Unit 9: H&R Block/TaxACT

Part 1. Market Definition

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

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The deal

- **H&R Block to acquire TaxAct**
  - Signed October 13, 2010
  - $287.5 million (all cash)

- **The buyer: H&R Block**
  - Missouri corporation headquartered in Kansas City, MO
  - Employees: 7900 full-time (107,200 including seasonal employees)
  - Revenues: $3.8 billion
  - Tax products
    1. Retail (filed 14.7 million returns)
       - Has a brick-and-mortar store within 5 miles of most Americans
       - 10,099 company-owned and franchised locations (average fee: $190) (2011 10-K)
    2. Software products:
       - "H&R Block At Home" (2.2 million returns)
    3. Online tax preparation
       - "H&R Block At Home Online Tax Program" (3.7 million returns)

The deal

- **The target: TaxACT**
  - Delaware corporation headquartered in Cedar Rapids, Iowa
  - Sells TaxACT-branded tax preparation products and services (5.2 million returns)
  - "Freeium" business model—2010 Consumer product offerings:

2010 TaxACT Consumer Product Offerings

TaxACT Desktop (Download/CD)

Free Federal Edition
- Federal Software = FREE
- Federal Electronic Filing = FREE
- State Software = $14.95
- State Electronic Filing = $7.95

Deluxe Federal Edition
- Federal Software = $12.95
- Federal Electronic Filing = $7.95*
- State Software = $14.95
- State Electronic Filing = $7.95

Ultimate Bundle - Deluxe & State
- Federal & State Software = $21.95
- Federal Electronic Filing = $7.95*
- State Electronic Filing = $7.95

TaxACT Online (Over the Web)

Free Federal Edition
- Federal Software = FREE
- State Add On = $17.95
- E-Filing = FREE

Deluxe Federal Edition
- Federal Software = $9.95
- State Add On = $8.00
- E-Filing = FREE

Ultimate Bundle (Deluxe & State)
- Federal & State Software = $17.95
- E-Filing = FREE

Tax preparation—Three methods

1. Manual ("pen and paper")

2. "Assisted" preparation (hiring a tax professional or going to a retail tax store)
   - H&R Block operates the largest retail tax store chain in the U.S.
   - Jackson-Hewitt (retail tax stores)
   - Liberty Tax Service (retail tax stores)
   - Individual tax preparers

3. Digital "do-it-yourself" (DDIY) tax software—disks, downloads, and online (35-40 million returns)
   - *Intuit* (62.2%) — TurboTax
   - *H&R Block* (15.6%) — "H&R Block At Home" (6.69 million units sold)
   - *TaxACT* (12.8%) (5 million returns) — "Freemium"
   - *Others* (9.4%) [including TaxHawk/FreeTaxUSA (3.2%); TaxSlayer (2.7%)]

Deal rationale

- **H&R Block explanation**
  - Deal allows combined companies to reach more customers with different needs
    - Companies sell complementary products (in a business sense)
      - HRB: higher-end, higher-priced products
      - TaxACT: lower functionality, lower-priced products
    - Merged company will maintain both HRB and TaxACT brands (Op. 9)
      - Echoes of Hertz/Dollar Thrifty?

- **DOJ theory**
  - IRS was working to promote efiling
    - Partnering with digital tax preparation firms through the Free Software Alliance to create free or "value" products
    - But at request of the participating companies, the IRS imposed restrictions on which taxpayers could qualify for free products on the IRS web site
  - TaxACT was the first company to offer a free DDIY product to all taxpayers for federal filings on its own website
  - HRB concerned that "free" DDIY products would undermine HRB paid-DDIY products
  - HRB targeted TaxACT for acquisition to eliminate a firm that threatened to disrupt HRB's business model in order to maintain higher prices for paid products in the future

Deal rationale

- IRS free filing program (public-private partnership)

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7

DOJ complaint

- *Filed*: May 23, 2011
  - Seven months after the signing of the merger agreement

- *Claim*: Acquisition, if consummated, would violate Section 7:
  - $3 \rightarrow 2$ in digital "do-it-yourself" tax software (disks and online)
    - Note that the DOJ did not consider the "fringe" firms
  - Would result in a duopoly of Intuit (62.2%) and H&R Block (28.4%)
    - 2FCR = 90.2%
    - Next largest firm: TaxHawk (3.2%)
  - Theories of anticompetitive harm:
    - Coordinated effects
    - Unilateral effects

    Will discuss in the last two classes of this unit

- *Prayer*: Permanent injunctive relief blocking the transaction

DOJ strategy

1. Narrow relevant market to DDIY products

2. Use *PNB* presumption to establish the prima facie case

   - ❏ Intuit 62.2%
   - ❏ HRB 15.6%
   - ❏ TaxACT 12.8%

   Combined share = 28.4%
   $\Delta \approx 400$
   Premerger HHI = 4276
   Postmerger HHI = 4675

   $$HHI = \sum_{i=1}^{n} s_i$$
   $$= 62.2^2 + 15.6^2 + 12.8^2$$
   $$= 4276 \text{ (premerger)}$$

3. Present supporting evidence and reasoned economic arguments on anticompetitive effect for strengthen the showing of anticompetitive effect

   - ❏ To follow Merger Guidelines and to make the case more persuasive
   - ❏ Focus on likely price effects (why?)

4. Anticipate and rebut likely defenses

   - ❏ Should know from arguments made by parties in the HSR merger review
     - ▪ Barriers to entry to defeat an anticipated entry defense
     - ▪ Lack of sufficient cognizable efficiencies to defeat an efficiencies defense

5. Press the public equities

   - ❏ The public equities will always win (especially on a permanent injunction where the court has found that the merger would violate Section 7)

Merger parties' strategy

1. Expand relevant product market to all tax preparation methods to negate the use of the *PNB* presumption

   - Argue functional substitutability for expanded market

2. Shares in expanded market too low to trigger *PNB* presumption

   - All tax preparation methods: 140 million returns total
   - HRB
     - ≈ 6.69 million DDIY (4.8%) + 14.7 million assisted (10.5%)
     - ≈ 21.39 million returns (15.3%)
   - TaxACT ≈ 5 million returns (3.6%)

   > Combined share: 18.9%
   > Delta: 110

   > Very low for a challenge notwithstanding high postmerger HHI

3. Rebut explicit theories of anticompetitive effect

   - Market not susceptible to coordinated effects
   - Merger would not create anticompetitive unilateral effects

4. Offer downward pricing pressure defenses

   - Entry defense
   - Post-merger efficiencies offset any upward pricing pressure

5. Largely ignore equities—Cannot defeat the DOJ on this element

The trial

- **DIOJ complaint**
  - Filed May 23, 2011
  - In the District of Columbia

- **Judge Beryl A. Howell**
  - Nominated by President Barack Obama
  - Sworn in: December 27, 2010
  - Currently Chief Judge (since March 17, 2016)

- **Trial**
  - Parties stipulated to a TRO—proceeded to trial on the merits
    - Court consolidated proceedings under Rule 65(a)(2)
  - Trial began on September 6, 2011 (nine days)— 4 months after complaint filed
    - 8 fact witnesses/3 expert witnesses
    - Additional testimony by affidavit and deposition
    - 800 exhibits from each side
  - Decision: Permanent injunction ordered on October 31, 2011 (originally filed under seal)
    - < 6 months after complaint filed

A Little Law

Clayton Act § 7

- ## Clayton Act § 7 provides the U.S. antitrust standard for mergers

> No person engaged in commerce or in any activity affecting commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person subject to the jurisdiction of the Federal Trade Commission shall acquire the whole or any part of the assets of another person engaged also in commerce or in any activity affecting commerce, where in **any line of commerce** or in any activity affecting commerce **in any section of the country**, **the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly**. [1]

- ## Essential elements of a Section 7 violation

  1. Acquisitions of stock or assets that,
  2. "in any line of commerce" (product market)
  3. "in any part of the country" (geographic market)

     Called the *relevant market*

  4. The effect of the acquisition "may substantially lessen competition or tend to create a monopoly"

     Called the *anticompetitive effects test*

[1] 15 U.S.C. § 18 (emphasis added; remainder of section omitted).

Proving the prima facie case

- Three elements:

  1. *Product market definition*: Courts broadly look at two types of indicia in evaluating evidence on the relevant product market—
     a. The "*Brown Shoe* factors"
     b. The "hypothetical monopolist test"

  2. *Geographic market definition*: Courts broadly look at two types of indicia in evaluating evidence on the relevant geographic market—
     a. "The area of effective competition"
        i. The area where customers of the merging firms can practically turn to alternative suppliers (when customers travel to suppliers—think retail stores)
        ii. The area where alternative suppliers exist that can practically service the customers of the merging firm (when suppliers travel to customers—think plumbers)
     b. The "hypothetical monopolist test"

  3. *Anticompetitive effect*: Courts broadly look at two types of indicia in evaluating evidence on the relevant geographic market
     a. The *Philadelphia National Bank* presumption
     b. Explicit theories and supporting direct and circumstantial evidence of likely anticompetitive harm resulting from the merger

Before turning to market definition, we need to examine the
Philadelphia National Bank *presumption*

The *PNB* presumption

"This intense congressional concern with the trend toward concentration warrants dispensing, in certain cases, with elaborate proof of market structure, market behavior, or probable anticompetitive effects. Specifically, we think that a merger which **produces a firm controlling an undue percentage share of the relevant market**, and **results in a significant increase in the concentration of firms** in that market is so inherently likely to lessen competition substantially that it must be enjoined in the absence of evidence clearly showing that the merger is not likely to have such anticompetitive effects."[1]

❑ Requires—

- The combined firm to pass some (unspecified) threshold of *market share*, *and*
- The *increase in market concentration* caused by the transaction

NB: The opinion was careful to note that it was not setting a lower bound and that commentators had suggested 20% as a threshold of "undue" market share

❑ Supposed to reflect the latest in economic thinking in the then-prevailing structure-conduct-performance paradigm

- "[T] the test is fully consonant with economic theory."[2]
- "[C]ompetition is greatest when there are many sellers, none of which has any significant share."[3]

[1] United States v. Philadelphia National Bank, 374 U.S. 321, 363 (1963).
[2] *Id*. (citing extensively to structure-conduct-performance literature).
[3] *Id*.

The *PNB* presumption: Background

- Application in *Philadelphia National Bank*
    - Combined firm had at least a 30% share in the relevant market
        - Enough for an "undue market share"
    - Share of the two largest banks in the relevant market would increase from 44% to 59%
        - Enough for a "significant increase" in market concentration
    - Therefore, the *PNB* presumption was satisfied
    - Nothing in record to rebut presumption
        - District court misplaced reliance on testimony that competition was vigorous and would continue to be vigorous (problem too complex; witnesses failed to give "concrete reasons" for conclusions)

The *PNB* presumption: Background

- The Supreme Court in the 1960s was very aggressive on the market share thresholds of the *PNB* presumption

- Some (infamous) early Supreme Court precedents
  - Brown Shoe/Kinney (1962)[1] (pre-*Brown Shoe*)
    - Combined share of as little as 5% in an unconcentrated market

  - Von's Grocery/Shopping Bag Food Stores (1966)[2]
    - 4.7% (#3) + 4.2% (#6) → 8.9% (#2) in an unconcentrated market

  - Pabst Brewing/Blatz Brewing (1966)[3]
    - 3.02% (#10) + 1.47% (#18) → 4.49% (#5) in an unconcentrated market

  > *Bottom line*: Through the 1960s and into the 1970s, antitrust law prohibited most significant horizontal mergers and acquisitions

[1] Brown Shoe Co. v. United States, 370 U.S. 294 (1962).
[2] United States v. Von's Grocery Co., 384 U.S. 270 (1966).
[3] United States v. Pabst Brewing Co., 384 U.S. 546 (1966).

The *PNB* presumption: Background

- **Status of the *PNB* presumption as of the late 1970s**
  - *General Dynamics* (1974) had returned to a rebuttable presumption
  - BUT
    - There was no meaning test of market definition
    - The market share triggers remained very low
    - The evidence sufficient to rebut the presumption remained generally undefined
    - Courts tended to defer to the market definitions advanced by the DOJ and FTC
    - The "Potter Stewart rule" continued to hold not withstanding *General Dynamics*
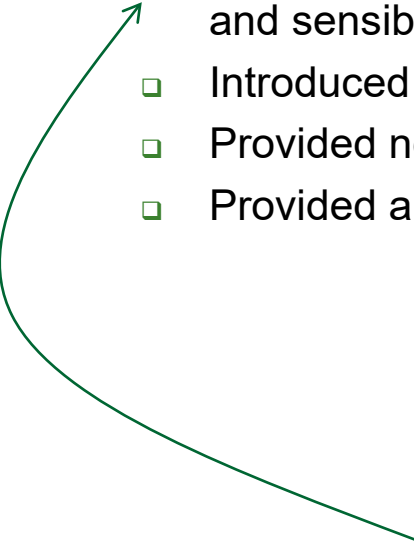
> The sole consistency that I can find is that in litigation under [Section 7], the Government always wins.[1]

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[1] United States v. Von's Grocery Co., 384 U.S. 270, 301 (1966) (Stewart, J., dissenting).

The *PNB* presumption: Background

- **1982 DOJ Merger Guidelines**
  - Introduced the *hypothetical monopolist test* to provide an economically rigorous and sensible means of defining markets in the context of the *PNB* presumption
  - Introduced the HHI as the measure of market concentration
  - Provided new market share thresholds to be used by the DOJ
  - Provided a catalog of defenses to rebut the presumption

This is why we needed to introduce the PNB *presumption before examining market definition*

Baker-Hughes[1]

- **Uses a three-step burden shifting approach:**

  1. The plaintiff bears burden of proof in market definition and in market shares and market concentration within the relevant market sufficient to trigger the *PNB* presumption and thereby prove a prima facie Section 7 violation

     - More generally, this should be the burden of proving a prima facie case (whether or not the *PNB* presumption or other evidence is invoked to show anticompetitive effect)

     - You can think of the burden here as the *burden of production*, that is, the plaintiff must adduce sufficient evidence to allow the trier of fact to find each and every essential element of a Section 7 violation

     - Essential elements
       1. The relevant product market
       2. The relevant geographic market
       3. The requisite anticompetitive effect in the relevant market

       > Also need to satisfy the interstate commerce element, but this is rarely contested

  2. If the plaintiff satisfies this burden, the *burden of production* shifts to defendants to adduce evidence sufficient to rebut *PNB* presumption and create a genuine issue for the trier of fact

     a. Negate the plaintiff's market definition

     b. Rebut the predicates of the *PNB* presumption and other evidence of gross anticompetitive effect

     c. If applicable, provide evidence of one or more downward-pricing pressure defenses

[1] United States v. Baker Hughes Inc., 908 F.2d 981, 982-83 (D.C. Cir. 1990).

