"Critical Loss" Analyses

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* Opinions are those of author, not necessarily those of the Commission or individual Commissioners

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Market Definition

- Role of merger enforcement in the EU is to prevent mergers that would strengthen or enhance a dominant position

- As noted in EU Market Definition Statement

  "Market definition is a tool to identify and define the boundaries of competition between firms . . . **The objective of defining a market in both its product and geographic dimension is to identify those actual competitors of the undertakings involved that are capable of constraining their behavior and of preventing them from behaving independently of an effective competitive pressure**."
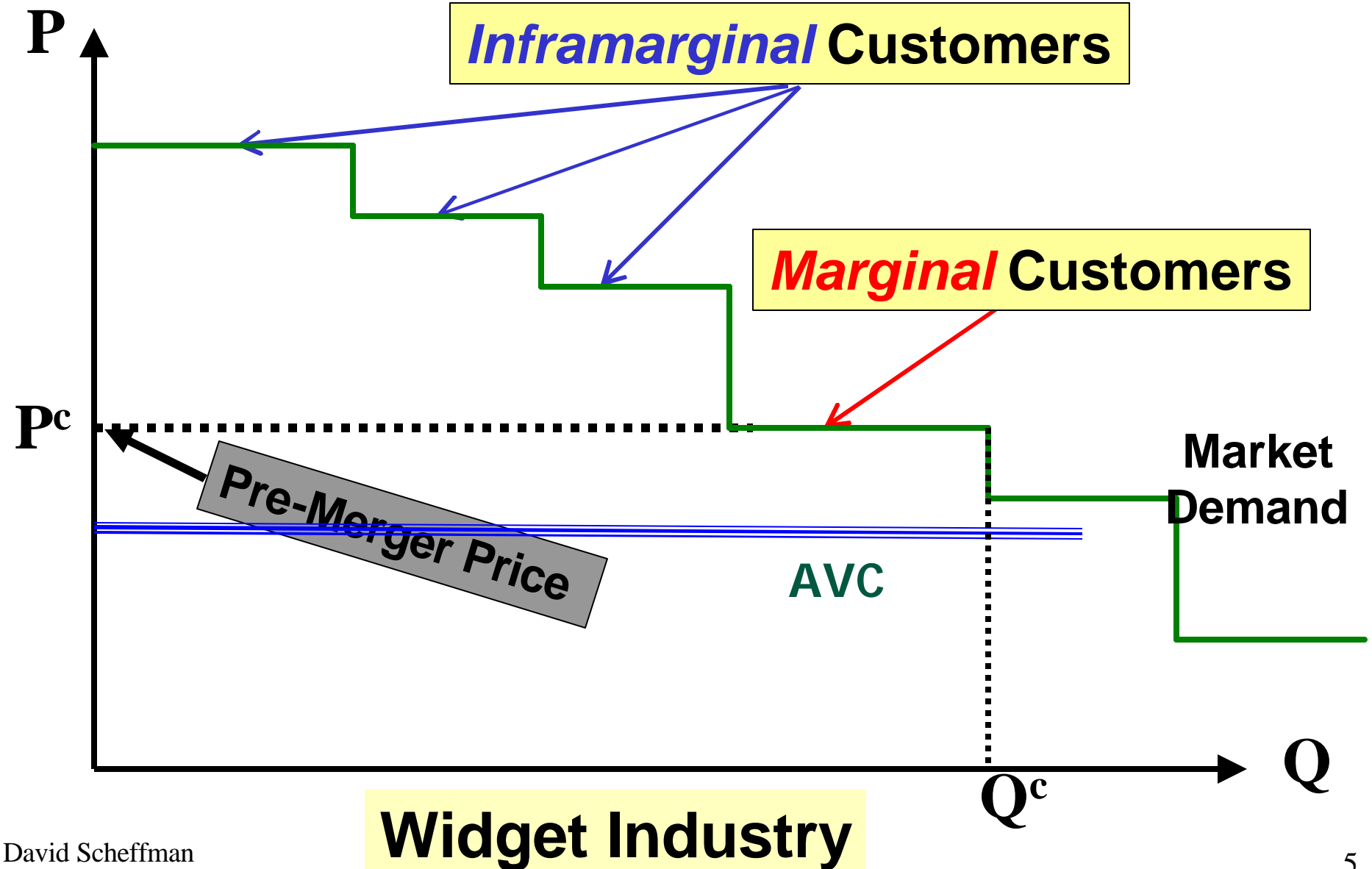
What are the Factors That Would Provide Constraints on Market Power?

