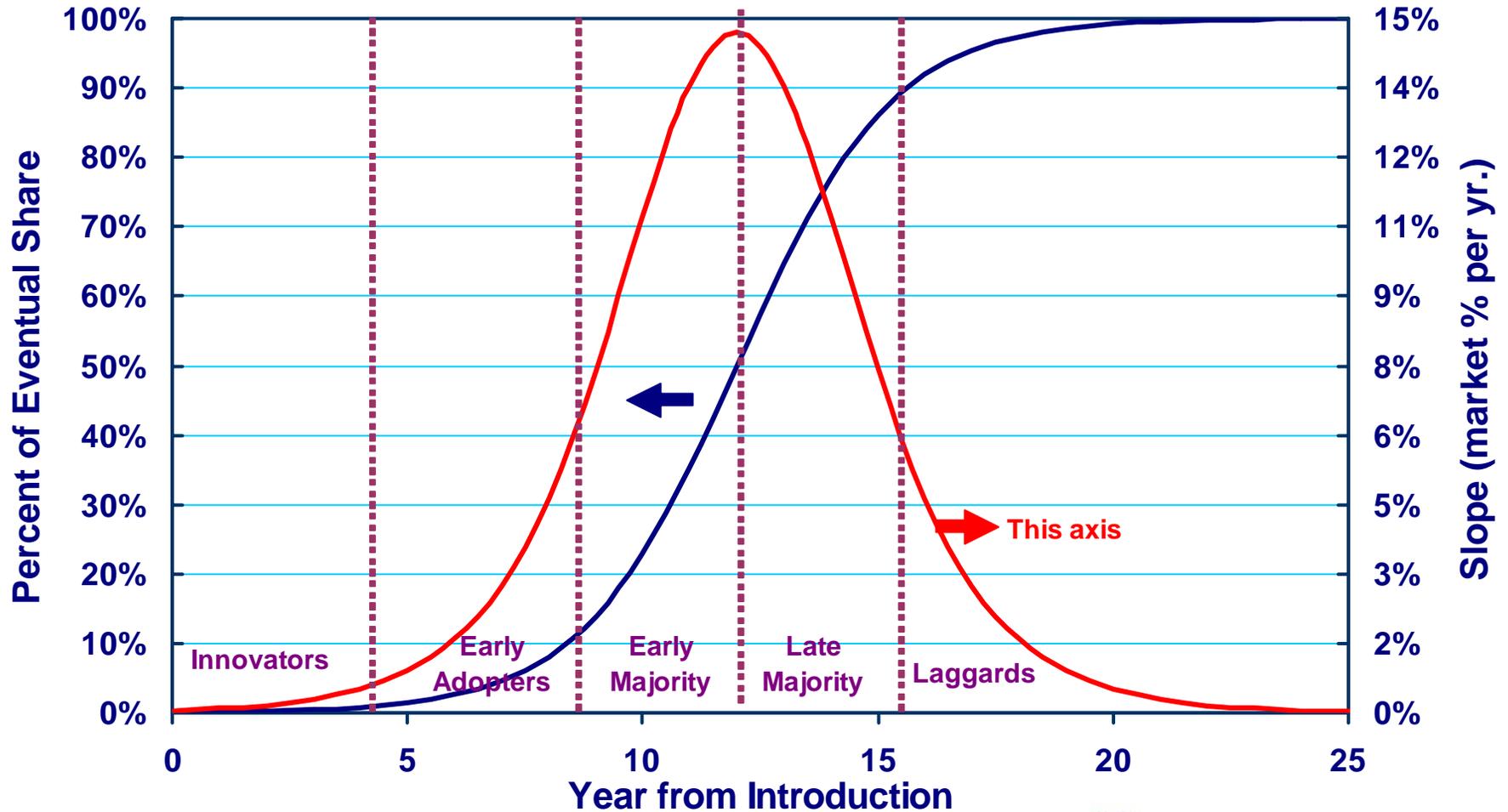
Consistent with G. Moore, AVID Buyer Characteristics Also Vary

G. Moore ¹	AVID Model ²	Moore/AVID Buyer Attributes
Innovators	Early adopters	Attracted to new technology; <u>less sensitive to price</u> ; risk takers
Early adopters	Early adopters	Rely on own intuition; not pragmatic; influenced by innovators
Early majority	Early buyers	Use <i>own group</i> references; pragmatic; intense product use
Late majority	Majority buyers	Conservative and pragmatic; buy for function; not intensive users

¹ Moore, G.A., 2002, *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Consumers*, HarperCollins, New York, NY.

² Santini, D. and A. Vyas, 2004, *Suggestions for a New Vehicle Choice Model Simulating Advanced Vehicles Introduction Decisions (AVID): Structure and Coefficients*, Argonne National Laboratory