Baker-Hughes[1]

- Uses a three-step burden shifting approach:
  3. *The burden of persuasion* then returns to plaintiff to prove in light of all of the evidence in the record that the merger is reasonably probable to have an anticompetitive effect in the relevant market

Market definition procedurally

- ## Question of fact
  - The determination of the boundaries of the relevant market is a question of fact

- ## Burden of proof on the plaintiff
  - Bears the burden of proving a *prima facie* relevant market in Step 1 of *Baker Hughes*
    - Essentially a burden of production
  - Bears the *burden of persuasion* on relevant market in Step 3 of *Baker Hughes*

- ## Motion to dismiss: *Twombly* applies
  - The complaint must contain sufficient factual allegations to make the alleged market definition plausible under the market definition standards in the case law
  - The plaintiff's failure in a complaint to adequately plead the factual predicates of market definition will result in the complaint's dismissal under FRCP 12(b)(6)
  - However, *Twombly* challenges are typically not brought where—
    1. The defendants are not likely to ultimately challenge the plaintiff's definition of the relevant market, *or*
    2. It is easy for the plaintiff to replead the complaint and supply the missing factual allegations to support its alleged market definition
  - More generally, motions to dismiss are rare in preclosing merger antitrust challenges
    - Merging parties want to proceed to the merits as quickly as possible

Market definition procedurally

- **Forward looking**
  - Since merger antitrust law is forward-looking—that is, it makes unlawful mergers and acquisitions that are likely to lessen competition substantially in the future as compared to what competitive conditions would have been absent the transaction—market definition equally must be forward-looking
  - Product market definition, for example, should account for new products that shortly will be released or old products that will soon be obsolete
  - Likewise, geographic market definition should account for the construction of new facilities, changing transportation modes or patterns, or new methods of purchasing or distribution

- **Appeal**
  - As a finding of fact, district court ruling reviewed under the "clearly erroneous" rule
  - FTC findings reviewed under the "substantial evidence" rule

Market definition: A debate

- **Is the proof of a relevant market really necessary?**
  - Some commentators argue that direct evidence of anticompetitive harm should obviate the need to prove the relevant market
    - For example, say the challenge is to a consummated merger and that the plaintiff can prove the merger resulted in a substantial price increase
  - Opponents of this view argue that the terms of Section 7 explicitly require the showing of the product and geographic dimensions of a relevant market
  - Views of the DOJ and FTC
    - The DOJ and FTC agree that the determination of a relevant market is not necessary in order to prove the requisite anticompetitive effect in the vast majority of mergers
    - BUT they have not been willing to test whether they can dispense with the market definition elements in court
  - Courts
    - Have not had to decide a case on precisely point
    - BUT perhaps the rigor with which a relevant market needs to be defined may depend on whether market shares will play a significant role in the competitive effects analysis
  - WDC view
    - Courts will require proof of a relevant market in all Section 7 cases
    - BUT will not be too demanding on the dimensions of the market if market shares and market concentration statistics are not being using to prove anticompetitive effect

Market Definition
Part 1: The judicial tests

Introduction

- ## Two dimensions

  - Every relevant market has two dimensions:

    - *The product dimension*: The products within the market (the *relevant product market*)

    - *The geographic dimension*: The geographic area covered by the market (the *relevant geographic market*)

- ## The relevant market in H&R Block/TaxACT

  - The parties stipulated that the relevant geographic market was the United States

    - It is common for the parties to stipulate to the relevant markets

    - *Some exceptions*:

      - The relevant market is frequently a major issue in "retail" deals (where individuals travel to the business location—think retail stores, banks, hospitals)

      - It can also be an issue when products trade internationally—Is the relevant geographic market national or global?

  - The dimensions of the product market was the central issue in the case

One or both market dimensions almost always will be a major issue in any litigated case. Empirically, disproof of the plaintiff's market definition is the major reason plaintiffs fail in merger antitrust cases.

We will focus on product market definition in this unit and geographic market definition in the next unit

Product markets generally

- **What is a relevant product market?**

  - A relevant product market defines the product boundaries within which competition meaningfully exists[1]

  - Although discussed in terms of products, the product market concept equally applies to services or a mixed combination of a product with accompanying services

- **Modern concept of relevant markets**

  - Products in the relevant market should exert significant price pressure on one another

    - That is, an increase in the price of one of the products in the market should cause customers to switch to other products in the market, and this loss of sales should result in the price increase being unprofitable.

  - Some definitions

    - *Inframarginal customers* continue to buy the product after the price increase

    - *Marginal customers* would buy the product at the original price but not at the increased price

- **The showing of the relevant market(s) is an essential element of every Section 7 violation**

  - The plaintiff must make a prima facie showing of a relevant market as part of its prima facie case and bears the ultimate burden of persuasion

[1] United States v. Continental Can Co., 378 U.S. 441, 449 (1964).

Two complementary tests in judicial analysis

1. The "outer boundaries" and "practical indicia" criteria of *Brown Shoe*[1]

2. The hypothetical monopolist test of the Merger Guidelines[2]

[1] Brown Shoe Co. v. United States, 370 U.S. 294, 325 (1962).

[2] U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines § 4 (rev. Aug. 19, 2010).

The *Brown Shoe* Tests

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

29

Brown Shoe "outer boundaries" test

- *Brown Shoe*:

> The outer boundaries of a product market are determined by **the reasonable interchangeability of use** or the **cross-elasticity of demand** between the product itself and substitutes for it.[1]

- This remains the prevailing definition of a relevant product market in the case law
- Key indicia—
    1. Reasonable interchangeability of use
    2. [High] cross-elasticity of demand
- Modern usage
    - Reasonable interchangeability of use has largely come to mean high cross-elasticity of demand and is no longer a distinct "outer boundary" factor

[1] Brown Shoe Co. v. United States, 370 U.S. 294, 325 (1962) (emphasis added).

Brown Shoe "outer boundaries" test

- **General idea**
  - In a horizontal merger, the relevant product market should—
    1. *Start* with the overlapping products of the merging firms
    2. *Contain* all products that exhibit a reasonable interchangeability of use and a high cross-elasticity of demand with one another
    3. *Exclude* all products that lack reasonable interchangeability of use and have a low cross-elasticity of demand with products in the relevant product market

The Brown Shoe test is intended to isolate all and only those products that exert significant price-constraining force on the overlapping products of the merging parties

[1] Brown Shoe Co. v. United States, 370 U.S. 294, 325 (1962) (emphasis added).

Brown Shoe "practical indicia" test

- **Submarkets and "practical indicia" of relevant markets**

However, within this broad market [defined by reasonable interchangeability of use and high cross-elasticity of demand], well-defined **submarkets** may exist which, in themselves, constitute product markets for antitrust purposes. The boundaries of such a submarket may be determined by examining such **practical indicia** as

[1] industry or public recognition of the submarket as a separate economic entity,

[2] the product's peculiar characteristics and uses,

[3] unique production facilities,

[4] distinct customers,

[5] distinct prices,

[6] sensitivity to price changes, and

[7] specialized vendors.[1]

[1] Brown Shoe Co. v. United States, 370 U.S. 294, 325 (1962).

Brown Shoe "practical indicia" test

- **Submarkets and "practical indicia" of relevant markets**
  - This list of "practical indicia" was not intended to be exhaustive
  - Some additional factors that courts typically consider—
    1. Relative prices of products in the candidate market
       - A Timex and a Rolex both tell time, but they are unlikely to exhibit a high cross-elasticity of demand with on another
    2. Different functional attributes that might appeal to different classes of buyers
       - Consider the functional difference between a Ferrari 812 (0-60 mph: 2.8 sec.; top speed: 211 mph) and a Nissan Versa S (0-60 mph: 10.2 sec.; top speed: 119 mph)
       - Differences in functionality are often accompanied by differences in price (Ferrari 812 base price: $ 401,500; Nissan Versa S base price: $15,080)
    3. Differences in reputation
       - Even without functional differences

- **Problems with the *Brown Shoe* "practical indicia" test**
  - The list provides some factors to consider, but does not say what weight they should be given or give any other analytical technique to apply them to determine the boundaries of submarkets
  - This created an enormous amount of confusion, bad analysis, and bad decisions

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

Brown Shoe submarkets: The modern view

- **Submarkets (surprisingly) remain a valid concept in antitrust law**
  - Courts still employ the concept, but with decreasing regularity

- **But most courts view submarkets as no different than a relevant market**
  - Under this view, the *Brown Shoe* "practical indicia" are simply circumstantial evidence probative of reasonable interchangeability of use and cross-elasticity of demand
  - Courts routinely rely on the *Brown Shoe* factors to define the relevant product market in merger and other antitrust cases

- **Since 1982, the merger guidelines have rejected submarkets as distinct from markets**

The Hypothetical Monopolist Test

Hypothetical monopolist test (HMT)

- **The original idea**
  - The relevant market should be—
    1. the *smallest group of products* containing the products of interest (say, the products of the merging firms in a horizontal merger)
    2. in which a hypothetical monopolist of those products *could raise prices profitably* over the current level
    3. by at least "*small but significant nontransitory*" amount
  - Observations
    - Introduced in the 1982 DOJ Merger Guidelines
    - Designed to introduce some economic sense and analytical rigor into market definition
    - Continued in the subsequent merger guidelines (although with some important modifications)
    - "SSNIP" = "Small but significant nontransitory increase in price"
      - Under the Merger Guidelines, a SSNIP is usually taken to be a price increase of 5% for at least one year
  - General idea
    - If a hypothetical monopolist—effectively the merger of all firms in the candidate market—could not anticompetitively affect prices, then a fortiori a merger of only two firms in the candidate market could not affect prices
    - Accordingly, the candidate market should be accepted as a relevant market only if a hypothetical monopolist could raise prices profitably
      - Is this a *necessary condition* or a *necessary and sufficient condition* for a relevant market?

HMT: Example

- **Example:**
  - Say a hypothetical monopolist—
    - Faces an (inverse) demand: p = 10 – ½ q
    - Has no fixed costs and constant marginal costs of 4 per unit of production
    - Prevailing (premerger) price: $p_1 = 5$

    Question: If the current market price is 5, would a SSNIP— usually taken to be 5%—be profitable?

  - We know how to do this:
    - Apply the incremental profitability test we examined in Unit 8 to determine if the gross loss in profits from the lost marginal sales are outweighed by the gross gain in profits from the higher profit margins earned on the retained inframarginal sales
    - Steps
      1. Set up the problem with what you know
      2. Figure out what you need
      3. Solve for the variables you need using the parameters given in the problem and the demand curve
      4. Solve for net incremental profits

    If incremental profits are positive, the hypothetical monopolist can profitably increase price by 5% and satisfies the HMT

HMT: Example

- Step 1. Set up the problem with what you know:
  - (Inverse) demand: $p = 10 - \frac{1}{2} q$
  - Prevailing (premerger) price: $p_1 = 5$
  - SSNIP = 5%
  - Constant marginal cost c = 4

HMT: Example

- **Step 1. Set up the problem:**
  - (Inverse) demand: $p = 10 - \frac{1}{2} q$
  - Prevailing (premerger) price: $p_1 = 5$
  - SSNIP = 5%
  - Constant marginal cost $c = 4$

$\Delta p = ?$ $\uparrow$ $p_2 = 5.25$
$p_1 = 5.0$

$m_1 = p_1 - c = ?$

q_2 q_1

$\Delta q = ?$

Step 2: Figure out what you need:

1. Need the gross gain on inframarginal sales that will be retained (Area G):

   > Area G = price increase (Δp)
   >   times inframarginal sales (q_2)
   > $= \Delta p q_2$

2. The gross loss on marginal sales that will be lost (Area L):

   > Area L = gross margin on marginal sales (m_1)
   >   times (lost) marginal sales (Δq)
   > $= m_1 \Delta q$
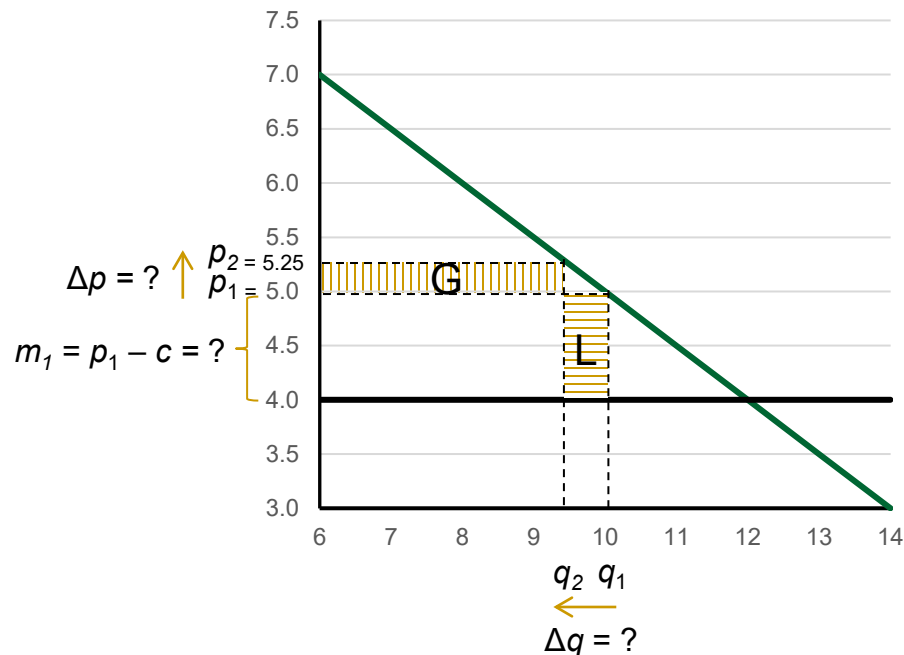
   So need q_1, q_2, Δq, Δp, p_2, and m_1

HMT: Example

- **Set up the problem:**
  - (Inverse) demand: $p = 10 - \frac{1}{2} q$
  - Prevailing (premerger) price : $p_1 = 5$
  - SSNIP = 5%
  - Constant marginal cost $c = 4$
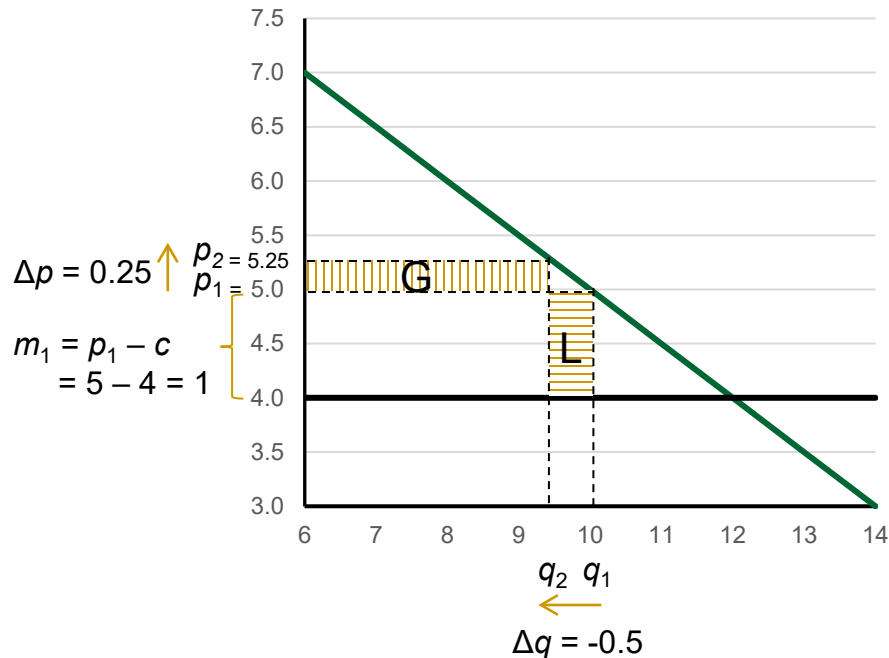
Step 3. Solve for the variables you need using the parameters given in the problem and the demand curve:

$q = 20 - 2p$ (from the inverse demand curve)

$q_1 = 10$ (when $p_1 = 5$)

$\Delta p = 0.25$ (applying 5% SSNIP to $p_1 = 5$)

$p_2 = 5.25$ ($= p_1 + \Delta p$)

$q_2 = 9.5$ (from demand curve with $p_2 = 5.25$)