- Customer Demand
  - Lost Customers (**by type**)
  - Lost Sales/Per Customer (**by type**)

- Output expansions/price cuts by "fringe" (and substitutes, and potential entrants)
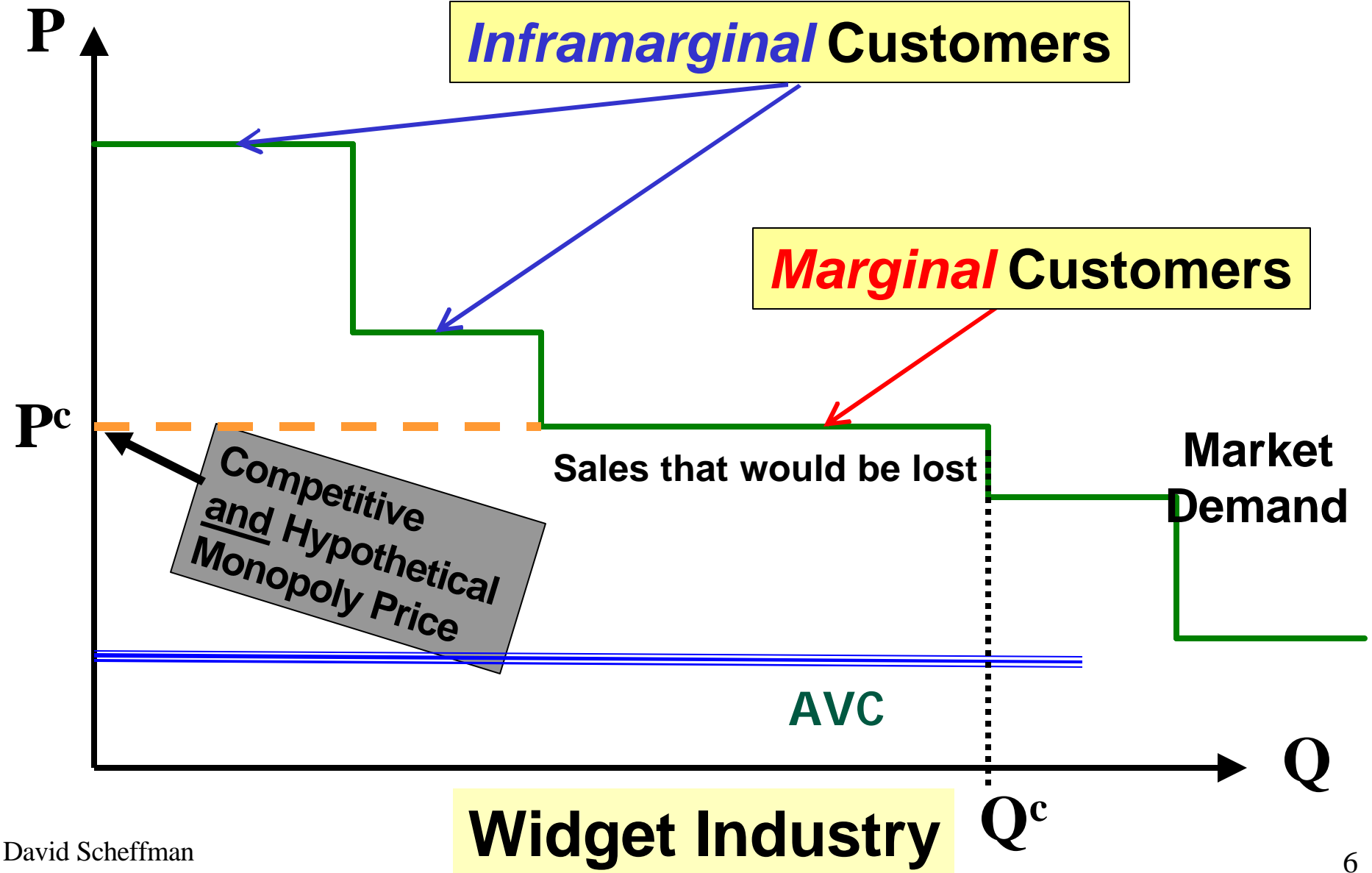
Assessing Customer Substitution