The Implied Rate of Change In Year-to-Year Share Has a Symmetric Shape

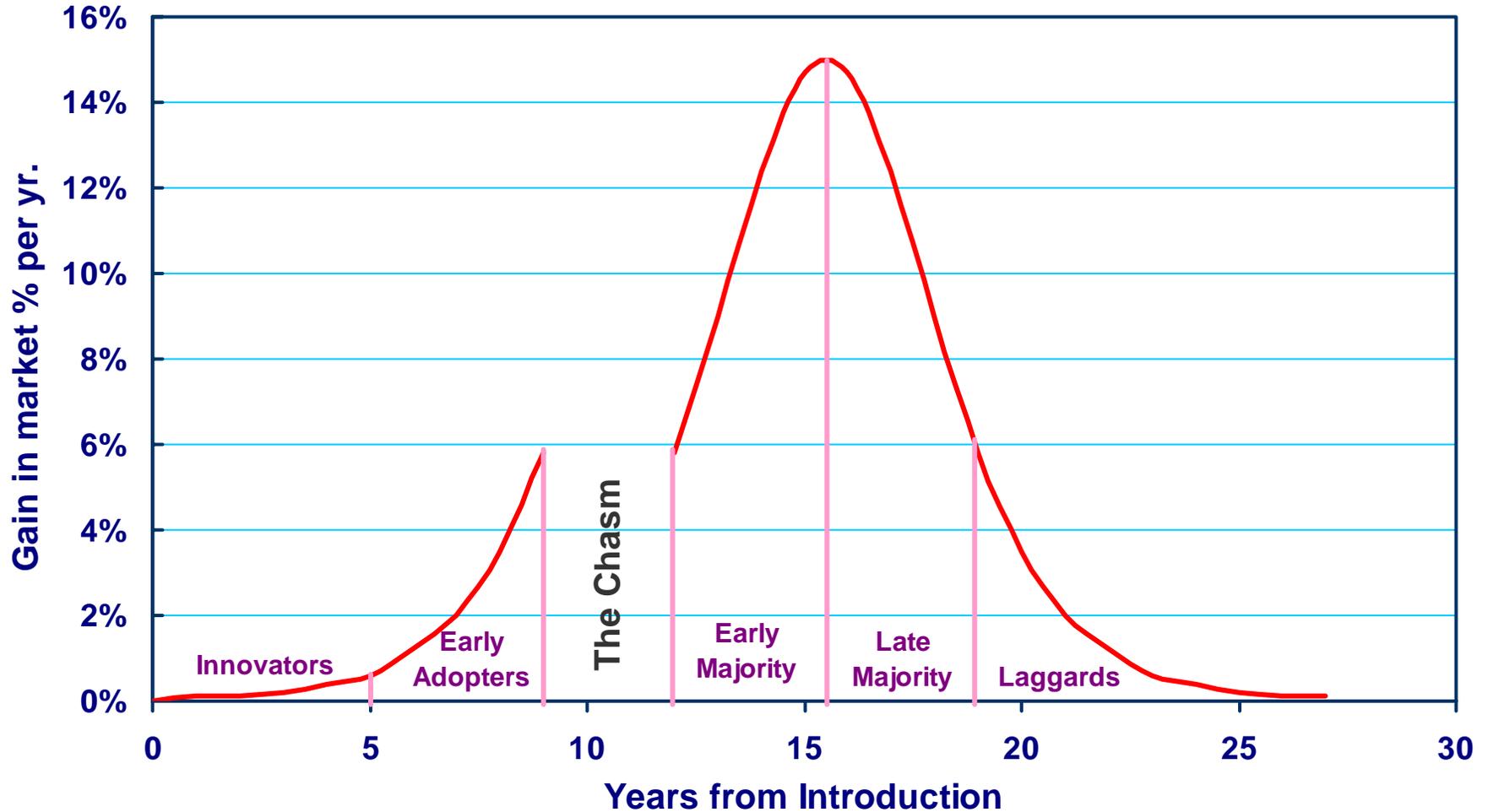




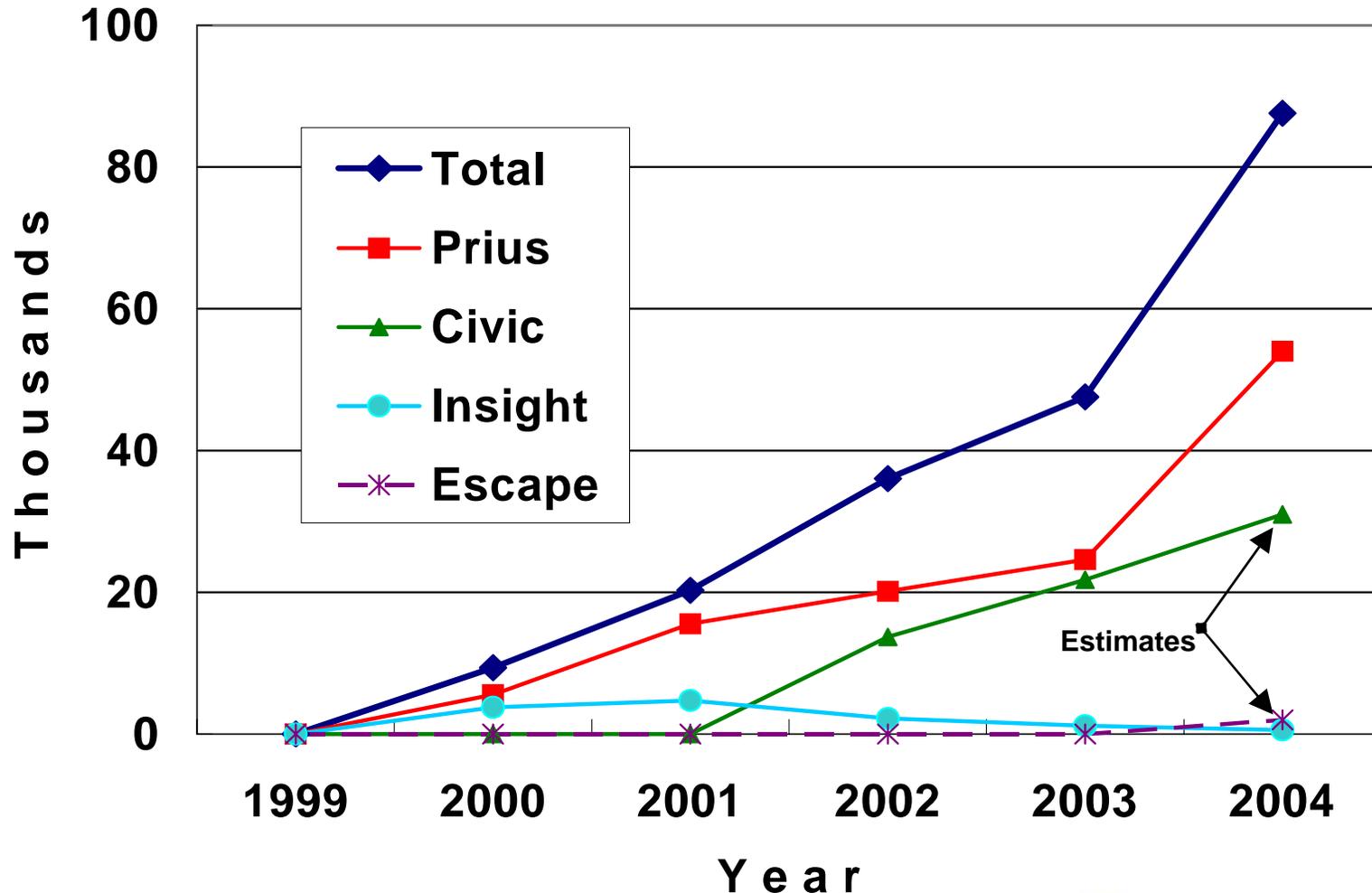
Early-Adopters Provide a Start; Majority Buyers are the Target