$\Delta q = q_2 - q_1 = 9.5 - 10 = -0.5$

$m_1 = p_1 - c = 5 - 4 = 1$

$\Delta p = 0.25$ $p_2 = 5.25$ $p_1 = 5.0$

$m_1 = p_1 - c$
$= 5 - 4 = 1$

q_2 q_1

$\Delta q = -0.5$

HMT: Example

- ## Set up the problem:

  - ❏ (Inverse) demand: $p = 10 - \frac{1}{2} q$

  - ❏ Starting point: $p_1 = 5$

  - ❏ SSNIP = 5%

  - ❏ Constant marginal cost $c = 4$

$q = 20 - 2p$ (from the inverse demand curve)
$q_1 = 10$ (when $p_1 = 5$)
$\Delta p = 0.25$ (applying 5% SSNIP to $p_1 = 5$)
$p_2 = 5.25$ (= $p_1 + \Delta p$)
$q_2 = 9.5$ (from demand curve with $p_2 = 5.25$)
$\Delta q = q_2 - q_1 = 9.5 - 10 = -0.5$
$m_1 = p_1 - c = 5 - 4 = 1$
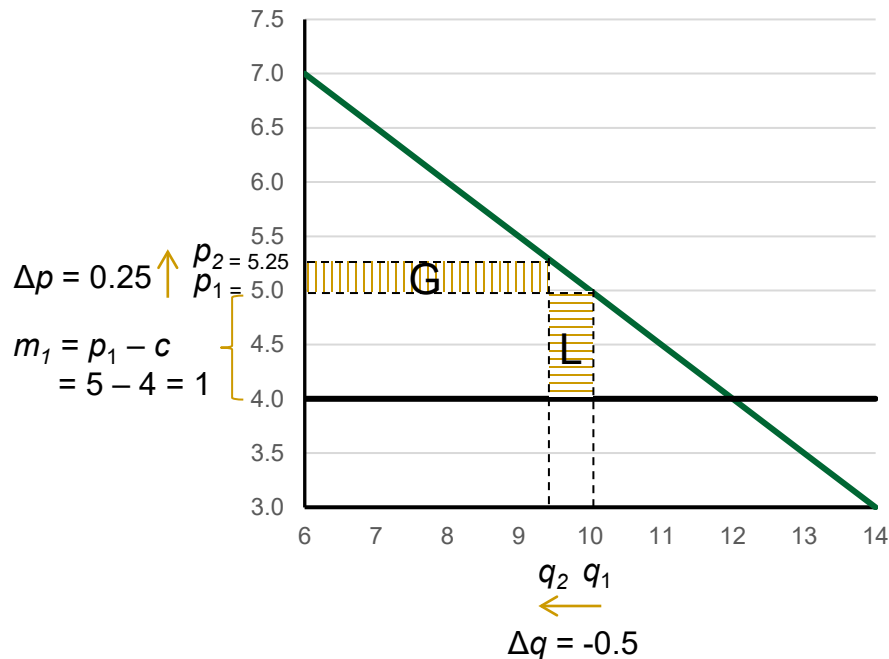
Step 4. Solve for net incremental profits

Area G = $q_2\Delta p$ = (9.5)(0.25) = 2.375
Area L = $m_1\Delta q$ = (1)(-0.5) = -0.5

Incremental profits = Area G – Area L
$\qquad\qquad\qquad$ = 2.375 – 0.5 = 1.875

Therefore, a price increase of 5 percent above the current level is profitable and the HMT is satisfied

HMT: Recap

- ## The question
  - Can a hypothetical monopolist of a group or products (a *candidate market*) profitably increase the price of those products by a small but significant nontransitory amount (a *SSNIP*)?

- ## The test: If the incremental profits from the price increase are—
  - *Positive*: The price increase is profitable and the HMT is satisfied
  - *Negative*: The price increase is unprofitable and the HMT fails

- ## The accounting: Incremental profits
  - = The gain from the increased margin (Δp) on the inframarginal sales (q_2) *minus* the loss of margin ($p_1 - c$) on the marginal sales (Δq)
  - $= \Delta p \times q_2 - (p_1 - c) \times \Delta q$

- ## The data
  - The statement of the problem will give you p_1, q_1, c, the SSNIP, and some indication of how demand changes with an increase in price
  - Those variables will permit you to calculate Δp, q_2, Δq, and net incremental profits

Hypothetical monopolist test

- Example—Uniform price increase on all products in the candidate market

Consider blue cars (a homogeneous product) as a candidate market. Say blue cars are priced at $20,000 per car, cost $17,000 per car to produce, and sell 50,000 cars per year. If the price is increased by 5% on all blue cars, blue cars will only sell 45,000 cars per year. Are blue cars a relevant market under the hypothetical monopolist test for a 5% SSNIP?

Data			Incremental profit on inframarginal sales (area G)		
Unit sales (q1)	50,000	From problem	Inframarginal sales	45,000	
Price (p1)	$20,000	From problem	$SSNIP	$1,000	p1 times q1
Unit cost (c)	$17,000	From problem	Incremental gross profits	$45,000,000	Difference
$Margin ($m)	$3,000	Calculated			
			Incremental loss of profit on marginal sales (area L)		
Retained sales (q2)	45,000	From problem	Marginal sales	-5,000	Δq
Lost (marginal) sales (Δq)	5,000	Calculated	$Margin	$3,000	$m
%SSNIP	5%	From problem	Incremental gross losses	-$15,000,000	$m times Δq
$SSNIP	$1,000	Calculated			
		Calculated	**Incremental net profits**	**$30,000,000**	

- Incremental net profits are positive, so blue cars are a relevant market under the hypothetical monopolist test
- This is a "brute force" accounting implementation of a uniform SSNIP test

HMT: Merger Guidelines Algorithm[1]

1. Start with the product of a merging firm as the starting candidate market.

   ❑ In practice (and in the courts), the starting market may include multiple products selected for reasons outside the HMT test (such as industry recognition)

2. Ask whether a hypothetical monopolist of the candidate market could profitably increase price by a SSNIP. If so, then that candidate market satisfies the HMT. If not, go to Step 3.

3. Expand the market to include the next closest substitute to the products in the prior candidate market and repeat Step 2.
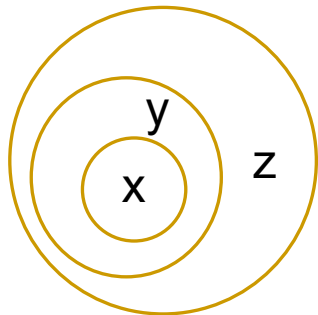
1. Start with candidate market x. Apply HMT.
   If HMT is satisfied, this is the relevant market
   If HMT fails, expand market to y

2. Apply HMT to new candidate market
   If HMT is satisfied, this is the relevant market
   If HMT fails, expand market to z

3. Apply HMT to new candidate market
   If HMT is satisfied, this is the relevant market
   If HMT fails, expand market . . .

[1] 1992 Horizontal Merger Guidelines § 1.11.

HMT: Some questions

1. Should the test be whether the SSNIP is profitable for the hypothetical monopolist (the *profitability* or *breakeven test*) or whether the hypothetical monopolist's profit-maximizing price is equal to or greater than the SSNIP (the *profit-maximization test*)?

   ❑ The practice under the 1982 and 1992 Merger Guidelines in the agency and the courts was to use the profitability test

   ▪ The profitability test is sometimes called the *breakeven test*
   ▪ Moreover, notwithstanding that change in verb from "could" to "would" in the 1992 Merger Guidelines, the agencies did not change from a profitability test to a profit-maximization test either in their investigations or in their briefs in court

   ❑ After the 2010 Merger Guidelines were released, the DOJ and FTC chief economists began to emphasize the profitability test as the proper one in economic analysis as well as the one prescribed by the language of the Guidelines

   ❑ Practice in the courts

   ▪ As the courts were adopting the hypothetical monopolist test in the 1980s and early 1990s, the 1982 and 1992 guidelines were in effect
   ▪ As a result, the agencies urged the courts to adopt, and the courts did adopt in fact, the probability version of the hypothetical monopolist test
   ▪ Today, the profitability test remains the judicial test in most courts

HMT: Some questions

- *Example*: HMT profitability and profit maximization tests in a close-to-monopolized market

The HMT profit maximization test is not satisfied—Hypothetical monopolist would not price as high as a SSNIP

The HMT probability test is satisfied—a 5% SSNIP would be profitable

5% SSNIP

Model:
$q = 1000 - 5p$
$p_1 = 145$
$q_1 = 275$
$F = 0$
$mc = 100$
$\pi_1 = 12{,}375$

$p_{max} = 150$
$q_{max} = 250$
$\pi_{max} = 12{,}500$

SSNIP = 5%
$p_2 = 152.25$
$q_2 = 238.75$
$\pi_2 = 12{,}475$

Profits

12600
12500
12400
12300
12200
12100
12000

140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160

p_1 p_{max} p_2 Price

HMT: Some questions

- **Testing for profit-maximization**
  - *Proposition*: Given the symmetry in the profit curve when demand is linear, a candidate market will satisfy the profit-maximization test for a SSNIP of δ if the candidate market satisfies the profitability test of 2δ

- **Profitability v. profit-maximization: Does it matter?**
  - *Not really*: The profit-maximization test will fail only if the prevailing market price is within 5 percent of the monopolist's profit-maximizing price
    - Empirically, this should occur only rarely

In this course, the default is the profitability version of the HMT although we will see the profit-maximization in some case studies

HMT: Some questions

2. Uniform or selective SSNIP

- ❑ Should the hypothetical monopolist increase the prices of all products in the relevant market by the same percentage SSNIP or should the monopolist be allowed to selectively increase the prices of one or more products in the relevant market?
  - *The 1982 Merger Guidelines*: Required a uniform SSNIP
  - *The 1992 Merger Guidelines*: Allowed a selective SSNIP; the practice was to use a selective SSNIP when the product in question was already selectively priced under prevailing market conditions
  - *The 2010 Merger Guidelines*: Allowed a selective SSNIP; the practice is to use a selective SSNIP when the product in question was already *or* could be selectively priced
- ❑ *Proposition*: If a candidate market satisfies the HMT, then any superset of that market will satisfy the HMT
  - Use selective pricing and keep the added products at their original price

B

A
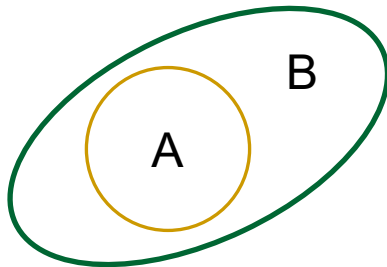
If A satisfies the HMT, then AB + B satisfies the HMT (just keep the B products at their original prices)

HMT: Some questions

3. Should the relevant market identified by the HMT be the smallest market that satisfies the test or should any (reasonable) candidate market that satisfies the test be a relevant market?

- ❑ The 1982 and 1992 Merger Guidelines imposed a "smallest market" requirement
  - ■ In principle, this makes the relevant market unique
- ❑ The 2010 Merger Guidelines rejected the smallest market requirement
  - ■ Also rejects unique relevant markets and allows multiple relevant markets for the same pair of overlapping merger products
- ❑ The courts have never applied the HMT strictly algorithmically and have accepted larger relevant markets that also satisfied the *Brown Shoe* tests
  - ■ We see this in H&R Block/TaxAct
  - ■ Courts, however, do sometimes state that they do apply the smallest market principle
- ❑ NB: When using a selective or one-product SSNIP, any superset of a relevant market will satisfy the HMT profitability test

HMT: Some questions

4. Is passing the HMT a necessary or a necessary and sufficient condition for a relevant market?

❑ Originally, the HMT was widely considered by the agencies and the bar as a necessary and sufficient condition

❑ But courts did not accept the HMT as a sufficient test when the product grouping did not comport with the "commercial realties" of a market—typically when:

  ▪ Close substitutes were excluded, *or*

  ▪ The industry did not recognize the product grouping as a market

❑ The 2010 Horizontal Merger Guidelines implicitly weakened the HMT to more of a necessary test when they eliminated the smallest market requirement:

> The hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to a single relevant market. The Agencies may evaluate a merger in any relevant market satisfying the test, guided by the overarching principle that the purpose of defining the market and measuring market shares is to illuminate the evaluation of competitive effects.
> Because the relative competitive significance of more distant substitutes is apt to be overstated by their share of sales, when the Agencies rely on market shares and concentration, they usually do so in the smallest relevant market satisfying the hypothetical monopolist test.[1]

[1] 1992 Horizontal Merger Guidelines § 4.11.

Market Definition
Part 2: Qualitative evidence

Evidence

- **Types of probative evidence**
  1. Qualitative evidence probative of consumer substitutability: cross-elasticity of demand, diversion, reasonable interchangeability of use
     - *Brown Shoe* "practical indicia"-type evidence
  2. Quantitative evidence implementing the Hypothetical Monopolist Test (HMT)

- **Sources of evidence**
  1. Business documents of the merging parties and other companies
  2. Testimony of fact witnesses
  3. Analysis by expert economists

- **Some key questions**
  1. Which products does the company regard as its primary competitors when setting prices, deciding on products attributes or improvements, or considering strategy?
  2. Which products does the company track for prices, product offering, product attributes?

  We are going to look first at the qualitative evidence in H&R Block

Evidence: DDIY belong in the market

- When setting prices and product attributes, the merging parties—
    - Look almost exclusively at other DDIY firms and rarely look at other firms
    - Rarely consider loss of DDIY customers to other tax preparation methods

- TaxACT CIM identified HRB and TurboTax as the main competitors
    - A "CIM" is a *Confidential Information Memorandum*—a sales document prepared by the investment bankers designed to attract interest at the highest price
    - Can be a serious problem for the antitrust defense if not carefully written (as here)

- TaxACT strategy documents: "Freemium" strategy designed to attract customers from other DDIY competitors (especially HRB and TurboTax)

Evidence: Other methods do not belong

1. **Consumer experience is very different from DDIY experience**
   - Different technology
   - Different prices
   - Different convenience levels
   - Different time investments
   - Different type of interaction by the customer with the product

2. **DDIY prices differ significantly from assisted preparation**
   - TurboTax: $55
   - HRB: $25 (average) — DDIY average price: $44.13
   - TaxACT: Freemium
   - Assisted: $150-$200 (not within SSNIP)

   > But note that the court ignored the significant percentage differences in prices of products within the DDIY candidate market

3. **No detectable switching based on small changes in relative price**
   - *Testimony*: Switching that does occur appears the result of changes in tax condition
     - Not price driven
   - HRB and third-party executives testified that they do not believe that their DDIY compete closely with manual or assisted

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

54

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Conclusion

Qualitative evidence indicates that DDIY tax software products are the relevant product market

Market Definition
Part 3: Quantitative evidence

Experts

- **DOJ: Frederick R. Warren-Boulton**
  - Ph.D in economics (Princeton University)
  - Private consultant (Ankura)
  - Formerly ATD chief economist
  - Expert witness in multiple cases

- **Merging parties: Christine Meyer**
  - Ph.D in economics (MIT)
  - Private consultant (NERA)
  - First merger case as a testifying expert

Federal Rules of Evidence

- ## Rule 602: General rule

> "A witness may testify to a matter only if evidence is introduced sufficient to support a finding that the witness has *personal knowledge* of the matter."

- ## Rule 702: Exception for expert opinion evidence[1]

Personal qualifications:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify *in the form of an opinion* or otherwise if:

[1] Rule 702 was amended in 2000 in response to Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993), and to the many cases applying *Daubert*, including Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999). In *Daubert* the Court charged trial judges with the responsibility of acting as gatekeepers to exclude unreliable expert testimony. In *Kumbo*, the Court clarified that this gatekeeper function applies to all expert testimony, not just testimony based on science.