- "Surveys" of customer opinions re: switching in response to hypothetical *hypothetical* price increases

  - In most situations most customers are probably going to be ***inframarginal***

  - **The key issue is what percentage of pre-merger sales are *marginal***

- Quantitative analyses relevant to assessment of own- and cross-price elasticities
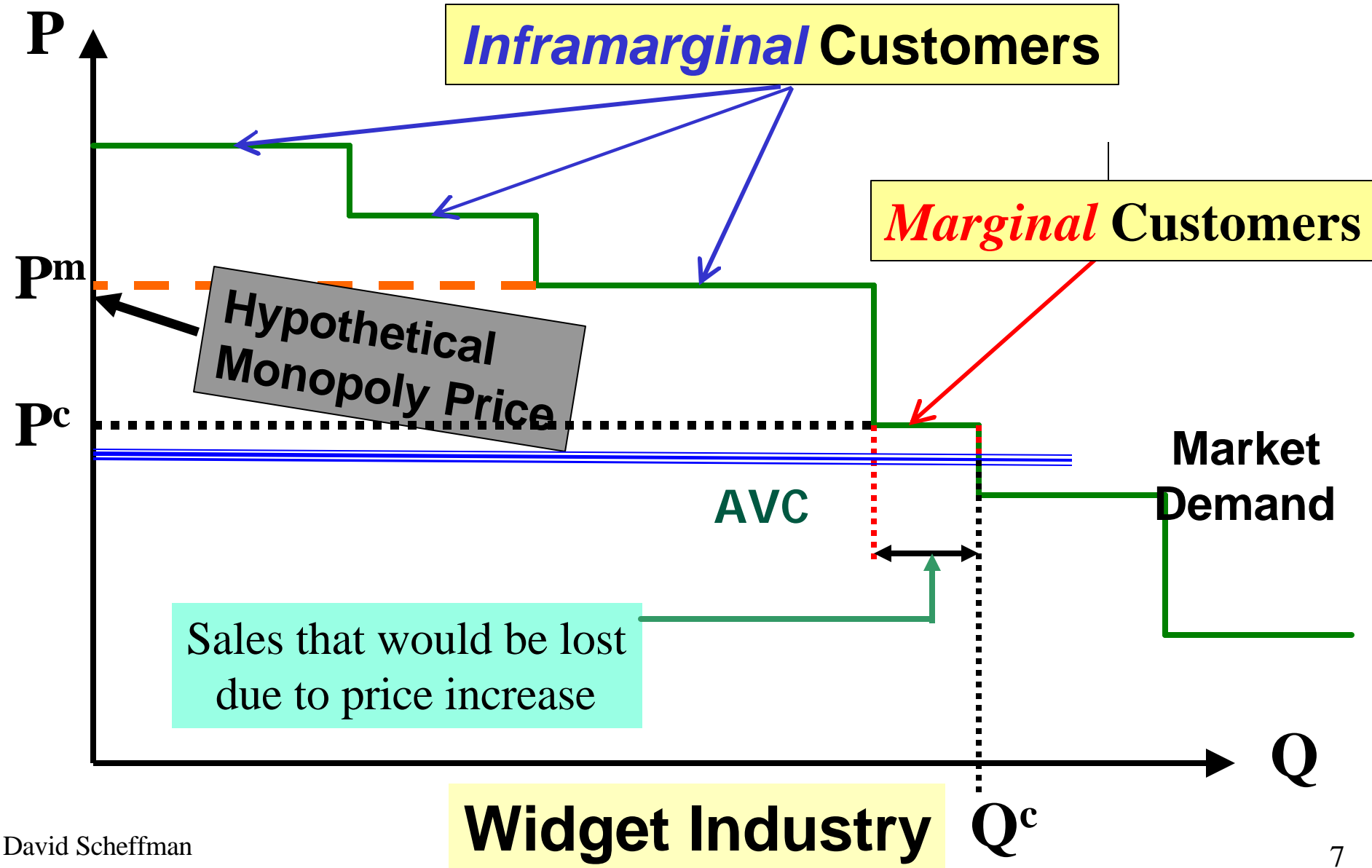
Basic Supply/Demand Analysis