- ❖ Innovators enter the market early and leave when technology is unique no more, early adopters follow
- ❖ Early adopters help push the technology to a point, but they are limited in numbers
- ❖ Between early adopters and the more cautious early-majority, a “chasm” is posited by G. Moore
- ❖ Innovators & early adopters can provide volume, experience to reach early majority desire of low cost
- ❖ Majority buyers do not use early adopters as references! (nominally a marketing problem)

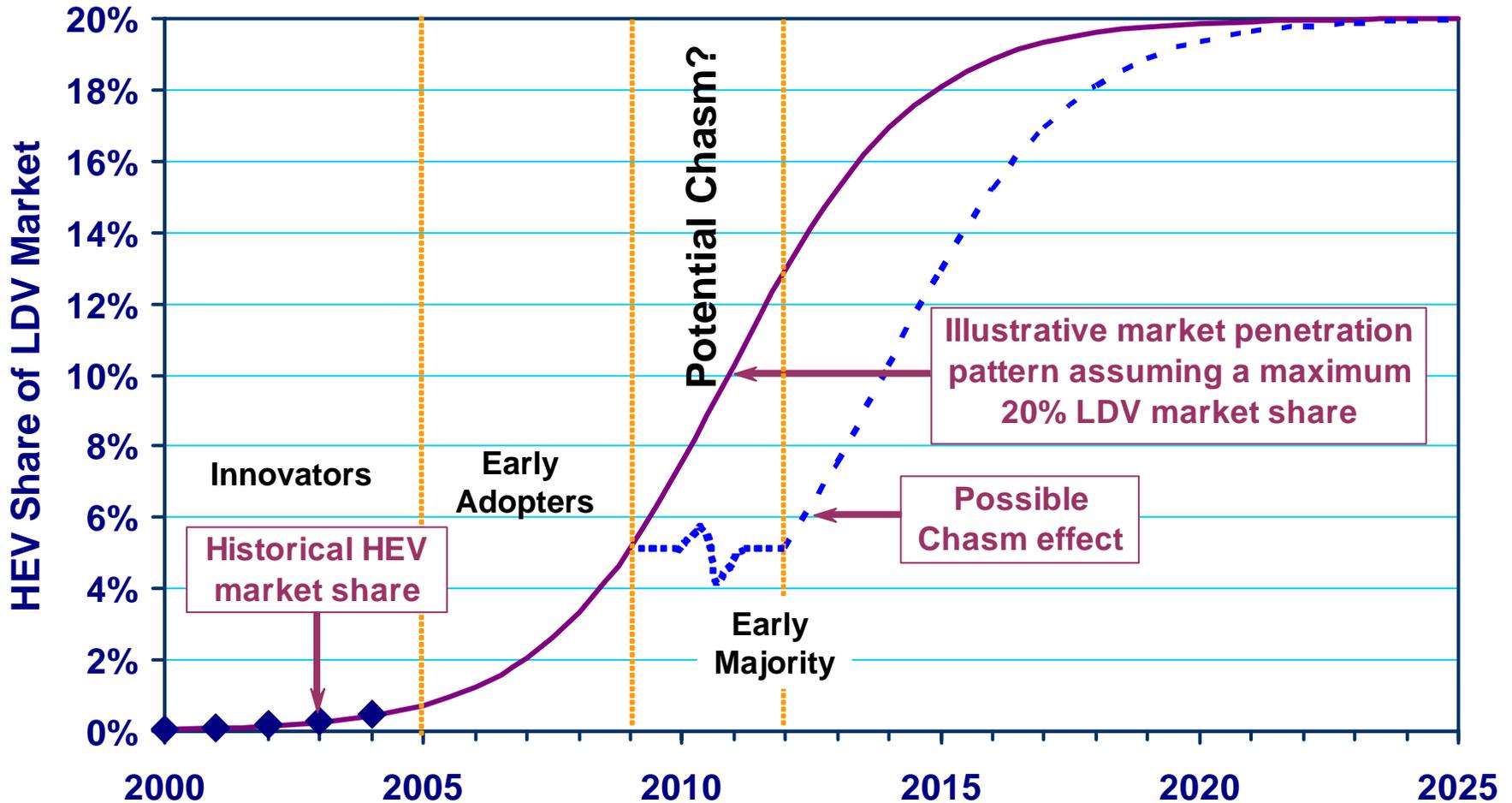
Getting to and Crossing Moore's "Chasm" Is Essential for Success



HEV LDV Sales are Steadily Rising, but are Only 0.5% of the '04 Total



Are HEVs Now Attracting Innovators, Early Adopters, or the Early Majority ?





Diesel and Hybrid Technologies: Where Do They Stand?

- ❖ **Diesel technology marketed for many years**
 - Is known to consumers
 - May not attract any more innovators
 - Is probably past the stage of early adopters
- ❖ **Hybrid technology new to the market**
 - Is not well known to consumers
 - Has attracted innovators
 - Appears to be shifting at least to early adopters
 - Will it cross the “Chasm” soon? Is it now?