Federal Rules of Evidence

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> (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

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Reliability of methods:

> (c) the testimony is the product of reliable principles and methods; and

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Reliability of methods:
> (c) the testimony is the product of reliable principles and methods; and

Reliability of application:
> (d) the expert has reliably applied the principles and methods to the facts of the case.

Federal Rules of Civil Procedure

■ Discovery: Rule 26(a)(2)—Disclosure of expert testimony: Requires—

1. Disclosure of the identity of any witness who may be used at trial to present expert opinion testimony

2. A written report prepared and signed by each testifying expert containing—

    a. a complete statement of all opinions the witness will express and the basis and reasons for them;

    b. the facts or data considered by the witness in forming them;

    c. any exhibits that will be used to summarize or support them;

    d. the witness's qualifications, including a list of all publications authored in the previous 10 years;

    e. a list of all other cases in which, during the previous 4 years, the witness testified as an expert at trial or by deposition; *and*

    f. a statement of the compensation to be paid for the study and testimony in the case

Federal Rules of Civil Procedure

- **Departures from the expert report**
  - New evidence not contained within the expert's report or testimony that significantly departs from the report is objectionable and the court may stricken from the record

- **Observations**
  - Rule 26(a)(2) expert reports are discovery products and are not given to the court as a matter of course
    - But can be submitted as a declaration in support of a preliminary injunction
      - Frequently, the expert submits a new declaration and not the entire expert report
  - Experts typically testify at trial
    - But courts can require written reports or written direct testimony
    - So you sometimes see expert reports in the record (although they are almost always under seal)

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

Federal Rules of Civil Procedure

- **Usual procedure**
    - Expert provides Rule 26(a)(2) report to opposing party
        - Usually both sides have experts—Depending on the case management order (CMO), initial reports may be exchanged simultaneously or provided sequentially (with the plaintiff going first with its report)
    - Opposing side takes the expert's deposition
    - Opposing expert submits rebuttal report
    - Expert submits a reply report responding to criticisms
        - NB: The reply report cannot introduce "new" analysis or opinions
            - *Query*: What does "new" mean in this context?
            - A frequently litigated issue

- **Challenges to the admissibility of expert testimony**
    - Based on the expert reports and deposition, the opposing side may file a pretrial motion in limine to exclude from trial some or all of the expert's analysis and opinions for failure to satisfy the requirement of Rule 702
        - This is called a *Daubert* motion
    - Usually decided on the papers, but the court can hear live testimony and question the expert at a *Daubert* hearing
        - Daubert hearings are common in jury trials and reasonably rare in bench trials

DOJ's expert evidence

- **Warren-Boulton conclusions: The relevant product market is DDIY**
  1. A hypothetical monopolist of DDIY products could profitably impose a uniform SSNIP profitably for all DDIY products, *and*
  2. Consumer substitution to assisted methods or pen-and-paper would be insufficient to defeat the SSNIP

- **Organization of testimony**
  1. Results of review of regular course of business documents
  2. Hypothetical monopolist test
  3. Merger simulation

DOJ's expert evidence

1. Started with DDIY as the initial provisional market

    ❑ Functionally similar from user perspective

    ▪ Fundamentally similar service

    ▪ Similar user experience: User sits at computer and interacts with the DDIY software, which prompts user for information

    ❑ Review of defendants' documents indicated they viewed DDIY products in same market

    ❑ *Court*: Agreed that this is an appropriate starting place

    Note that Warren-Boulton was not applying any formal economic tools here. He was simply looking at the practice as evidenced by what he reviewed in the documents and the (deposition) testimony. Still, he opined as an economist that economists look at these things when determining the starting point of the market definition analysis. Then the exercise becomes what else—if anything—to include in the market.

DOJ's expert evidence

2. Ruled out manual preparation (in the initial provisional market)

- ❑ Some facts
  - ■ "Gradual migration of customers to DDIY from more traditional methods like pen-and-paper"
  - ■ DDIY growing in share while manual declining
- ❑ But—
  - ■ No correlation of switching to manual with changes in yearly average DDIY prices
  - ■ IRS data indicates that switching to manual from DDIY appeared to be driven by decreases in tax return complexity, not relative prices
    - ❑ That is, a shift of the taxpayer's demand curve, *not* a shift along the demand curve

DOJ's expert evidence

3. Ruled out assisted preparation (in the initial provisional market)

- ❑ Growth in DDIY not at expense of assisted (from documents and testimony)

- ❑ HRB internal studies and IRS data indicate that switching from DDIY to assisted is correlated to increases in tax complexity

- ❑ Using IRS switching data from 2004-2009, increase in relative price of assisted was not associated with—

  - ■ Decreases in relative share of assisted, *or*
  - ■ Increases in relative share of DDIY

Remember the relationships: If products are substitutes, then an increase in the relevant price of one product will—
  1. Decrease the demand for that product, and
  2. Increase the demand of the other product

DOJ's expert evidence

- Used two quantitative tests to confirm DDIY as the relevant market
    1. A *critical loss implementation* of the hypothetical monopolist test
    2. *Merger simulation*

Implementations of the Hypothetical Monopolist Test:
Critical Loss

Critical loss

- **The basic idea**
  - ❑ When demand is linear, the profit curve as a function of price is a parabola
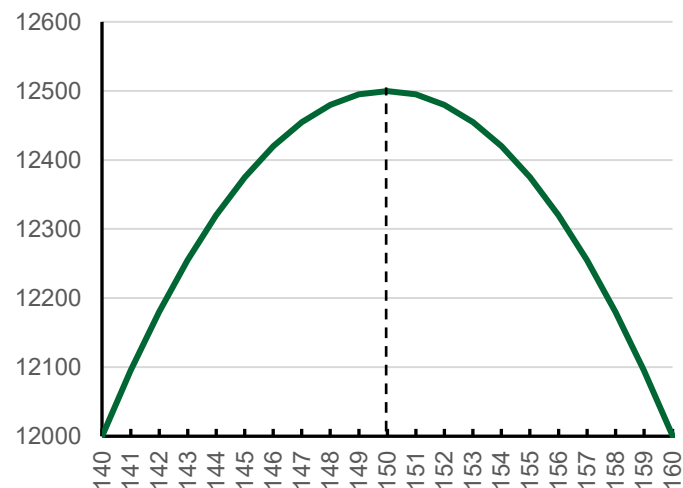
  Model:
  $q = 1000 - 5p$
  $F = 0$

  $p_{max} = 150$
  $q_{max} = 250$
  $\pi_{max} = 12{,}500$

Profits as a Function of Price

Critical loss

- Say the prevailing price is 145

- Then a price of 155 would yield the same profits

p	q	π
145	275	12,375
155	225	12,375

- Any price strictly between 145 and 155 would yield higher profits

- Note that 150 is the profit-maximizing price

Profits as a Function of Price
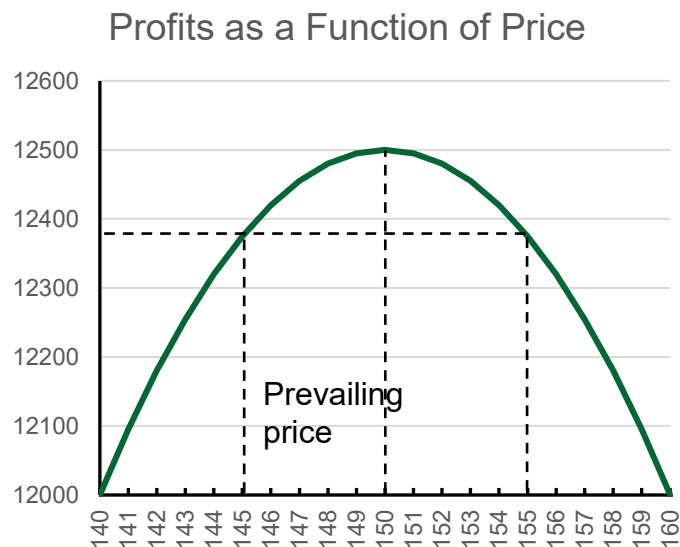
Critical loss

- Δ*p* is profitable in the first graph and unprofitable in the second graph

Profits as a Function of Price

Δ*p*

Prevailing price

Profits as a Function of Price

Δ*p*

Prevailing price
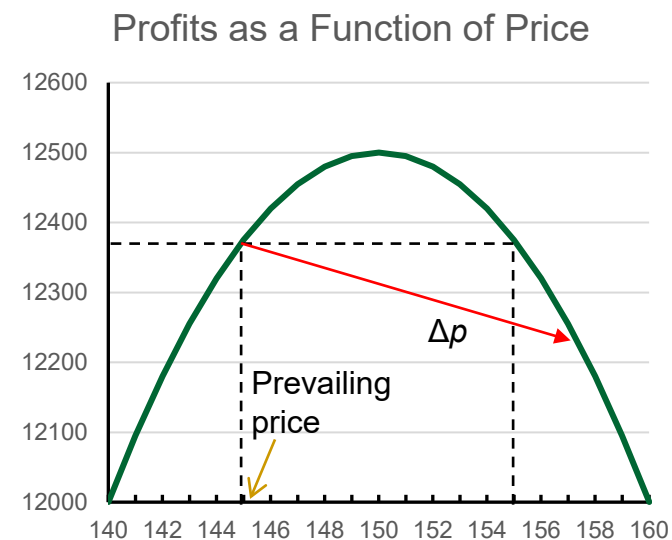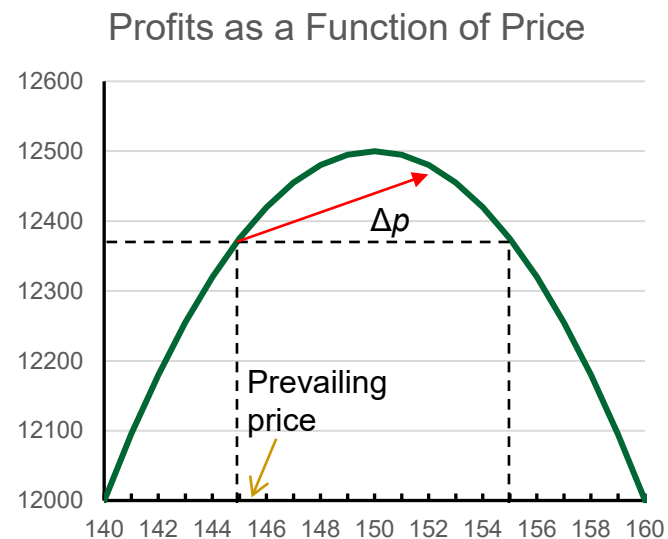
Critical loss

- **Implementing the hypothetical monopolist test**
    - The *critical loss* for Δp will be the maximum quantity Δq_{cl} the hypothetical monopolist could lose and still make at least as much in profit as it did before the SSNIP was implemented
    - We can associate an actual loss Δq with a price increase of Δp

    Whether the price increase is profitable will depend on whether the associated quantity decrease is less than the critical loss, that is whether $\Delta q \leq \Delta q_{cl}$

- **This is called the *critical loss test***
    - Δp_1 is profitable because $\Delta q_1 \leq \Delta q_{cl}$
    - Δp_2 is unprofitable because $\Delta q_2 \leq \Delta q_{cl}$

Profits as a Function of Price
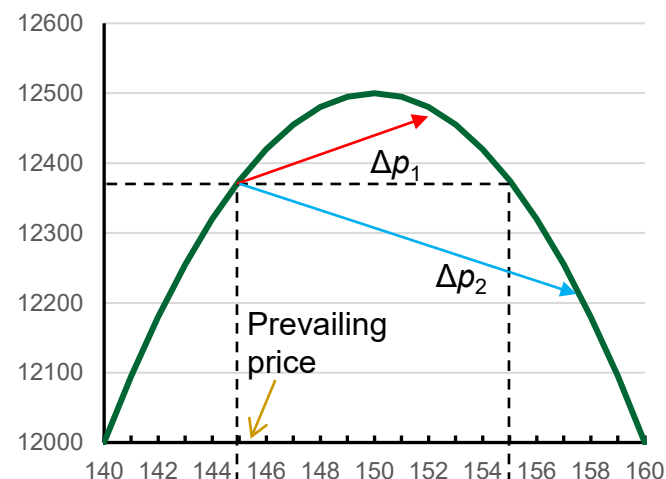
Profits as a Function of Quantity
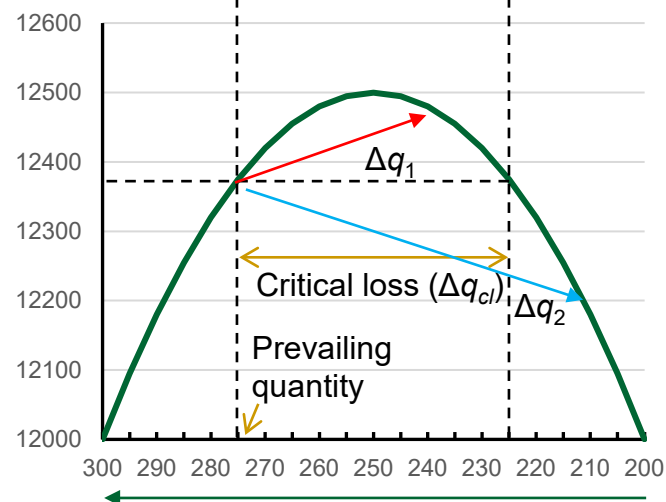
Critical loss

- ## The *critical loss rule*:

    *If actual loss is less than the critical loss,
    the candidate market satisfies the HMT*

- ## The idea
    - When actual loss is less than critical loss, this means that for a given SSNIP the hypothetical monopolist is able—
        - to capture enough incremental profits on the margin increase on its inframarginal sales
        - to offset the incremental profit decrease on the loss of the marginal sales

- ## A caution
    - Actual loss and critical loss are functions of the magnitude of the SSNIP
    - A hypothetical monopolist that satisfies the HMT at a 5% SSNIP may fail the HMT for a 10% SSNIP

Critical loss

- ## A little algebra

  - The critical loss for Δp will be the maximum quantity Δq_{cl} the hypothetical monopolist could lose and still make at least as much in profit as it did before the SSNIP was implemented:

Post-price increase profits   Pre-price increase profits

$$\underbrace{\underbrace{\left(p + \Delta p - c\right)}_{p_2}\underbrace{\left(q - \Delta q_{cl}\right)}_{q_2}}_{m_2} \qquad = \qquad \underbrace{\left(p - c\right)q}_{m_1}$$

> Breakeven condition with constant marginal costs

  - Rearranging this equality, we can also express this condition as an equality of the gross gain in profits on retained sales and the gross loss in profits from lost sales:

Gain on retained sales   Loss of margin on lost sales

$$\Delta p\left(q - \Delta q_{cl}\right) \qquad = \qquad \left(p - c\right)\Delta q_{cl}$$

Note: Critical loss is a function of the starting point q as well as p, Δp, and c

Critical loss

- A little more algebra: Three formulas for critical loss

  1. Solving for Δq_{cl} provides a formula for the *critical loss in units*:

  | 1. Unit critical unit loss formula: | $$\left(CL=\right)\Delta q_{cl}=\frac{q\Delta p}{\left(p+\Delta p\right)-c}$$ | In a HMT, Δp is the \$SSNIP |

    - Requires—
      - The same price (and hence the same Δp) for all products in the candidate market
      - The same dollar margin for all products in the candidate market