P

Inframarginal Customers

Marginal Customers

Market Demand

Pᶜ

Pre-Merger Price

AVC

Q

Qᶜ

Widget Industry

Market is Larger

P

Inframarginal **Customers**

Marginal **Customers**

P^c

Competitive **and** Hypothetical Monopoly Price

Sales that would be lost

Market Demand

AVC

Q

Q^c

Widget Industry

Market is Widgets

Inframarginal Customers

P

Marginal Customers

P^m

Hypothetical Monopoly Price

P^c

Market Demand

AVC

Sales that would be lost due to price increase

Q

Widget Industry **Q^c**

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Elements of Customer Substitution Analysis

- How much volume would have to shift to other products (geographic areas) to make a hypothetical, say, 5-10% price increase unprofitable?

  – **Critical Loss**

- What evidence exists that such shifting would or would not actually occur?

Critical Loss

- Critical Loss Analysis addresses the following simple question:
  What amount of sales would have to be lost to make a hypothetical price increase unprofitable?

The Math

(unit costs, c_i are *variable* unit costs)
the hypothetical price increase is not profitable (*i.e.*, market definition **fails**) if:

$$(p_1 - c_1)Q_1 < (p_0 - c_0)Q_0$$

Usually assume $c_0 = c_1$

Notice that you can easily implement this analysis with Excel

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Critical Loss Excel Spreadsheet

Based on $(p_1 - c_1)Q_1 = (p_0 - c_0)Q_0$

Critical Loss Excel Spreadsheet	
Pre-Merger Output	100000
Pre-Merger Price	$1.00
Pre-Merger AVC	$0.65
Pre-Merger Variable Margin	$35,000
Break-Even %? Output	
Post-Merger Price Increase:	**%?Q**
5%	-12.5%
10%	-22.2%
15%	-30.0%

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Critical Loss-Type Analyses are Actually Used by Businesses

- C.L. analysis has the advantage that analogous analyses are regularly used in "real world" business in assessing the viability of hypothetical price changes

  i.e., if I increase price by X% will profits go up or down? – answer depends on unit volume response

- Notice, however, that in many "typical" business price change analyses – the business forecasts little-or-no unit volume response – because a price change involves responding to "changed" demand and/or costs

Critical Loss Formula

(%?) means "percentage change in"

CM is *Variable* Contribution Margin = **(p-c)/p**

"The" Critical Loss % Change in Quantity:

$$\%?Q = \%?p/(CM + \%?p)$$

i.e., if $\%?Q > \%?p/(CM + \%?p)$

Hypothetical price increase not profitable

Quantity Decrease Needed to Make Price Increase Unprofitable
Various Profit Margins and Price Increase Assumptions

Variable Margin Assumption	% Change in Price					
	5%	10%	15%	20%	25%	30%
10%	33%	50%	60%	67%	71%	75%
20%	20%	33%	43%	50%	56%	60%
30%	14%	25%	33%	40%	45%	50%
40%	11%	20%	27%	33%	38%	43%
50%	9%	17%	23%	29%	33%	38%
60%	8%	14%	20%	25%	29%	33%
70%	7%	13%	18%	22%	26%	30%
80%	6%	11%	16%	20%	24%	27%

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Issues in Using Critical Loss ("C.L.")