Perspective on Majority Capture May Depend on Degree of Model Preference

- ❖ **DOE/ORC Survey: ~ 15% total innovators and early adopters**
- ❖ **If 15% of the compact car market is captured first, will early majority buyers remain for other models?**
- ❖ **Is Toyota correct that they are now capturing the early majority? Of what market? Have they crossed the chasm? Or is it still ahead?**
- ❖ **Are current HEV intenders just like diesel intenders – pragmatists about fuel savings? Or are HEV intenders systematically different?**

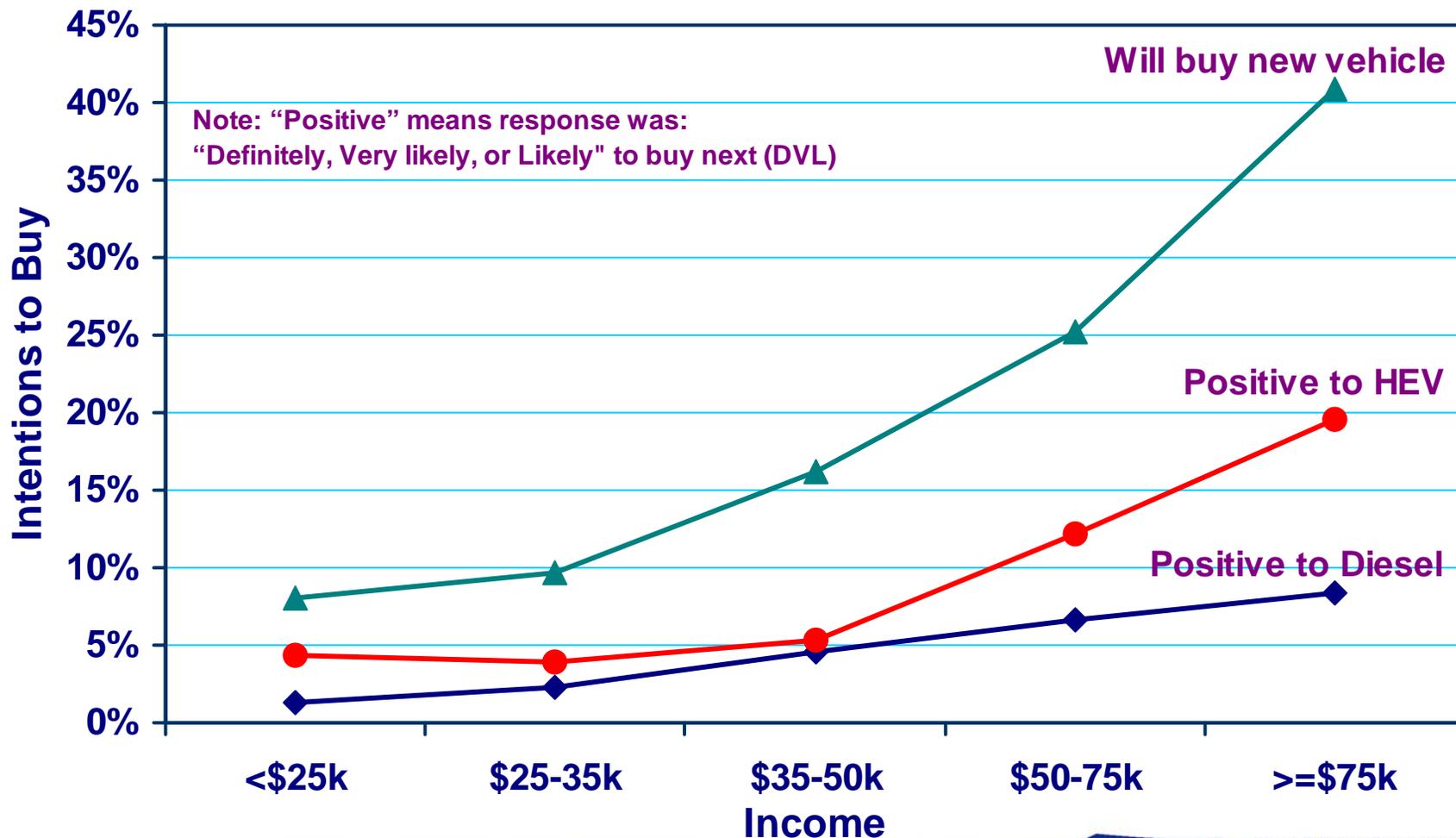
An Analysis of Consumer Perceptions of Diesel and Hybrid Technologies



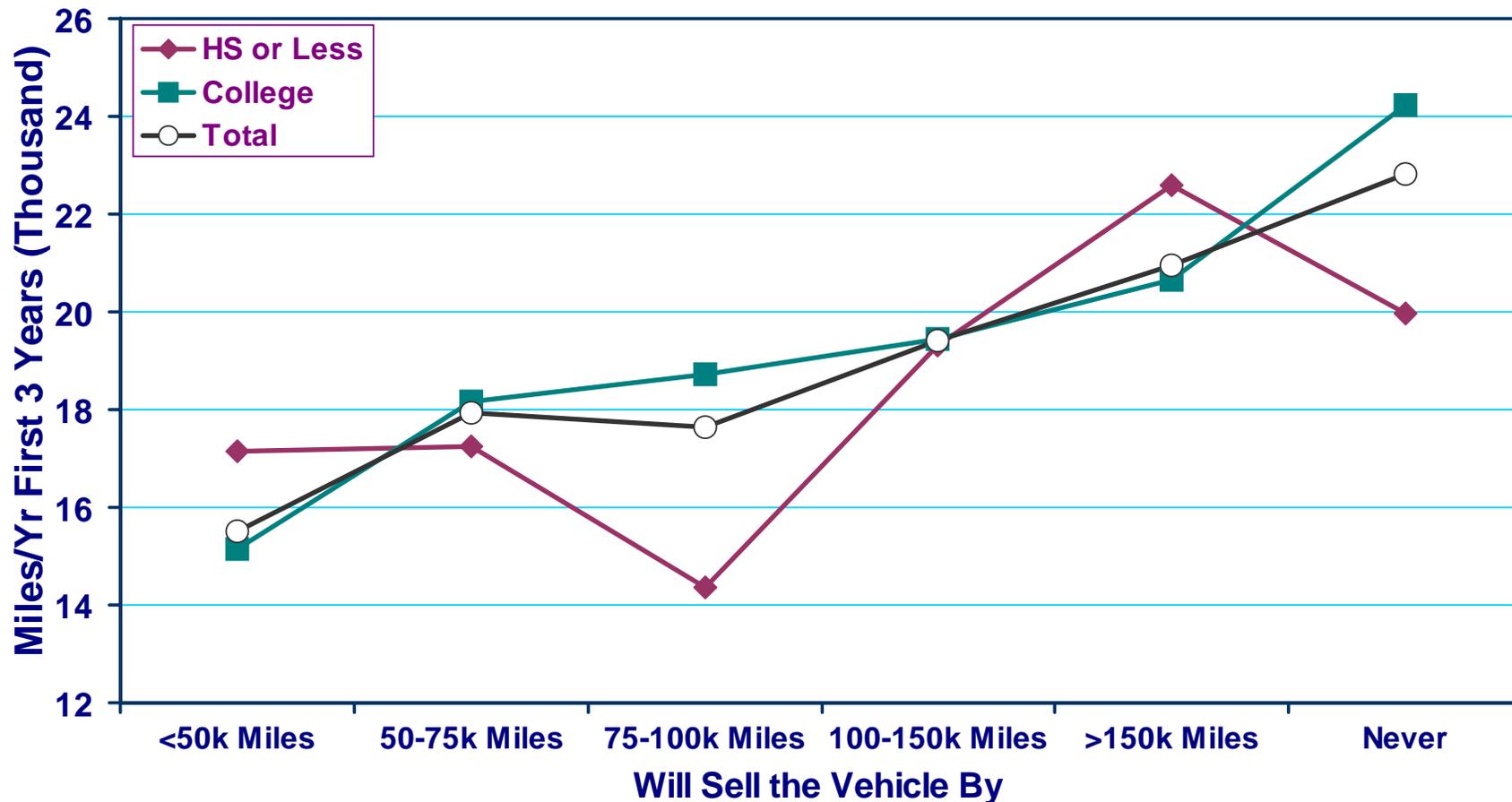
Perceptions of New Technology Vehicles Were Analyzed