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

78

Critical loss

- A little more algebra: Three formulas for critical loss

  1. Solving for Δq_{cl} provides a formula for the *critical loss in units*:

1. Unit critical unit loss formula:	$\left(CL=\right)\Delta q_{cl}=\dfrac{q\Delta p}{\left(p+\Delta p\right)-c}$	In a HMT, Δp is the \$SSNIP

    - Requires—
      - The same price (and hence the same Δp) for all products in the candidate market
      - The same dollar margin for all products in the candidate market

Critical loss

- A little more algebra: Three formulas for critical loss
  2. Divide Equation 1 by q to obtain *percentage critical loss*:

$$\left(\%\Delta q_{cl} \equiv\right)\frac{\Delta q_{cl}}{q} = \frac{\Delta p}{(p + \Delta p) - c} = \frac{\dfrac{\Delta p}{p}}{\dfrac{\Delta p}{p} + \dfrac{p - c}{p}}$$

2. Percentage critical loss formula:	$$= \frac{\delta}{\delta + m}$$

where

δ is the percentage price increase: $\delta = \dfrac{\Delta p}{p}$ In a HMT, δ is the %SSNIP

m is the percentage gross margin: $m = \dfrac{p - c}{p}$

  - Requires a constant percentage margin m for all products in the candidate market

Critical loss

- A little more algebra: Three formulas for critical loss
  3. We can also define the *critical elasticity ε_{cl}* as the maximum elasticity that will profitably support a price increase of δ:

Definition of own-elasticity:
$$\left|\varepsilon_{cl}\right| = \frac{\dfrac{\Delta q_{cl}}{q}}{\dfrac{\Delta p}{p}} = \frac{\Delta q_{cl}}{q}\frac{1}{\delta} \Rightarrow \frac{\Delta q_{cl}}{q} = \delta\left|\varepsilon_{cl}\right|$$

> NB: By convention, Δq_{cl} is a *positive* number. To make the signs work, we must use the absolute value of the elasticity. *Always watch for the sign of Δq in any equation.*

Percentage critical loss formula:
$$\frac{\Delta q_{cl}}{q} = \frac{\delta}{\delta + m} \Rightarrow \delta\left|\varepsilon_{cl}\right| \cong \frac{\delta}{\delta + m},$$

Cancelling the δ s:
$$\left|\varepsilon_{cl}\right| \cong \frac{1}{\delta + m}$$

> 3. Critical elasticity formula

- Accordingly, when the actual own-elasticity of demand ε is less than the critical elasticity ε_{cl} (i.e., ε is more *in*elastic than ε_{cl} or equivalently $\left|\varepsilon\right| < \left|\varepsilon_{cl}\right|$), then for a small enough %SSNIP the price increase will be profitable
  - We can express this as:
  $$\left|\varepsilon\right| < \frac{1}{\delta + m}.$$

Critical loss and market definition

- **The basic idea**
  - Recall that under the hypothetical monopolist test, a candidate market is a relevant market if a hypothetical monopolist could profitably raise prices in the candidate market by a SSNIP
  - So for any candidate market with prevailing aggregate output q and price p and a $SSNIP Δp—
    - if the associated change in output Δq is less than the critical loss Δq_{cl} ,
    - then a hypothetical monopolist could profitably raise price by the SSNIP
    - and the candidate market is a relevant market (more, more technically, satisfies the HMT)

Homework problem 1

Products A and B are being tested as a candidate market. The market price for each unit of either product is $300, each type of product has a constant incremental cost of $160 per unit and aggregate sales of 1000 units. When the price for both products is increased by $15, each firm loses 100 units to products other than A and B. What is the critical loss for the candidate market of products A and B? Do A and B constitute a relevant market under the hypothetical monopolist test using critical loss analysis and SSNIP of 5%?

You are given the actual unit loss, so think the unit critical loss test

- **"Brute force" method**
  - Step 1: Summarize the variables
    - p = 300 Q = 1000 + 1000 = 2000
    - c = 160 ΔQ = -100 + -100 = -200
    - $SSNIP = 15$
  - Step 2: Set up and solve the breakeven condition:

$$pq - cq = (p + \Delta p)(q - \Delta q_{cl}) - c(q - \Delta q_{cl})$$

  - Rearranging:

$$(p - c)q = (p + \Delta p - c)(q - \Delta q_{cl})$$

    | Profits = $margin times quantity |

  - Substituting parameters:

$$(300 - 160)2000 = (300 + 15 - 160)(2000 - \Delta q_{cl})$$

Homework problem 1

- **"Brute force" method (con't)**
  - Step 2: Set up and solve the breakeven condition for ΔQ_{cl} (con't)

  On the calculator screen:

  What do you want to calculate?

  $$(160) \cdot 2000 = (300 + 15 - 160) \cdot (2000 - x)$$

  CALCULATE IT!

  Solve | Lesson | Practice

  Let's solve your equation step-by-step.

  $$(300 - 160)(2000) = (300 + 15 - 160)(2000 - x)$$

  Show Step-By-Step

  Answer:

  $$x = \frac{6000}{31} \quad = 193.55$$

  - Step 3: Compare actual loss to unit critical loss
    - Actual loss: $\Delta Q = 100 + 100 = 200$ units
    - Unit critical loss $\Delta Q_{cl} = 193.55$
  - *Answer*: Since $\Delta Q > \Delta Q_{cl}$, Products A and B are technically NOT a relevant product market under the Merger Guidelines

> Neither precision nor accuracy is a hallmark of market definition. Although actual loss is greater critical than critical loss, the difference is so small that it is unlikely a court would reject A and B as a relevant market if the qualitative evidence had convinced the judge that A and B are a proper relevant market

Homework problem 1

Products A and B are being tested as a candidate market. The market price for each unit of either product is $300, each type of product has a constant incremental cost of $160 per unit and aggregate sales of 1000 units. When the price for both products is increased by $15, each firm loses 100 units to products other than A and B. What is the critical loss for the candidate market of products A and B? Do A and B constitute a relevant market under the hypothetical monopolist test using critical loss analysis and SSNIP of 5%?

- **Unit critical loss formula**
    - Step 1: Summarize variables
        - $p = 300$　　　　　　　　　　$Q = 1000 + 1000 = 2000$
        - $c = 160$　　　　　　　　　　$\Delta Q = 100 + 100 = 200$
        - $\$SSNIP = 15$
    - Step 2: Apply the *unit critical loss formula* find unit critical loss

$$\Delta Q_{cl} = \frac{Q \Delta p}{(p + \Delta p) - c} = \frac{2000 * 15}{(300 + 15) - 160} = 193.55$$

    - Step 3: Compare actual loss to unit critical loss
        - Actual loss: $\Delta Q = 100 + 100 = 200$ units
        - Unit critical loss $\Delta Q_{cl} = 193.55$
    - *Answer*: Since $\Delta Q > \Delta Q_{cl}$, Products A and B are technically NOT a relevant product market under the Merger Guidelines

Critical loss and market definition: Example 2

Products A and B are being tested as a candidate market. Each sells for $100, has an incremental cost of $60, and sells 1200 units. When the price for both products is increased by $5, each firm loses 100 units to outside the market. Do A and B constitute a relevant market under the 2010 Guidelines?

Given actual loss, so think unit critical loss

Critical loss and market definition: Example 2

Products A and B are being tested as a candidate market. Each sells for $100, has an incremental cost of $60, and sells 1200 units. When the price for both products is increased by $5, each firm loses 100 units to outside the market. Do A and B constitute a relevant market under the 2010 Guidelines?

Given actual loss, so think unit critical loss

Parameters		
Price	p	100
Cost	c	60
Gross margin	m	40
Market output	Q	2400
SSNIP	Δp	5
Customer loss	ΔQ	-200

Critical loss and market definition: Example 2

Products A and B are being tested as a candidate market. Each sells for $100, has an incremental cost of $60, and sells 1200 units. When the price for both products is increased by $5, each firm loses 100 units to outside the market. Do A and B constitute a relevant market under the 2010 Guidelines?

Given actual loss, so think unit critical loss

Parameters

Price	p	100
Cost	c	60
Gross margin	m	40
Market output	Q	2400
SSNIP	Δp	5
Customer loss	ΔQ	-200

Critical loss

$$\Delta q^* = \frac{q\Delta p}{(p + \Delta p) - c}$$

qΔp	12000
(p+Δp)-c	45
CL	266.6667

Unit critical loss formula

Actual loss (200) is less than the critical loss (266.67), so A and B are a relevant market

Critical loss and market definition: Example 2

Products A and B are being tested as a candidate market. Each sells for $100, has an incremental cost of $60, and sells 1200 units. When the price for both products is increased by $5, each firm loses 100 units to outside the market. Do A and B constitute a relevant market under the 2010 Guidelines?

Given actual loss, so think unit critical loss

Parameters			"Brute force" profit calculations		Critical loss	
Price	p	100	Gain = (Q+ΔQ)Δp			
Cost	c	60	Q + ΔQ	2200		
Gross margin	m	40	Δp	5		
Market output	Q	2400	Gain	11000		
SSNIP	Δp	5	Loss = mΔQ			
Customer loss	ΔQ	−200	ΔQ	−200	qΔp	12000
			m	40	(p+Δp)−c	45
			Loss	−8000	CL	266.6667
			Net	3000		

$$\Delta q^* = \frac{q\Delta p}{(p + \Delta p) - c}$$

From the breakeven condition (see earlier slide)

Actual loss (200) is less than the critical loss (266.67), so A and B are a relevant market

Brute force profit calculations confirmation: Since the gain exceeds the loss, a hypothetical monopolist of A and B could profitably raise price by 5% and so A and B are a relevant market

Critical loss and market definition: Example 3

> Premium cupcakes sell for $1.50 apiece and cost $0.90 to make. At this price, producers collectively sell 10,000 premium cupcakes. When the price for all premium cupcakes is increased by 5%, 15% of the customers switch to regular cupcakes. Do premium cupcakes constitute a relevant market under the 2010 Guidelines?

You are given the percentage loss, so think percentage critical loss

- Step 1: Summarize the variables

  - p = 1.50   %SSNIP = 5%
  - c = 0.90   Q = 10,000
  - m $= \dfrac{1.50 - 0.90}{1.50} = 40\%$ %ΔQ = 15%

- Step 2: Calculate the percentage critical loss:

$$\left(\%CL = \right)\frac{\Delta q_{cl}}{q} = \frac{\delta}{\delta + m} = \frac{5\%}{5\% + 40\%} = 11.11\%$$

- Step 3: Compare percentage actual loss to percentage critical loss

  - Percentage actual loss = 15%
  - Percentage critical loss = 11.11%

- *Answer*: Since %ΔQ > % ΔQ_{cl}, premium cupcakes are NOT a relevant product market

Homework problem 2

In *FTC v. Occidental Petroleum Corp*., No. 86-900, 1986 WL 952 (D.D.C. Apr. 29, 1986), the FTC challenged the pending acquisition by Occidental Petroleum, a major producer of polyvinyl chloride ("PVC"), of Tenneco's PVC business. Both companies produced PVC in plants in the United States. The parties agreed that the relevant product markets were suspension homopolymer PVC and dispersion PVC, and the PI proceeding focused largely on the relevant geographic market. The FTC alleged that the relevant geographic market was the United States for both types of products; the merging parties argued that the relevant geographic market was worldwide. In the Section 13(b) proceeding for a preliminary injunction, the evidence showed that if the price of all suspension homopolymer PVC produced in the United States was increased by 5%, U.S. customers would divert about 17% of their purchases to imports from foreign suppliers (who were ready to serve these customers). The evidence also showed that that if the price of all dispersion PVC produced in the United States was increased by 5%, U.S. customers would divert about 12% of their purchases to imports from foreign suppliers (again, who were ready to serve these customers). The evidence in the hearing also showed that the percentage gross margins for homopolymer PVC and dispersion PVC were 28% and 45%, respectively. Was the FTC correct that the relevant geographic market was the United States using the hypothetical monopolist test and a SSNIP of 5%?

You are given the percentage loss, so think percentage critical loss

90

Homework problem 2

- **Use percentage critical loss method**
  - ❑ Step 1: Summarize the variables

	Suspension PVC	**Dispersion PVC**
	%SSNIP = 5%	%SSNIP = 5%
	%m =28%	%m = 45%
	%ΔQ = 17%	%ΔQ = 12%

  - ❑ Step 2: Calculate the percentage critical loss:
  - ❑

$$\%\Delta q_{cl-suspension\ PVC} = \frac{\delta}{\delta + m} = \frac{5\%}{5\% + 28\%} = 15.15\%$$

$$\%\Delta q_{cl-dispersion\ PVC} = \frac{\delta}{\delta + m} = \frac{5\%}{5\% + 45\%} = 10.00\%$$

  - ❑ Step 3: Compare percentage actual loss to percentage critical loss:
    - ▪ Suspension PVC: 17% actual   15.15% percentage critical loss
    - ▪ Dispersion PVC: 12% actual   10.00% percentage critical loss
  - ❑ *Answer*: The percentage actual loss is greater than the percentage critical loss for both product types, so neither product type technically is its own relevant product market

Homework problem 3

Premium ice cream sells at $4.00/pint and has a constant marginal cost of $2.25/pint. The own-elasticity of aggregate demand for premium ice cream is −1.9, with almost all diversion going to regular ice cream. Two premium ice cream manufacturers proposed to merge. Is premium ice cream a relevant product market under the hypothetical monopolist test under a 5% SSNIP, or should the market be expanded to include regular ice cream?

You are given an actual elasticity, so think critical elasticity

- Step 1: Summarize variables
  - p = 4.00   %SSNIP = 5%
  - c = 2.25 ε = −1.9
  - %m $= \dfrac{4.00 - 2.25}{4.00} = 43.75\%$

- Step 2: Calculate the absolute value of the critical elasticity:

$$\left| \varepsilon_{cl} \right| = \frac{1}{\delta + m} = \frac{1}{0.05 + 0.4375} = 2.05$$

In calculating critical elasticity, be sure to convert the percentages into decimal numbers!

- Step 3: Compare the actual elasticity with the critical elasticity:
  - Actual elasticity (absolute value) = 1.9
  - Critical elasticity (absolute value) = 2.05

- *Answer*: Since $|\varepsilon| < |\varepsilon_{cl}|$, premium ice cream is a relevant market (inelastic enough)
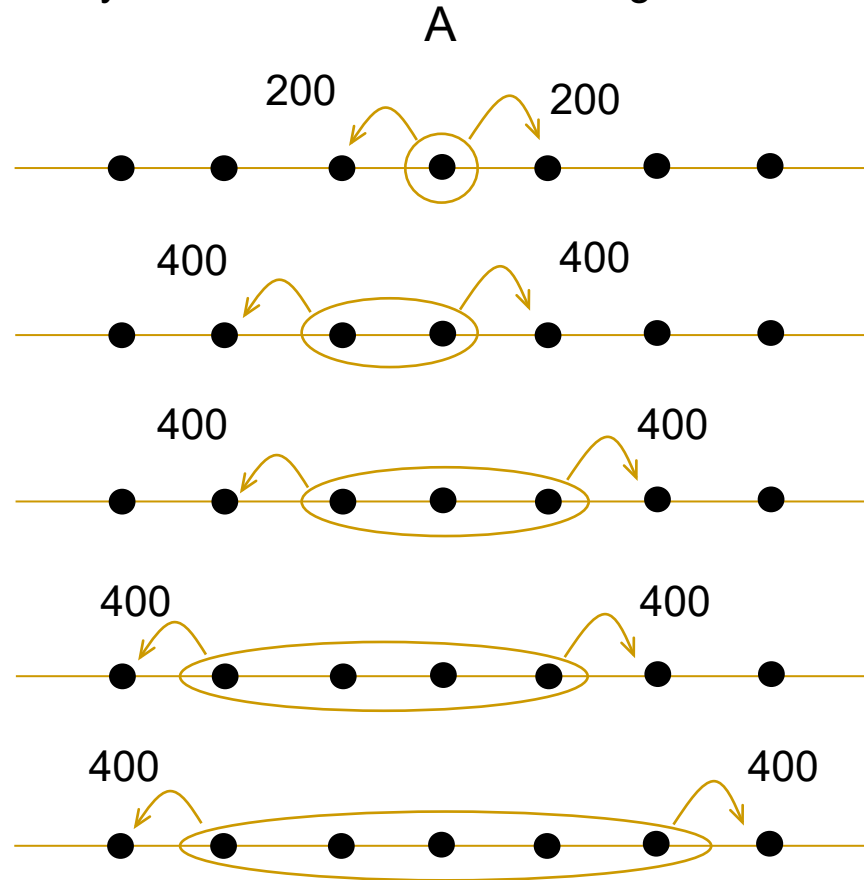
Critical loss and market definition: Example 4

Assume that there is an identical gas station every mile on a straight road. Each gas stations charges $3.25 per gallon, has an incremental costs of $2.50, and sells 1000 gallons. When the price at a station is increased by 5% (holding the price at all other gas stations constant), the station loses customers who in the aggregate buy 400 gallons. No customer will travel more than one mile, however, to avoid a 5% price increase. For a given station A and assuming a SSNIP of 5%, what is the relevant market?