- Importance of good information

  – Consistency of margin and switching information

  – What is the "right" variable margin?

  – What is the "right" price increase

    ➢ May be important to assess different hypothetical price increases to see whether a larger price increase would be profitable (See Langenfeld and Li)

Issues in Using Critical Loss ("C.L.")

- **C.L.** is an **<u>empirical</u>** analysis
  i.e., issue is what does the totality of evidence indicate about C.L. test
  Specifically – high variable margins
  <u style="color:red">**Do**</u> <u style="color:red">**NOT,**</u> <u style="color:red">**alone**</u> **imply market is broader**

- You need to use the "right" data/evidence
  - *e.g.*, *Retail* data analysis of branded products *manufacturer* analysis?
  - Patient migration analyses for hospital mergers when the transactions are between hospitals and "insurance" companies?

Issues in Using Critical Loss ("C.L.")

- It is not uncommon – particularly in branded products mergers – to get demand elasticity estimates that indicate that current prices are above "monopoly" prices

    - Economists need to think more about implications of this

- Inferring *firm-level* elasticities from margins via the Lerner Index CM = 1/e is <u>not</u> generally correct
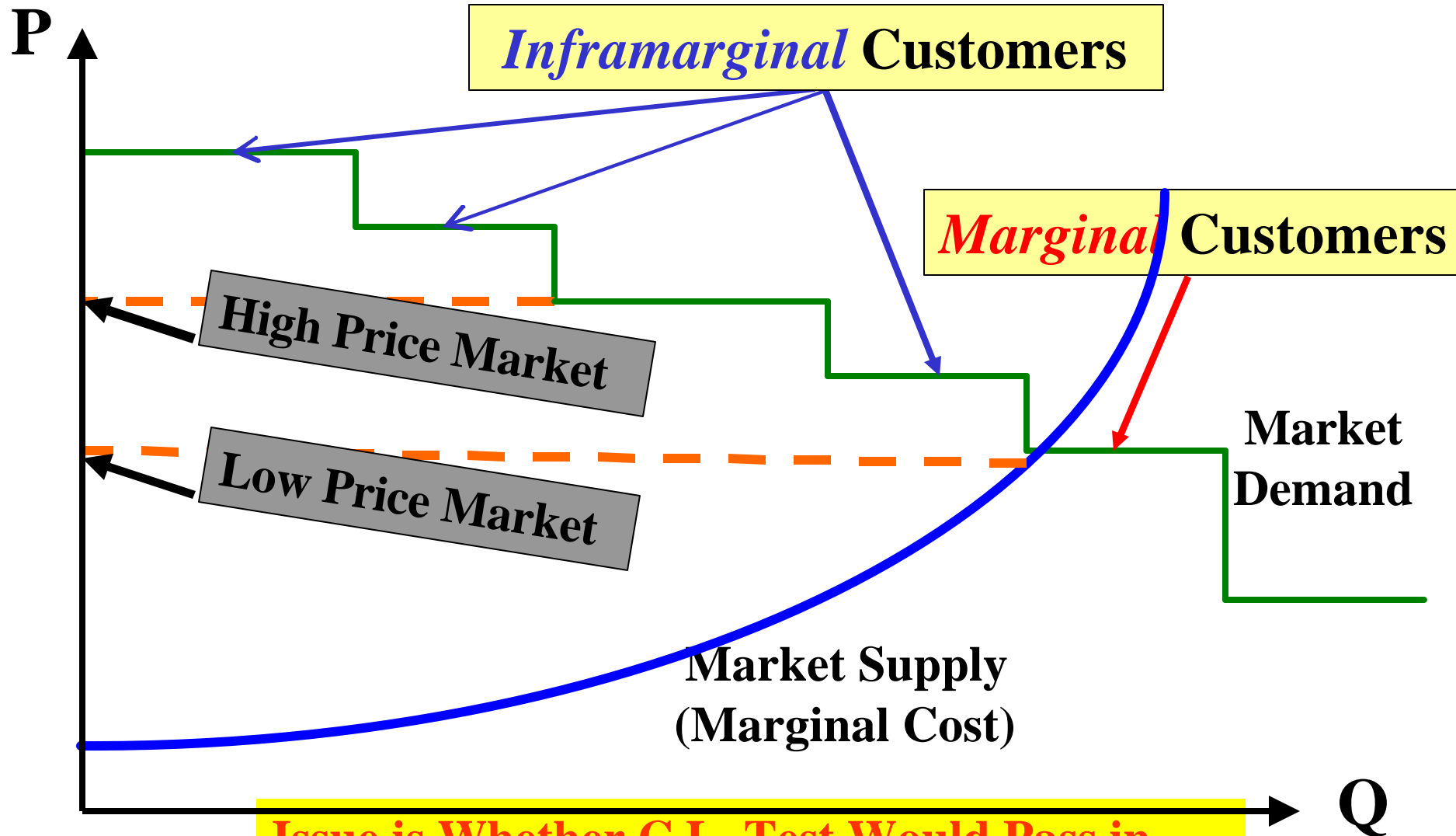
Price Discrimination Markets