- ❖ **Survey covered 1036 households and collected information on**
 - **New vehicle purchase intentions**
 - **Extent of a new vehicle use first 3 years**
 - **Potential vehicle retention**
 - **NPV \$ savings calculations, preferences tested:**
 - \$ paid for \$400 annual fuel savings, or
 - annual fuel savings required if incremental cost = \$1200
 - **Vehicle attribute preferences**
 - **Diesel purchase intentions**
 - **Hybrid electric purchase intentions**

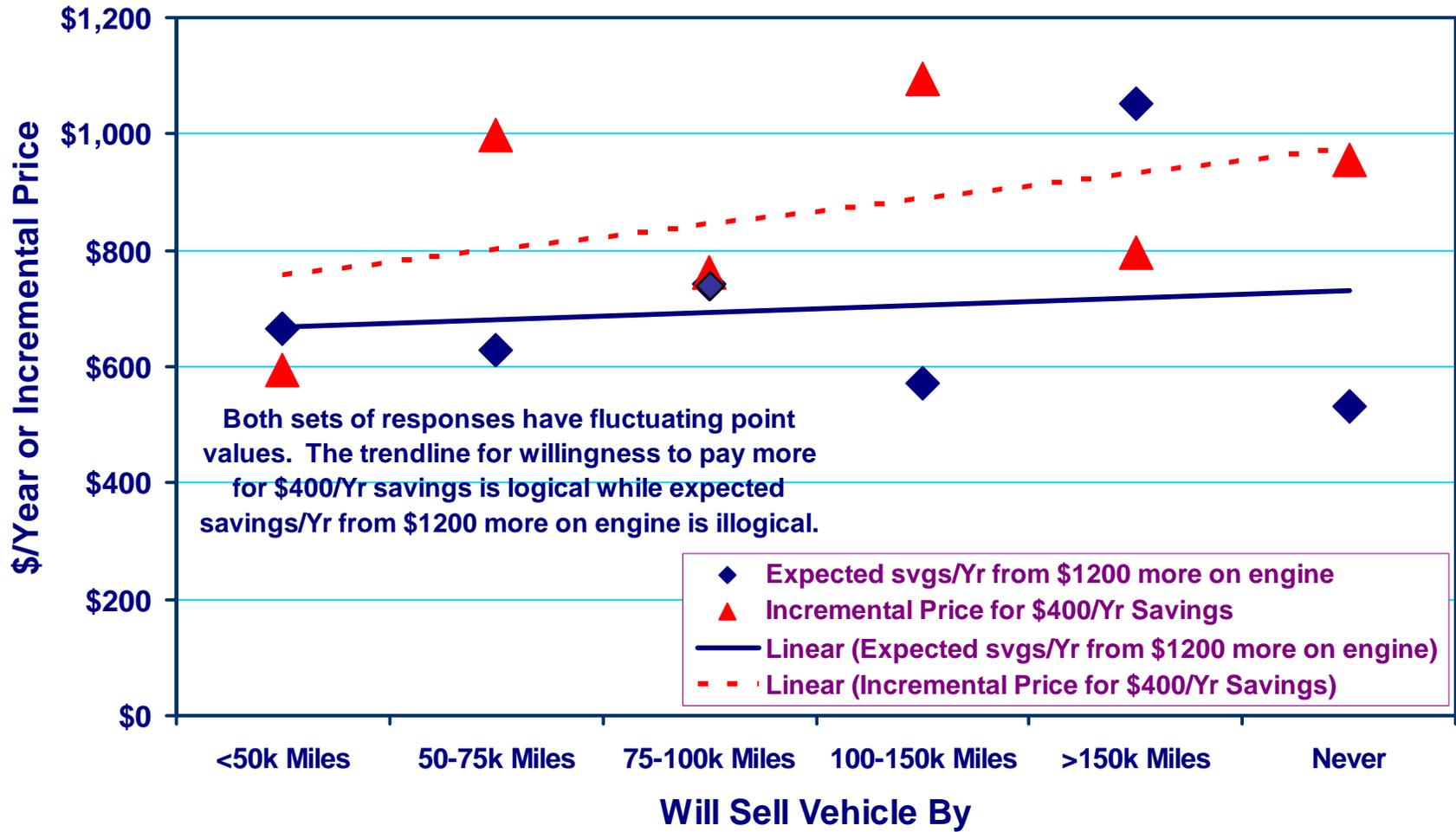
High Income Buyers, the Largest Buyer Group, Show Greater Interest In HEVs



Persons Driving More In 1st 3 Yrs Put More Total Miles Before Selling, Are Candidates for HEVs and Diesels