Critical loss and market definition: Example 4

- **Example 4: Gas stations on a road**
 - Step 0: Make sure you understand the switching behavior!

Critical loss and market definition: Example 4

Assume that there is an identical gas station every mile on a straight road. Each gas stations charges $3.25 per gallon, has an incremental costs of $2.50, and sells 1000 gallons. When the price at a station is increased by 5% (holding the price at all other gas stations constant), the station loses customers who in the aggregate buy 400 gallons. No customer will travel more than one mile, however, to avoid a 5% price increase. For a given station A and assuming a SSNIP of 5%, what is the relevant market?

This is complicated, so think brute force

- Step 1: Summarize the variables

  - p = 3.25   %SSNIP = 5%
  - c = 2.50 $SSNIP $= 0.05 * 3.25$
  - $m = 3.25 - 2.50 = 0.75$ $= 0.1625$
  - Customers/station = 1000
  - Customer loss per station = 400

- Step 2: Calculate net profit gain as the market expands

Stations in the market	Q	ΔQ	Gain	Loss	Net
1	1000	400	97.50	300.00	-202.50
2	2000	800	195.00	600.00	-405.00
3	3000	800	357.50	600.00	-242.50
4	4000	800	520.00	600.00	-80.00
5	5000	800	682.50	600.00	82.50
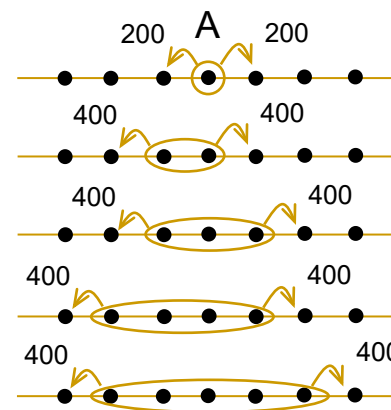
Five stations, with Station A in the middle, is the relevant geographic market

Critical loss and market definition

- **Estimating actual loss (Δq)**
  - First-order approximation of the percentage actual loss for any demand curve:

Percentage actual loss formula

$$\frac{\dfrac{\Delta q}{q}}{\dfrac{\Delta p}{p}} \equiv \varepsilon \Rightarrow \frac{\Delta q}{q} \approx \frac{\Delta p}{p}\varepsilon = \delta\varepsilon,$$

where ε is the residual own-elasticity of demand for the candidate market (i.e., of the hypothetical monopolist)

  that is, the percentage actual loss is approximately equal to the percentage price change times the own-elasticity of demand

  - This formula is exact when demand is linear

  - First-order approximation of the actual unit loss:

$$\frac{\Delta q}{q} \approx \delta\varepsilon \Rightarrow \Delta q \approx q\delta\varepsilon.$$

Unit actual loss formula

  - This formula is exact when demand is linear

Critical loss: Differentiated margins

- **Multiple margins in homogeneous markets**
  - ❏ The critical loss formulas in the earlier slides require some uniformity across all products in the candidate market
  - ❏ In many homogeneous candidate markets, however, the percentage margins will differ among products because of differences between producers in their marginal costs
    - Production technologies may differ among firms resulting in different marginal costs and hence different margins even when all products are homogeneous and sell at the same price
  - ❏ There are two modifications of the critical loss formulas to handle multiple margins
    1. Revenue share-weighted margins
    2. The maximum margin as a *sufficient* condition

Critical loss: Differentiated margins

1. Revenue share-weighted margins
   - ❑ Replace *m* in the above formulas with the revenue share-weighted average margin of the products in the candidate market
   - ❑ NB: This method assumes that unit losses by the hypothetical monopolist as a result of a uniform SSNIP are proportional to revenue shares within the candidate market
     - ■ This is a standard assumption used by economists in critical loss analysis in the absence of information on actual diversions

Critical loss: Differentiated margins

1. Revenue share-weighted average margins—Example

A homogeneous candidate market contains three products with different margins given in the table below. For a uniform 5% SSNIP, the hypothetical monopolist would lose 8% of its sales. Is the candidate market a relevant market?

- The data:

Product	Revenue share	Margin	
A	0.5	0.4	Contributes 50% to the average margin
B	0.3	0.7	Contributes 30% to the average margin
C	0.2	0.3	Contributes 20% to the average margin

- Calculate the revenue share-weighted average margin:

$$m_{ave} = (0.5)(0.4) + (0.3)(0.7) + (0.2)(0.3) = 0.47$$

- Calculate the percentage critical loss using m_{ave}:

$$\left(\%CL = \right)\frac{\Delta q_{cl}}{q} = \frac{\delta}{\delta + m_{ave}} = \frac{0.05}{0.05 + 0.47} = 9.62\%$$

- Since the actual percentage loss (8%) is less than the percentage critical loss calculated using revenue share-weighted margins, the candidate market is a relevant market

Critical loss: Differentiated margins

2. The maximum margin as a *sufficient* condition

- ❑ Replace *m* in the above formulas with the *maximum margin* of the products in the candidate market

- ❑ A *sufficient* condition for the candidate market to be a relevant market is if the actual loss by the hypothetical monopolist is less than the critical loss using the maximum margin

  - ■ This approach essentially assumes the worst case: all unit losses by the hypothetical monopolist as a result of a unform SSNIP come from the product with the highest margin and hence yields the maximum profit loss on marginal sales

  - ■ May use this test if data for a revenue-share-weighted margin is not available or cannot be estimated

This is a sufficient condition only*: Failure to satisfy the test does* not *mean that the candidate market is not a relevant market, since if some losses come from lower margin products the true critical loss is lower than the critical loss calculated using the maximum margin*

Critical loss: Differentiated margins

2. Maximum margin approach (sufficient condition)

> The homogeneous candidate market contains three products with different margins given in the table below. For a 5% SSNIP, the hypothetical monopolist would lose 8% of its sales. Is the candidate market a relevant market?

- The data:

Product	Revenue share	Margin
A	0.5	0.4
B	0.3	0.7
C	0.2	0.3

- Identify the maximum margin: m_{max} = 0.7

- Calculate the percentage critical loss using m_{max}:

$$\left(\%CL = \right)\frac{\Delta q_{cl}}{q} = \frac{\delta}{\delta + m_{max}} = \frac{0.05}{0.05 + 0.7} = 6.67\%$$

- Since the actual percentage loss (8%) is greater than the critical loss calculated using the maximum margin, the candidate market fails this sufficiency test

- BUT this does *not* mean that the candidate market is not a relevant market, since it assumes the worst possible losses for the hypothetical monopolist. Using a revenue share-weighted margin (prior slide), we saw that the candidate market is a relevant market

Critical loss

- ## Summary of formulas[1]

  - ### *Absolute terms (brute force):*

    Gain on retained sales

    $$\Delta p\left(q - \Delta q_{cl}\right) = \left(p - c\right)\Delta q_{cl}$$

    Loss of margin on lost sales

  - ### *Unit critical unit loss:*

    $$\left(CL =\right)\Delta q_{cl} = \frac{q\Delta p}{\left(p + \Delta p\right) - c}$$

    All variables are in units

  - ### *Percentage critical loss:*

    $$\left(\%CL =\right)\frac{\Delta q_{cl}}{q} = \frac{\delta}{\delta + m}$$

    All variables are in percentages

    where δ is the percentage price increase: $\delta = \dfrac{\Delta p}{p}$

    m is the percentage gross margin: $m = \dfrac{p - c}{p}$

---

[1] This is for the profitability implementation of the HMT and assumes constant marginal costs.

Critical loss

- **Summary of formulas[1]**
  - *Critical elasticity*:

$$\left|\varepsilon_{cl}\right| \cong \frac{1}{\delta + m}$$

All variables are in decimals because of the "1" in the numerator (If you want to use percentages, use "100" in the numerator)

  where ε is the own-elasticity of demand of the monopolist (i.e., the aggregate demand curve)

  - *Percentage actual loss*:

$$\frac{\Delta q}{q} \cong \delta\varepsilon$$

Exact when the demand curve is linear

---

[1] This is for the profitability implementation of the HMT and assumes constant marginal costs.

Critical loss: Summary

- **Points to remember**
  - In the standard models, the hypothetical monopolist increases price by reducing output, which creates a scarcity in the product. Inframarginal customers then bid up the price in order to clear the market.
  - While small reductions in output may increase profits, sufficiently large reductions will reduce profits below the prevailing level
  - The maximum output reduction at which the hypothetical monopolist just breaks even on profits is called the *critical loss*
    - The critical loss is the output reduction where the profits gained from the increase in margin in the inframarginal sales just equal the profits lost from the loss of the marginal sales
  - *Test*: If the actual loss of sales due to a SSNIP is less than the critical loss, the SSNIP will be profitable and the candidate market will satisfy the HMT
  - Implementations
    - "Brute force" accounting
      - Calculate the additional profit gain from the increase in margin on inframarginal sales ($SSNIP times inframarginal sales)
      - Calculate the profit loss from the lost marginal sales ($margin times marginal sales)
      - Compare: If the gains exceed the losses, then the product grouping is a relevant market
    - Use a critical loss formula

When in doubt, use "brute force" accounting—It is the most intuitive and will always work!

One-Product SSNIPs and Aggregate Diversion Analysis

Aggregate diversion analysis

- **Basic idea**

  - 1982 Merger Guidelines

    - Required that all products in the provisional market be increased by the same percentage SSNIP (the *uniform SSNIP test*)

  - 1992 Merger Guidelines

    - The 1992 Merger Guidelines allowed a selective SSNIP

    - The practice was to use a selective SSNIP when the product in question was already selectively priced

  - 2010 Merger Guidelines

    - After the 2010 Merger Guidelines, some economists—including agency economists in court proceedings—used price-discriminating SSNIPs in any differentiated products markets

      - A *one-product SSNIP* often creates the most narrow relevant markets, since internalizes the maximum amount of diversion

      - The "aggregate diversion ratio" method can determine whether a candidate market satisfies the hypothetical monopolist test under a one-product SSNIP

    - Some economists have used the aggregate diversion ratio method when imposing a uniform price increase across all products in the candidate market, but this requires some restrictive conditions

      - Examples: DOJ's economist in H&R Block/TaxACT

        FTC's economist in Sysco/US Foods

        DOJ's economist in Aetna/Cigna

Diversion ratios

- Definition (when Firm A raises in price and Firm B holds its price constant):

$$D_{A \to B} \equiv D_{AB} = \frac{\Delta q_B}{\Delta q_A}\bigg|_{\text{for some } \Delta p_A}$$

  where Firm A increases prices by Δp_A and loses total sales of Δq_A, of which Δq_B go to Firm B

- *Keep in mind*: The definition of diversion ratios is motivated by Firm A's price *increasing* and a corresponding loss of A's sales, some of which divert to Firm B

  - More formally:

$$D_{AB} = \frac{\dfrac{\Delta q_B}{\Delta p_A}}{\dfrac{\Delta q_A}{\Delta p_A}} = \frac{\Delta q_B}{\Delta q_A}\bigg|_{\text{for some } \Delta p_A}$$

Diversion ratios

- **Example**
  - Firm A raises its price by 5% and loses 100 units (all other firms hold their price constant)
    - 40 units divert to Firm B
    - 25 units divert to Firm C
    - 35 units divert to other products

Diversion of
25 units to Firm C

C

A

Diversion of
35 units to other products

Loses 100 units with
a 5% price increase

Diversion of
40 units to Firm B

Other products

B

  - Then:

$$D_{A \to B} = \frac{40}{100} = 0.40 \text{ or } 40\%$$

$$D_{A \to C} = \frac{25}{100} = 0.25 \text{ or } 25\%$$

Since $D_{A \to B} > D_{A \to C}$,
B is generally regarded
as a closer substitute to
A than C

Diversion ratios

- **How are diversion ratios estimated?**

  1. Data collected during the regular course of business (including win-loss data)

  2. Indications in the company documents

  3. Consumer surveys
     - But very sensitive to survey design and customer ability to accurately predict product choice in the presence of a price increase

  4. Market shares as proxies: Relative market share method
     - Commonly used method when other data is not available
     - Assumes that customers divert in proportion to the market shares of the competitor firms (after adjusting for any out-of-market diversion)
       - So that the largest competitors (by market share) get the highest diversions

  5. Demand system estimation/econometrics
     - Econometric estimation of all own- and cross-elasticities of all interacting firms
     - Very demanding data requirements—Usually possible only in retail deals where point-of-purchase scanner data is available

  6. Switching shares as proxies
     - Where switching behavior is not limited to reactions to changes in relative price
     - Use only when better estimates are not available
     - *Example*: H&R Block/TaxACT (where the court accepted a diversion analysis based on IRS switching data only as corroborating other evidence)

Diversion ratios

- ## How are diversion ratios estimated?
  - ### Relative market share method: Application
    - When all diversion is to products within the candidate market:

    $$D_{A \to B} = \frac{s_B}{s_B + s_C + \cdots + s_N} = \frac{s_B}{1 - s_A},$$

    That is, $D_{A \to B}$ is the share of firm B divided by the sum of the shares of the firms other than A in the candidate market

    where s_A and s_B are the market shares of firms A and B, respectively

    - Example: Candidate market—
      - Firm A   40%
      - Firm B   30%
      - Firm C   24%
      - Firm D   6%

      60% points to be allocated to three firms pro rata by their market shares

      - No diversion outside the candidate market

    Then:

    $$D_{A \to B} = \frac{0.30}{1 - 0.40} = 50.0\%$$

    $$D_{A \to C} = \frac{0.24}{1 - 0.40} = 40.0\%$$

    $$D_{A \to D} = \frac{0.06}{1 - 0.40} = 10.0\%$$

    Adds to 100%, to account for 100% of the diverted sales

Diversion ratios

- **How are diversion ratios estimated?**
  - Relative market share method: Application (con't)
    - When there is some diversion to products outside the candidate market:

$$D_{A \to B} = \left(1 - \frac{\Delta q_{outside}}{\Delta q_A}\right) \frac{s_B}{1 - s_A},$$

where $\frac{\Delta q_{outside}}{\Delta q_A}$ is the percentage of Firm A's lost sales that are diverted to firms outside

of the market

- Example: Candidate market—

  - Firm A   50%
  - Firm B   25% } Shares in the candidate market (= 100%)
  - Firm C   15%
  - Firm D   10%
  - Outside diversion: 15%
    - → 85% points to be allocated to the firms in the candidate market