- With potential price discrimination markets – apply C.L. to the potential markets

  BUT – need to account for "diversions" between price discrimination categories

- **CAUTION** – **price differences, *alone*, do not indicate price discrimination markets**

Potential Price Discrimination Markets

Inframarginal Customers

Marginal Customers

High Price Market

Low Price Market

Market Demand

Market Supply
(Marginal Cost)

Issue is Whether C.L. Test Would Pass in
One or Both Price Discrimination Markets

Example: Cruise Ships "Simple" Critical Loss

- Analysis for Current Sailings:

  – Very low critical loss given low marginal cost per passenger – *i.e.*, CM very high (near 100%)

  – Evidence from a variety of sources bearing on demand elasticity indicated that demand elasticity was 2.0 or greater

  – Therefore, C.L. test failed for an across-the-board price increase

 – Market broader absent price discrimination

Example: Cruise Ships:
Critical Loss *Based on Opportunity Cost*

- Analysis for Redeployment of ships:
  - Loss calculation somewhat different because not assuming "lost" passengers but different passengers

  - **Lost margin equals the difference in margins in current location versus margins in alternative location (taking into account price effect of new capacity in alternative location)**

    This is a typical geographic market C.L. analysis

  - Analyzed whether redeployments likely to be profitable given the amount of capacity that would have to shift to achieve a given price increase

Application of Critical Loss Analysis to Assessment of *Competitive Effects:* Response of "Fringe" Competitors

- In "dominant firm" analysis – need to take into account the response of the fringe to a hypothetical price increase

- In coordinated interaction – some competitors may not be likely participants in hypothetical coordinated interaction