Initial Cost vs. Savings/Yr: One of Two Responses was Inconsistent with Net Present Value Implications

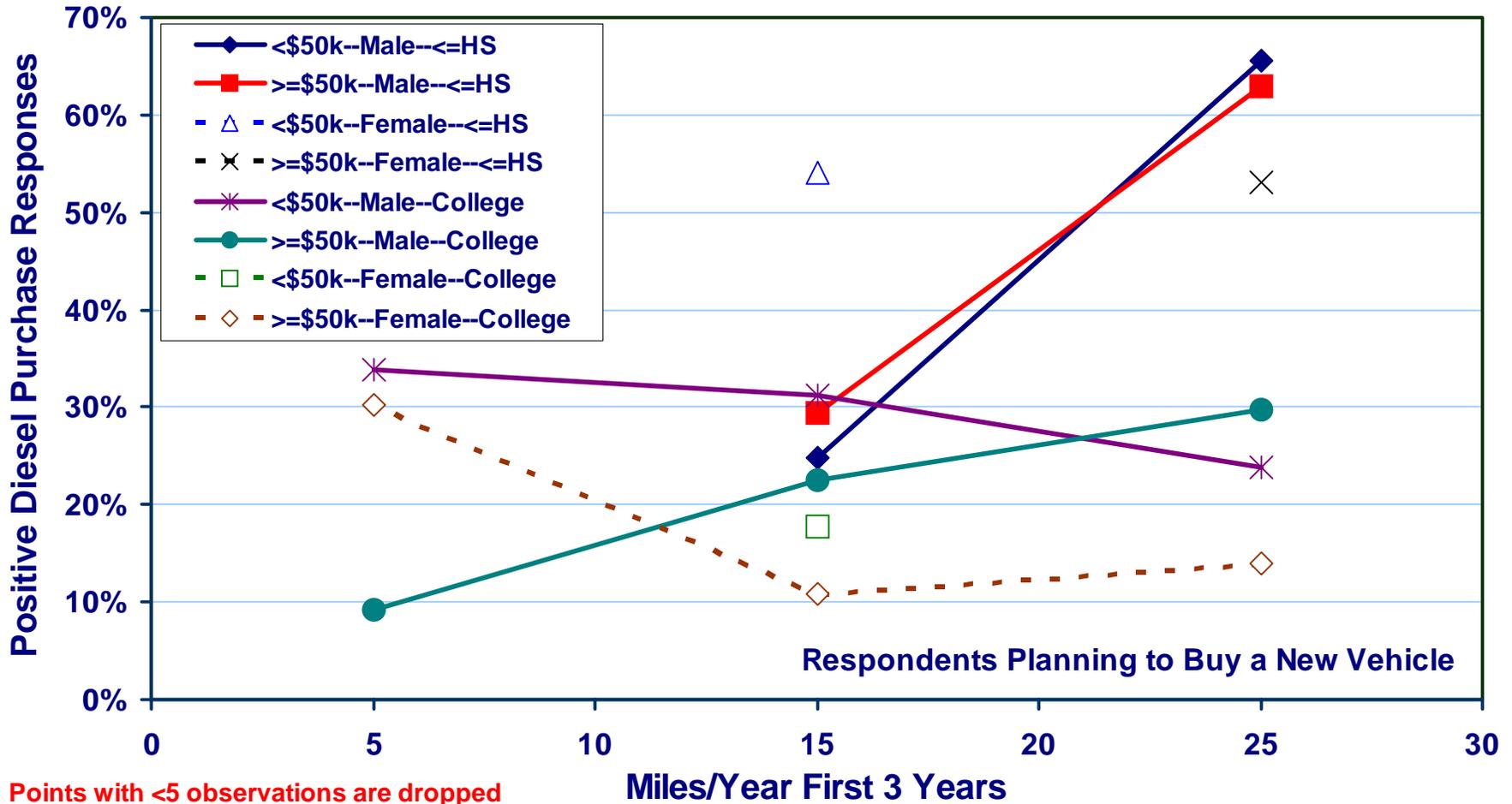




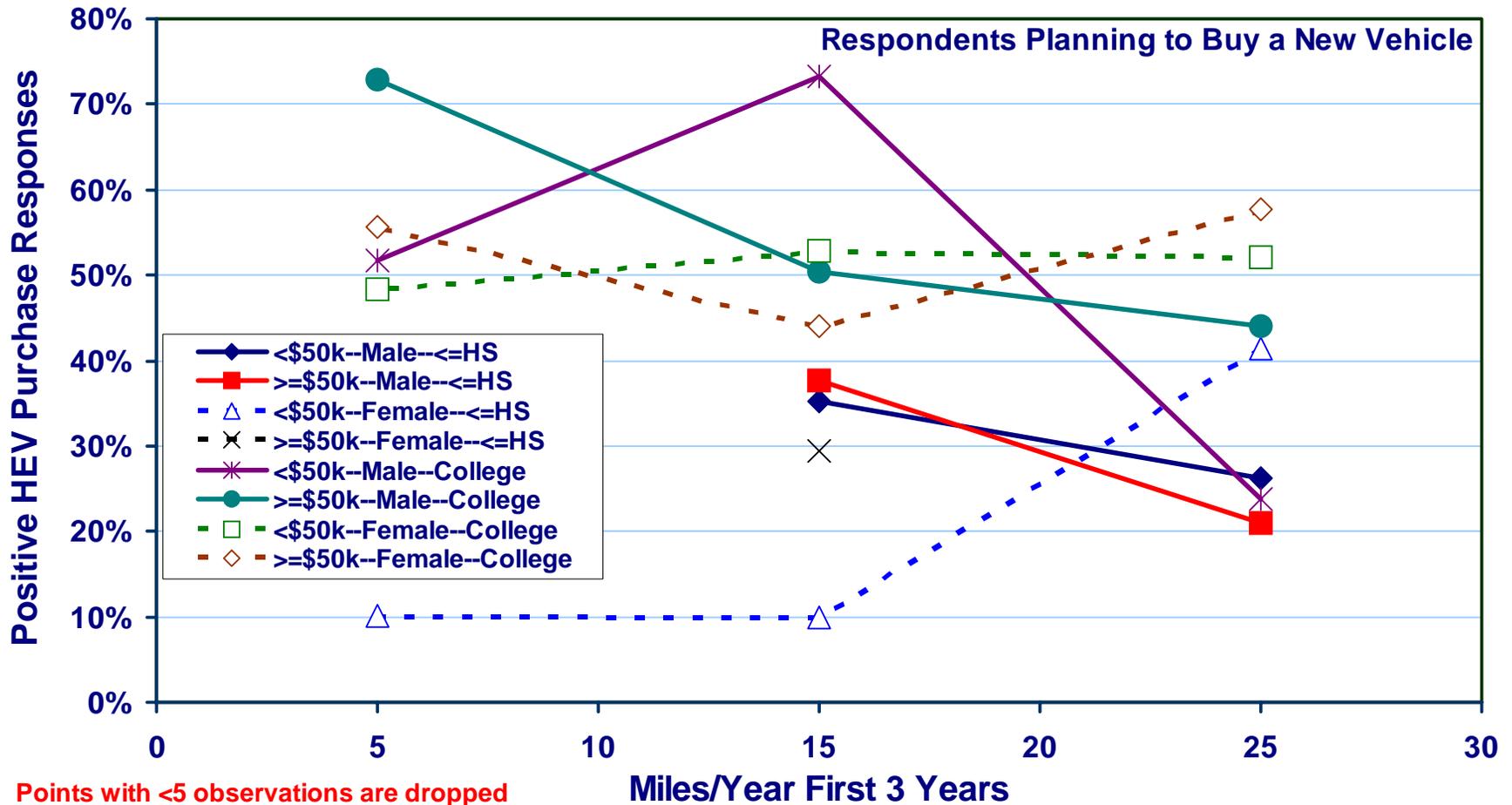
The Survey Showed Significant Differences in Preferences by Gender