The outside diversion is data (say, from empirical analysis) and not to be estimated

Then:

$$D_{A \to B} = (1 - 0.15)\frac{0.25}{1 - 0.50} = 42.5\%$$

$$D_{A \to c} = (1 - 0.15)\frac{0.15}{1 - 0.50} = 25.5\%$$

$$D_{A \to D} = (1 - 0.15)\frac{0.10}{1 - 0.50} = 17.0\%$$

$$D_{A \to O} = 15\%$$

Total 85%
With outside diversion: 100%

Diversion ratios in *H&R Block*

- Warren-Boulton's derivation of diversion ratios in H&R Block/TaxACT
  - Used market shares to estimate diversion ratios
  - Recall
    - s_{HRB} = 15.6%
    - s_{TaxACT} = 12.8%
  - So

$$D_{HRB \rightarrow TaxACT} = \frac{12.8\%}{1 - 15.6\%} = 15.2\%$$

$$D_{TaxACT \rightarrow HRB} = \frac{15.6\%}{1 - 12.8\%} = 17.9\%$$

  - Interestingly, the court reported these diversion ratios as 14% and 12%
    - Warren-Boulton probably had some diversion to an outside option that was not given by the court
   - An outside option (assisted and manual) of 17% for HRB gives $D_{HRB \rightarrow TaxACT} = 14\%$
      - An outside option (assisted and manual) of 10% for TaxAct gives $D_{TaxACT \rightarrow HRB} = 12\%$

One-product SSNIP recapture test

- **Definition: Aggregate diversion ratio**
  - The percentage R_i of total sales lost by a given product in the wake of a SSNIP applied only to product i that is captured by the aggregate of the other products inside the provisional market

Provisional market boundary

Single firm price increase for firm i
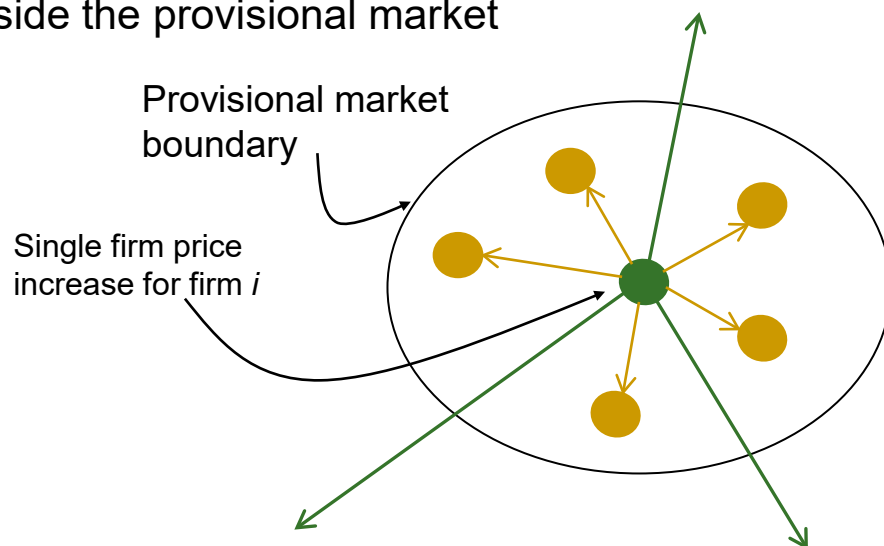
The aggregate diversion ratio is more descriptively call the *recapture ratio* or the *recapture rate*

Internal diversion (R_i)
External diversion ($1 - R_i$) (which is actual loss L_i)

  - **Observation**
    - 100% of the total loss of sales by firm i is equal to the recapture percentage R_i that is retained by firms in the provisional market plus the loss of sales L_i to all firms outside the market (that is, $R_i + L_i = 100\%$ for all firms in the market)

One-product SSNIP recapture test

- ## The 2010 Merger Guidelines and the one-product SSNIP

> The hypothetical monopolist test requires that a product market contain enough substitute products so that it could be subject to post-merger exercise of market power significantly exceeding that existing absent the merger. Specifically, the test requires that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products ("hypothetical monopolist") likely would impose at least a small but significant and non-transitory increase in price ("SSNIP") on **at least one product in the market, including at least one product sold by one of the merging firms**. For the purpose of analyzing this issue, the terms of sale of products outside the candidate market are held constant.[1]

- ❑ This creates the *one-product SSNIP test*:

  A provisional market is a relevant market if a hypothetical monopolist could profitably increase the price of one of the merging firm's products by a SSNIP holding the prices of all other product constant

- ❑ NB: Just because one product in the candidate market fails the one-product SSNIP test does not preclude another product from passing it

[1] U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines § 4.1.1 (rev. 2010) (emphasis added).

One-product SSNIP recapture test

- ## The idea
  - When the hypothetical monopolist increases the price of only one product in the candidate market, its lost sales divert both to—
    - Products outside of the market ("external diversion"), *and*
    - Other products inside the market ("internal diversion)
  - As always, the profitability of a one-product SSNIP will depend on whether the hypothetical monopolist profit gains from the profit gain will outweigh its profit losses
  - But in the case of a one-product SSNIP, the gains will be—
    - The increase in margin on the inframarginal sales
    - PLUS the profits earned by other products in the candidate market on recaptured sales from internal diversion
  - *The test*: Assume that there are *n* products in the candidate market. A one-product SSNIP in the price of product 1 is profitable for the hypothetical monopolist if and only if:

Gains on the inframarginal sales of Product 1	+	Profits on the lost Product 1 sales recaptured by Products 2, . . ., *n*	>	Loss of profits the lost marginal sales of Product 1

One-product SSNIP recapture test

- **"Brute force" method for single product price increase—Example 1**
  - (Differentiated) Gourmet pizzas
    - Assume that for a price increase of 5% of a single product, the hypothetical monopolist would retain 90 out of every 100 customers of that product. Of the 10 lost customers, 7 would divert to another gourmet pizza and 3 would go to a standard pizza. Assume that the price of gourmet pizzas is $3.00 and that the dollar margin is $1.50 per pie for all producers.
    - *Query*: Under the single-product 5% SSNIP test, are gourmet pizzas a relevant product market?

Data				
Out of every units sold:	100	Price	$3.00	
Units retained	90	Margin	$1.50	
Total units lost	10	SSNIP (%)	5.00%	
Units recaptured	7	SSNIP ($)	$0.150	

Analysis		
Gain on inframarginal	$13.50	Units retained (90) times $SSNIP ($0.15)
Loss on marginal sales	-$15.00	Total units lost (10) times $margin ($1.50)
Gain on recapture	$10.50	Recaptured units (7) times $margin ($1.50)
Net gain	$9.00	

- Since the 5% price increase results in a net profit gain, gourmet pizzas are a relevant market

One-product SSNIP recapture test

- **"Brute force" method for single product price increase—Example 2**
    - We can use the brute force method for a single product price when *dollar margins* differ among products within the candidate market (here, $\$m_2 = 1.75$; $\$m_3 = 1.35$)
        - Of firm G1's 10 marginal customers, 4 divert to firm G2 and 3 divert to firm G3
        - A "brute force" accounting calculation is almost always the best way to analyze the profitability of a single-product SSNIP when dollar margins differ in the candidate market

Gourmet pizza--Single product price increase
(brute force method--different margins for candidate market of three firms)
Out of every 100 units sold by Firm G1 (the firm experiencing the price increase):

	For Firm G1:		For Firm G2:		For Firm G3:	
	Total units retained	90				
	Total unit diverted	10	Total units recaptured	4	Total units recaptured	3
Data	G1 price	$3.00				
	G1 margin	$1.50	G2 $margin	$1.75	G2 $margin	$1.35
	SSNIP (%)	5.00%				
	SSNIP ($)	$0.15				
	Gain on retained units	$13.50	Gain on recaptured units	$7.00	Gain on recaptured units	$4.05
	Loss on diverted units	-$15.00				
	Total gross gain to HM	$24.55	= $13.50 + $7.00 + $4.05			
	Total gross loss to HM	-$15.00				
	NET GAIN	**$9.55**				

> Since the net gain to the hypothetical monopolist is positive, the candidate market is a relevant market

One-product SSNIP recapture test formulas

- ## The test

  - *Proposition*: A candidate market is a relevant market under a one-product SSNIP recapture test for Product 1 if:

  $$R_1 > R^1_{Critical} = \frac{\delta p_1}{\$m_{RAve}} \quad \left(= \frac{\$SSNIP_1}{\$m_{RAve}} \right).$$

  > That is, if this condition is satisfied, a hypothetical monopolist could profitably increase the price of Product 1 by δ

  - *Observations*:

    1. NB: Any product in the candidate market can be Product 1

       - I assume that the SSNIP would apply to Product 1 to simply the notation

    2. Under the Merger Guidelines, as long a one product satisfies the one-product SSNIP recapture test, the candidate market is a relevant market

       - This is true even if all of the other products in the candidate market fail the test

  - *Corollary 1 (identical margins):* When all products have identical dollar margins $m, the formula reduces to:

  $$R_1 > R^S_{Critical} = \frac{\delta p_1}{\$m} \left(= \frac{\$SSNIP_1}{\$m} \right).$$

One-product SSNIP recapture test formulas

- **Corollaries**

  - *Corollary 2*: When the percentage margins m_o of the other products are the same (m_o), the test becomes:

    $$R_1 > R_{Critical}^S = \frac{\delta}{m_o}\frac{p_1}{p_{RAve}},$$

    > That is, if this condition is satisfied, a hypothetical monopolist could profitably increase the price of Product 1 by δ

    where p_{RAve} is the recapture share-weighted average of the prices of the other products in the candidate market (i.e., all the products except for product 1)

  - *Corollary 3*: When the prices of the other products are the same (p_o), the test becomes:

    $$R_1 > R_{Critical}^S = \frac{\delta}{m_{RAve}}\frac{p_1}{p_o},$$

    where m_{RAve} is the recapture share-weighted average of the percentage gross margins of the other products in the candidate market (i.e., all the products except for product 1)

  - *Corollary 4:* When the prices of all products in the candidate market are the same but the margins differ, the test becomes:

    $$R_1 > R_{Critical}^S = \frac{\delta}{m_{RAve}}.$$

  - *Corollary 5 (symmetric products)*: When all products in the candidate market have the same prices p and margins m_o, the test becomes:

    $$R_1 > R_{Critical}^S = \frac{\delta}{m_o}.$$

    > Note: Products can be differentiated (i.e., support different prices) even when in the current market equilibrium the prices and margins of all products are identical (e.g., consider hospitals).

One-product SSNIP recapture test formulas

- **Calculating recapture share-weighted averages**
  - The idea
    - The general one-product SSNIP recapture test uses a *recapture share-weighted average* of the dollar margins of all "other" products in the candidate market ($\$m_{RAve}$)
  - Example
    - There are five products A,B,C,D, and E. Are products A,B,C, and D a relevant market? Test using a one-product SSNIP recapture test for product A for a 5% SSNIP.
      1. Data

Product	Diversion Ratio	Price	$margin
A	–	$10.00	$5.00
B	0.1	$6.00	$3.00
C	0.4	$12.00	$6.00
D	0.3	$9.00	$4.50
E	0.2	$8.00	$4.00

      2. Determine the aggregate recapture rate for products B, C, and D

	Diversion Ratio
Product B	0.1
C	0.4
D	0.3
Aggregate recapture	0.8

This is the aggregate recapture rate for product A (R_A)

One-product SSNIP recapture test formulas

- **Calculating weighted averages**
  - Example (con't)
    3. Determine the recapture share for reach product (= $D_{A \to i}$/Aggregate recapture rate)

	Recapture Share	
	Calculation	Percentage
Product B	0.1/0.8	12.50%
C	0.4/0.8	50.00%
D	0.3/0.8	37.50%
		100.00%

> NB: Recapture share is the firm j's percentage share of the total number of units recaptured in the candidate market. The sum of all recapture shares total 199%. The recapture share is *not* the diversion ratio if there is diversion outside of the market.

    4. Calculate the recapture share-weighted dollar margin contributions by multiplying the product's recapture share by its dollar margin

	Weighted m contributions	
	Calculation	Contribution
Product B	0.125*$3.00	$0.3750
C	0.500*$6.00	$3.0000
D	0.375*$4.50	$1.6875
m_{RAve} =		$5.0625

    5. Sum the contributions to obtain the recapture share-weighted dollar margin

One-product SSNIP recapture test formulas

- **Calculating weighted averages**
  - Example (con't)
    6. Calculate the dollar SSNIP for product A ($SSNIP$_A$)

δ	0.05
A's price	$10.00
$SSNIP_A$	$0.50

7. Calculate the critical recapture rate for product A

$$R_{Critical}^{A} = \frac{\delta p_A}{\$m_{RAve}} \left(= \frac{\$SSNIP_A}{\$m_{RAve}} \right).$$

$$= \frac{\$0.50}{\$5.06}$$

$$= 9.9\%$$

8. Compare actual recapture rate (R_1) to the critical recapture rate

From Step 2

$$R_A = 0.80 > R_{Critical}^{A} = 0.099$$

Products A, B,C, and D satisfy the one-product critical recapture test for product A and so those products are a relevant market under the hypothetical monopolist test

One-product SSNIP recapture test formulas

- **Calculating weighted averages**
  - Example (con't)
    - Steps 1-5 illustrate the calculation of the recapture share-weighted average dollar margin for the "other" products (m_{RAve})
    - Without going though all of the steps, the formula is:

Dollar margin

Diversion weight

$$\$m_{RAve} = \frac{D_{A \to B}}{D_{A \to B} + D_{A \to C} + D_{A \to D}} \$m_B + \frac{D_{A \to C}}{D_{A \to B} + D_{A \to C} + D_{A \to D}} \$m_C + \frac{D_{A \to D}}{D_{A \to B} + D_{A \to C} + D_{A \to D}} \$m_D$$

$$= \left(\frac{0.1}{0.1 + 0.4 + 0.3} \right)(3.00) + \left(\frac{0.4}{0.1 + 0.4 + 0.3} \right)(6.00) + \left(\frac{0.3}{0.1 + 0.4 + 0.3} \right)(4.50)$$

$$= (0.125)(3.00) + (0.500)(6.00) + (0.375)(4.50)$$

$$= 0.675 + 3.00 + 0.16875$$

$$= 5.0625$$

Set up the problem and use Mathpapa to calculate!

One-product SSNIP recapture test formulas

- Using Mathpapa to calculate the recapture share-weighted average dollar margin of the "other" products

One-product SSNIP recapture test

- ## The test

  - ### Technical caution

    - $R^1_{Critical}$ is specific to product 1 and is a function of the quantity of marginal sales lost by product 1 in the wake of a SSNIP

      - This is because $\$m$ for any firm depends on $\%m$, which in turn depends on the elasticity of demand to satisfy the Lerner condition for a profit-maximizing firm. Changing the quantity of lost marginal sales changes the elasticity, and implies a different margin and hence a different critical recapture ratio.

    - So once you have calculated $R^1_{Critical}$ for some specific quantity of lost marginal sales, you cannot use the same $R^1_{Critical}$ in a one-product SSNIP test if you assume that firm 1 loses a different quantity of marginal sales. You need to recalculate $R^1_{Critical}$.