Residual Demand Analysis

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Market Demand

"Fringe" Supply

Residual Demand Facing Dominant Firm

Q
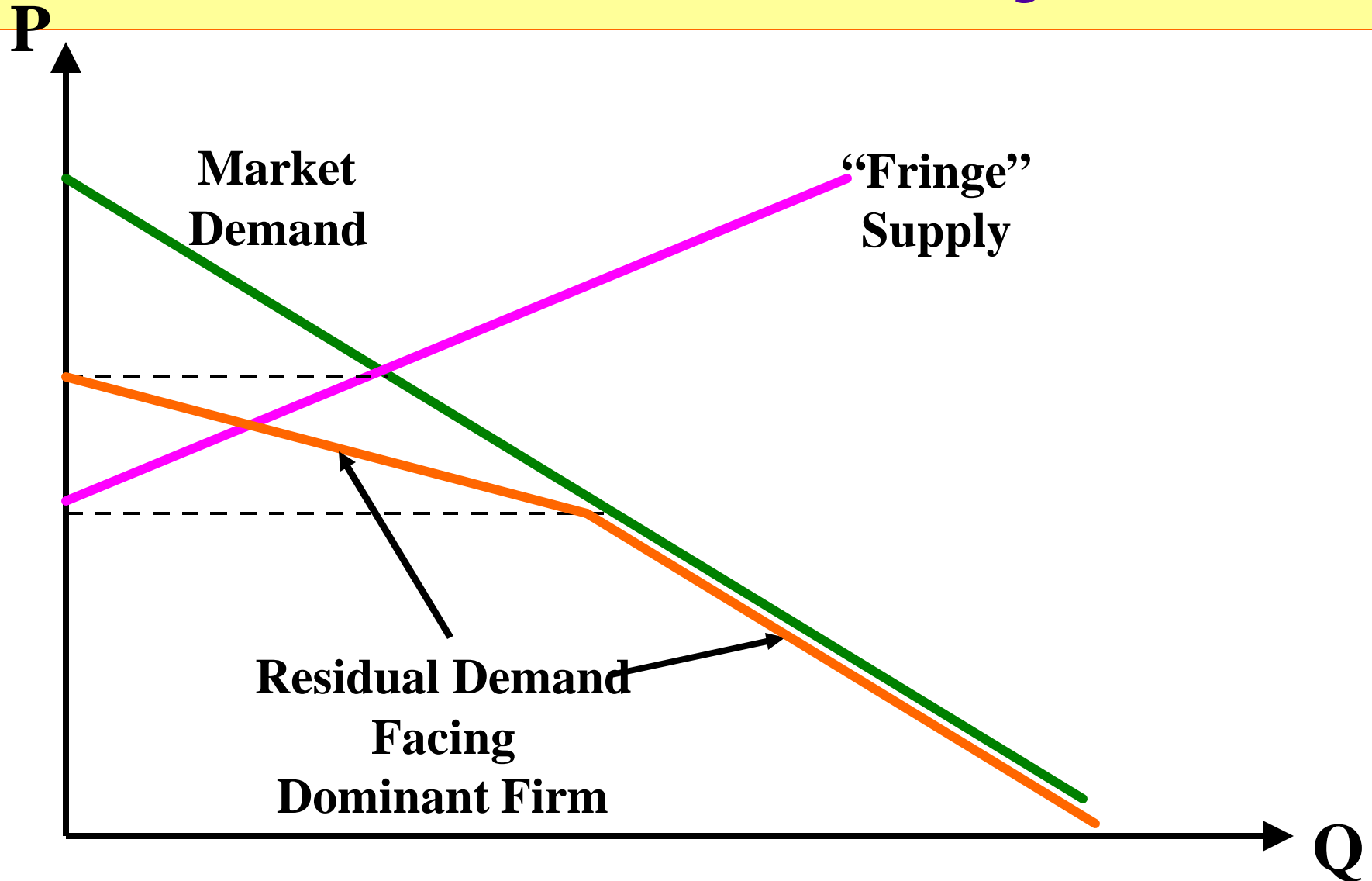
Example – Dominant Firm

- Assume dominant firm has 80% market share; to raise the *market* price by 5%, output must be restricted by X%, (demand elasticity = X/5).
  Then to raise price by 5% dominant firm must restrict *its* output by X%/.8 – **assuming no increased output of "fringe"** (this is based on a "local measure of demand elasticity)

- In addition, suppose that in response to hypothetical 5% price increase by dominant firm or hypothetical coordinated interaction group the fringe, currently representing 20% of industry sales, would increase their output/sales by 10% (*i.e.*, by 2% of pre-merger total market sales)