- ❖ **Women found search for fuel less acceptable**
- ❖ **Women had less desire for trucks**
- ❖ **Women indicated lower preference for diesels**
- ❖ **Women could not name specific hybrids**
- ❖ **But ... women were as likely as men to indicate preference for a generic hybrid**

For Those Interested in Diesels (Males), Odds Go Up Strongly With Miles Driven



HEV Purchase Intentions Increase With Education, But Not Miles



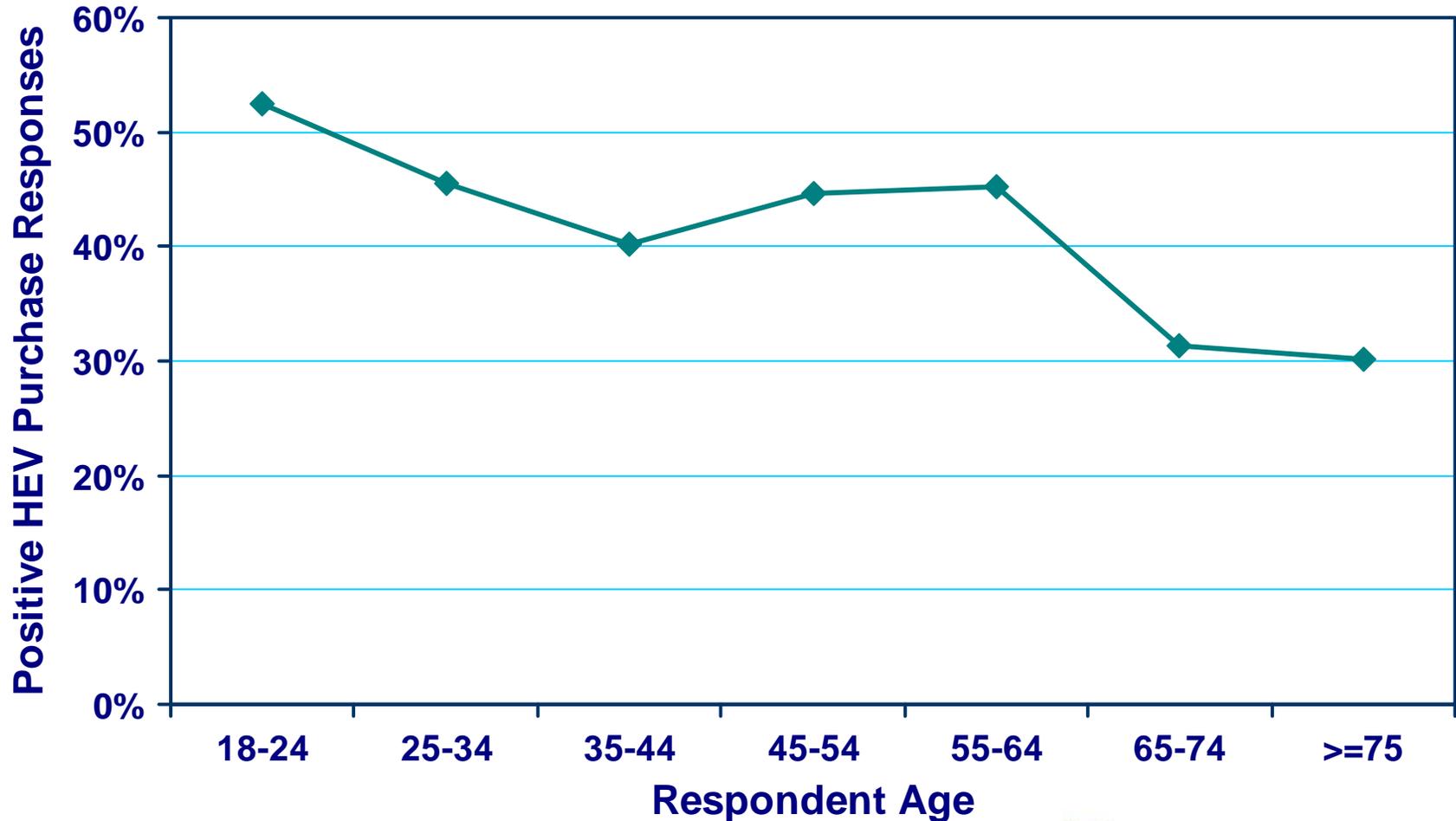


Ford HEV Marketing aims at “well-read ‘opinion influencers’ who keep up with ... technology”