Example – Dominant Firm

- Then in assessing C.L. for the dominant firm or hypothetical coordinated interaction group the output restriction must also absorb the 2% (20% $*$ 10%) increase in sales

- Then if given <u>Market</u> demand elasticity to increase price by 5% requires an output restriction of X%, for the dominant firm to effect a 5% price increase requires dominant firm to restrict <u>its</u> output by an amount equaling (X+2)% of pre-merger <u>Total</u> Market Output

- Then (X+2)% times total market output must be compared to the Critical Loss calculation for the dominant firm

Example
(Post-Merger) Dominant Firm

- Total Market Output = 100, price $1, dominant firm output 80, fringe output will increase by 2 (10%) with a 5% hypothetical price increase.
  Market demand elasticity = 1.2.
  Variable Margin for (post-merger) dominant firm = 50%, so C.L. = 9%

- With market demand elasticity of 1.2, market output must be reduced by 6.0% to raise price by 5%

- Therefore for the dominant firm to increase market price by 5% it would have to restrict <u>its</u> output by (6.0% + 2.0%)/80% = 10% – exceeds C.L. of 9%
  Notice that without fringe expansion price increase would be profitable.

Critical Loss Analysis: Differentiated Products/Unilateral Effects

- A and B produces products that are differentiated but are to some degree substitutable
  There are other products, C_1, C_2, C_3, … that are also to varying degrees substitutable for A and B

- C.L.-type analyses:

  – When raising the price of A are enough sales diverted to B (or *vice versa*) to make a price increase for A profitable after a merger of A & B?

  – Analysis of changes in prices of A and B

Critical Loss Analysis: Differentiated Products/Unilateral Effects

C.L. Condition for the profitability of a price increase in *A* (no change in price of *B*):

$$(p^A_0 - c_A)A^0 + (p^B_0 - c_B)B^0 < (p^A_1 - c_A)A^1 + (p^B_0 - c_B)B^1$$

Key issues: How much does A lose in sales and how much of that loss is picked up by B and variable margins for A and B

Critical Loss Analysis: Differentiated Products/Unilateral Effects

- This can be modeled with Excel – although it is not as simple as in homogeneous product case

  - Determination of which price or both prices may increase cases will be based on evidence in the case

  - **Remember that $(p^A_1 - c_A)A^1 < (p^A_0 - c_A)A^0$, i.e., a price increase for A is not profitable without the merger (*i.e.*, A is setting it optimal pre-merger price)**

- Key issues: How much does A lose in sales and how much of that loss is picked up by B and variable margins for A and B

- **My opinion is that inferring brand level elasticities from product margins is questionable (current prices are based on, among other things, perceptions of customer and competitor responses. Further, demand curves may be "kinked.")**

Critical Loss Analysis: Minimum Viable Cartel

- In this analysis we look at what is the smallest number of competitors, including the merged entity, to have a profitable cartel

- This involves assessing how much the minimum viable cartel would have to restrict <u>its</u> sales to effect a, say, 5% price increase, taking into account any response from the "fringe" (competitors not in the hypothetical cartel).

- Generally, fringe competitors that would have a "sizeable" (relative to the required output restriction) supply response will have to be included in the Minimum Viable Cartel

Example: Bulk Petroleum Products Supply

- Analysis of whether a particular geographic area is a relevant market

- Assume a hypothetical monopolist of all wholesale gasoline sales in the area

- Critical loss will depend on the alternatives to the monopolist for reduction in demand
  - Reduced output (variable margin = refining margin)
  - Shipments to alternative locations (variable margin = difference in netbacks)

Example: Bulk Petroleum Products Supply

- Given these numbers, calculate amount of volume that would have to be lost to make a price increase unprofitable.

- Given this estimate – determine alternative sources of gasoline supply to the area and whether enough exists to defeat a price increase. Important issues:
  - Import capacities
  - Pipeline capacities
  - Trucking