	Conventional Escape	Hybrid Escape
Print Advertising	<i>People, Time, InStyle</i> magazines	<i>New Yorker, Smithsonian, Organic Style</i> magazines
TV and Promotion	Splashy TV ads and product placement in <i>American Idol</i> and Fox's 24	No TV; grassroots marketing through gatherings such as the <i>Mind, Body & Beyond Expo</i> ; tie-in with organic beverage bottler <i>Honest Tea</i>
Demographics	Roughly 55% female; first-time SUV buyers	Majority male, greenies and geeks; most don't currently own a Ford

Source: Business Week, Oct. 18, 2004

Youngest Persons are High HEV Intenders, Oldest are Low





Market preferences also varied by geography

❖ Metro residents were most likely to prefer HEVs, least likely to prefer diesels

➤ Note:

- Sales of HEVs in Virginia are dominated by DC area counties
- For '03 HEV sales/person, VA and MD were the leading states
- DC area (VA & MD HEV market) is U.S.' most highly educated

❖ The western U.S. was more likely to buy HEVs

➤ Note:

- California, Oregon and Washington state were among the top five states for HEV sales per capita in 2003

Some Inferences Are Drawn

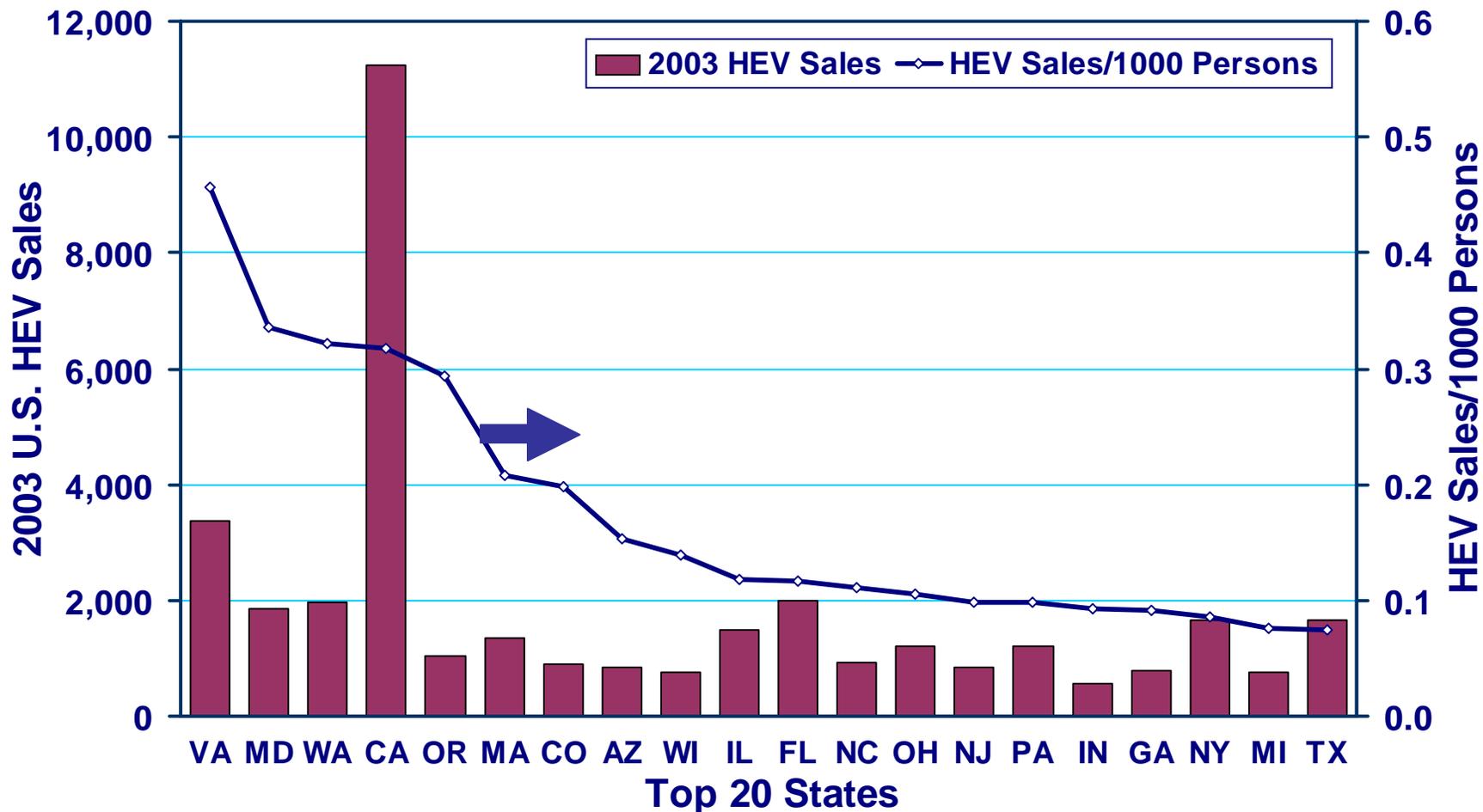
- ❖ Diesels and hybrids are competing for very different buyers
- ❖ New technology markets (vehicles included) are heterogeneous with some buyers responding with “vision”
- ❖ Hybrid vehicles probably still depend on AVID’s “early adopters” (either Moore’s innovators or early adopters)
- ❖ Diesel technology is mature and appears to depend on pragmatic early-majority buyers to succeed

Inferences (continued)

- ❖ HEVs, like other technology, may go through a stagnant period (Moore's "chasm") ... but
- ❖ Share stagnation is better than contraction
- ❖ The light-diesel rise and fall in the 1970s and 80s highlights uncertainty of trend analysis
- ❖ It is likely that hybrids have not yet reached the edge of the "chasm", despite Toyota's (via D. Hermance) opinion that they are now selling to the early majority

Supporting Data

VA, MD (DC Area) and Western States Lead In Per Capita HEV Sales



Are Emissions Tests and HOV Lane Exemptions Causing High HEV Sales?