One-product SSNIP recapture tests: Examples

- **Example 1A: Single-product SSNIP test (symmetric products)**
  - Gourmet pizzas
    - Assume that for a single product price increase of 5%, the hypothetical monopolist would retain 10 out of every 100 customers. Of the 10 lost customers, 7 would divert to another gourmet pizza and 3 would go to a standard pizza. Assume that the price of gourmet pizzas is $3.00 and that the dollar margin is $1.50 per pie for all producers.
    - *Query*: Under the single-product 5% SSNIP test, are gourmet pizzas a relevant product market?
    - *Answer*:

      The products are symmetrical (identical prices and margins), so use the one-product SSNIP test for symmetric products: The one-product SSNIP is profitable if $R_1 > \delta/m$.

      $\delta = 0.05$
      $m = 0.5\%$
      So $\delta/m = 10\%$

      $R_1 = 70\%$

      $R_1 > \delta/m$, so the one-product SSNIP test is satisfied, the hypothetical monopolist can profitably increase the price of product 1 by 5%, and gourmet pizzas are a relevant market (The same result as we obtained earlier).

      Generally, as long as $R_1 > 10\%$ in this problem, the one-product SSNIP test will be satisfied.

One-product SSNIP recapture tests: Examples

- **Example 2A: Single-product SSNIP test (same price, different margins)**
  - We can use Corollary 3 when the prices of the products in the candidate market are the same but the margins differ
    - Product 2 recaptures 2 units at $\$m_2 = 1.75$
      Product 3 recaptures 5 units at $\$m_3 = 1.05$
  - *Answer*:

    The products different dollar margins, so one-product SSNIP for Product 1 is profitable for a hypothetical monopolist if:

    $$R_1 > \frac{\delta}{m_{RAve}}.$$

    where m_{RAve} is the recapture share-weighted average of the percentage margins of the other products in the candidate market (i.e., all the products except for product 1)

	Gourmet pizzas				
	1	2	3		
Price	3	3	3		From problem
$margin	1.5	1.75	1.05		From problem
Loss	10				From problem
#Recapture (units)		2	5		From problem
%Recapture		28.57%	71.43%	100.00%	Recapture shares (% of total recapture)
$margin contribution		0.5000	0.7500		%Recapture times $margin
Average $m_{RAVE}				1.2500	Sum of $margin contributions
%m_{RAve}				0.416666667	Average $m_{RAVE}/price
δ	5%				From problem
δ/m_{RAve}	12.00%				Calculated
R_1	70.00%				From problem

$R_1 > \delta/m_{RAve}$, so the one-product SSNIP test is satisfied, the hypothetical monopolist can profitably increase the price of product 1 by 5%, and gourmet pizzas are a relevant market (The same result as we obtained earlier).

One-product SSNIP recapture test

- **A caution**
  - In a well-known paper, Katz and Shapiro derived a different condition for a one-product SSNIP test:

$$R_1 > \frac{\delta}{\delta + m_{RAve}},$$

where the prevailing prices for all products are equal.[1]

This condition is INCORRECT for a one-product SSNIP test!

  - The problem is that the Katz-Shapiro proof assumed that the recaptured sales would be sold at the original price of the recapturing product *increased* by the SSNIP, but in a one-product SSNIP recapture test the recaptured sales would be sold at the original prices charged by the other firms in the market
    - I note this only because this incorrect condition is still in circulation
    - However, it will be a useful condition in a uniform SSNIP test for differentiated products

[1] *See* Michael Katz & Carl Shapiro, *Critical Loss: Let's Tell the Whole Story*, Antitrust, Spring 2003, at 53 & n.25.

Uniform SSNIPs and the Aggregate Diversion Ratio Test

Aggregate diversion ratio test

- **Extension to a uniform SSNIP**

  - Some economists have attempted to create a recapture test for hypothetical monopolist imposing a *uniform* SSNIP in a differentiated candidate market

  - *Remember*: With recapture, the net profits of the hypothetical monopolist from a price increase in each product *i* taken individually comprise in—

    - The net loss on the sales of product *i* resulting from the price increase, *and*

    - All incremental profits earned by other firms in the candidate market from the capture of sales diverted from product *i*

  - When the hypothetical monopolist increases all prices in the candidate market by a SSNIP, its overall profit is the sum of the net profits from each of the individual products

Aggregate diversion ratio test

- **Extension to a uniform SSNIP**
  - Observations:
    1. In a single-product SSNIP test, the price of only one product in the candidate market is increased and the diversion and recapture ratios are determined holding the prices of all other firms in the candidate market constant
    2. In a uniform SSNIP test, the price of all products in the candidate market are increased and the diversion and recapture ratios are determined using these higher prices for all products in the candidate market
    3. The diversion ratios are likely to be different in the two situations
       - With the one-product SSNIP, the diversion ratios are from the higher priced SSNIP product to the originally priced other products
       - With a uniform SSNIP, the diversion ratios are from one higher-priced SSNIP product to (now less attractive) other higher-priced SSNIP products

In general, we can expect the diversion ratios with a one-product SSNIP to be higher than the diversion ratios for a uniform SSNIP

Aggregate diversion ratio test

- ## The aggregate diversion ratio test for a uniform SSNIP

  - *Proposition 1*. A hypothetical monopolist earns positive profits on product *i* from a uniform SSNIP in the candidate market if:

$$R_i^U > \frac{p_1 \delta}{\$m_{RAve} + \$SSNIP_{RAve}} = \frac{\$SSNIP_1}{\$m_{RAve} + \$SSNIP_{RAve}} \equiv R_{Critical}^U$$

Call the right-hand side the *critical recapture rate* for a uniform SSNIP.

New term accounting for higher margins for recapturing products

  - *Corollary (symmetric products)*: If the products in the candidate market are symmetric (same prices *p* and percentage margins *m*), then a hypothetical monopolist earns positive profits on product *i* from a uniform SSNIP in the candidate market if:

$$R_i^U > \frac{p_i \delta}{\$m_{RAve} + \$SSNIP_{RAve}} = \frac{p\delta}{pm + p\delta} = \frac{\delta}{\delta + m}$$

The critical recapture rate in the symmetric case is the same as the percentage critical loss

  - In the literature and some cases, the symmetric case is the variation most commonly discussed

Aggregate diversion ratio test

- ## A sufficiency test

    - *Proposition 2 (sufficiency)*: If:

    $$R_i^U \geq R_{Critical}^U \qquad \text{for all firms } i \text{ in the candidate market}$$

    $$R_j^U > R_{Critical}^U \qquad \text{for some firm } j \text{ in the candidate market}$$

    then the uniform SSNIP will be profitable for the hypothetical monopolist and the candidate market will be a relevant market

    - Proposition 2 simply says that if, in the wake of a uniform SSNIP, the hypothetical monopolist at least breaks even on every product in the candidate market and makes strictly positive profits on at least one product, the uniform SSNIP is profitable

    - Proposition 2 only states a *sufficient* condition

        - Failure to satisfy the test does not mean that the candidate market is not a relevant market

        - It is possible for a hypothetical monopolist to make positive profits from a uniform SSNIP even if it losses money in some products as long as it offsets those losses from positive profits in other products

Aggregate diversion ratio test

- **Example: Aggregate diversion ratio test**
  - Differentiated three-product candidate market
    - Parameters (symmetric products)
      - Each product has the same price of $100
      - Each product has a margin of 60%
      - Assume a uniform SSNIP of 5% across all products
    - Then use the symmetric version of the aggregate diversion ratio test:

$$R^U_{Critical} = \frac{\delta}{\delta + m} = \frac{0.05}{0.05 + 0.60} = 0.0769 \text{ or } 7.69\%$$

  - Suppose that the uniform SSNIP generates the following actual recapture rates:

Product	q	Δq	Recapture Units	Rate (R^U_i)
A	1200	100	30	30.00%
B	900	75	12	16.00%
C	600	50	10	20.00%

  - *Result*: Since the smallest R^U_i (16.00%) is greater than $R^U_{Critical}$ (7.69%), a hypothetical monopolist can profitably sustain a 5% uniform price and so the three products is a relevant market

Aggregate diversion ratio test

- ## A "presumptive" test
  - Some commentators suggest that in a uniform SSNIP test, the single-product SSNIP diversion and recapture rates can be used in Proposition 2 to create a *presumption* that the condition is satisfied and the candidate market is a relevant market[1]
  - But the recapture ratios across products in the candidate market will at least as high and likely higher using a single-product SSNIP than a uniform SSNIP because of the prices of substitute products will be lower in the former situation. Therefore, we should expect:

    $$R_i^S \geq R_i^U.$$

    - As one analyst noted:

      > Unless the different products within a candidate antitrust market increase prices by different amounts, it is likely there will be little substitution among the products within the candidate market. Consequently, when there is a price increase across all products in the candidate market the value of the Aggregate Diversion Ratio is likely to be close to zero.[2]

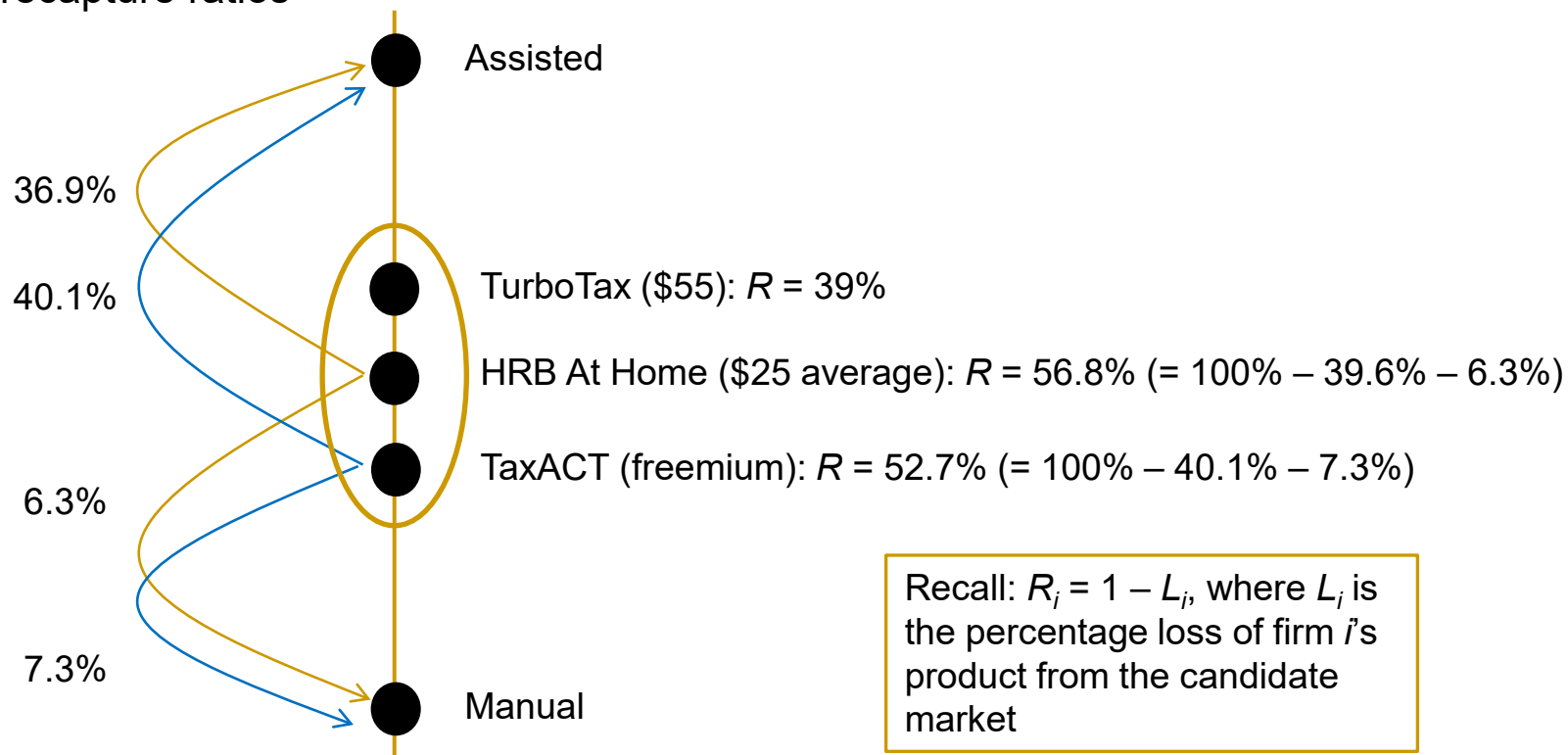   - Consequently, the presumptive test must be used with great care, if used at all

[1] Michael Katz & Carl Shapiro, *Critical Loss: Let's Tell the Whole Story*, Antitrust, Spring 2003, at 54 (footnote omitted).
[2] Barry Harris, *Recent Observations About Critical Loss Analysis* (undated), https://www.justice.gov/atr/recent-observations-about-critical-loss-analysis

Aggregate diversion ratio test

- ## Warren-Bolton analysis in H&R Block/TaxACT

  - Recall that Warren-Boulton relied on IRS switching data to estimate aggregate recapture ratios

Assisted

36.9%

40.1%

TurboTax ($55): $R = 39\%$

HRB At Home ($25 average): $R = 56.8\%$ ($= 100\% - 39.6\% - 6.3\%$)

TaxACT (freemium): $R = 52.7\%$ ($= 100\% - 40.1\% - 7.3\%$)

6.3%

7.3%

Manual

Recall: $R_i = 1 - L_i$, where L_i is the percentage loss of firm i's product from the candidate market

  - *Query*: Does the use of switching data indicated that the estimated R_i's are for a single-product SSNIP or a uniform SSNIP?

"Aggregate diversion ratio"

- **Warren-Bolton analysis in H&R Block/TaxACT**

  1. *Question*: Is DDIY a relevant market under a uniform SSNIP test?

  2. *Critical aggregate diversion ratio ($R^U_{Critical}$)*

     - Starting point: Start with DDIY products (HRB, TaxACT, and TurboTax)

     - SSNIP (δ): 10%

     - Gross margin (m): 50% on each product (Warren-Bouton assumption)

     - Then:

     $$R^U_{Critical} = \frac{\delta}{\delta + m} = \frac{10\%}{10\% + 50\%} = 16.7\%$$

  3. *Actual loss*: Determine aggregate diversion ratios (recapture rates R^U_i) for each product

     - *Test*: If each $R^U_i \geq R^U_{Critical}$ for all products in the candidate market and $R^U_i > R^U_{Critical}$ for at least one product i, then product grouping is a market

     - Using IRS switching data as a proxy for R, Warren-Bolton found:

       - HRB: R_{HRB} = 57%
       - TaxACT: R_{TaxACT} = 53%
       - TurboTax: $R_{TurboTax}$ = 39%

  4. *Conclusion* (Warren-Boulton)

     - Since each $R^U_i > R^U_{Critical}$, a hypothetical monopolist of the DDIY product could profitably raise price by a uniform SSNIP and therefore DDIY was a relevant product market

Implementations of the Hypothetical Monopolist Test: SUMMARY

Professor Dale Collins
Merger Antitrust Law
Georgetown University Law Center

Summary

1. ## Prevailing (premerger) conditions

   - ❑ Competitive interactions established premerger equilibrium in prices and production quantities

   - ❑ Also establishes other competitive variable such as product attributes, but we do not have good models for this

2. ## Hypothetical monopolist test

   - ❑ Seeks to identify a product grouping (relevant market) that contains the product of one or both of the merging firms in which market power could be exercised

   - ❑ *Test*: Whether a hypothetical monopolist of the product grouping could profitably implement "small but significant nontransitory increase in price" (SSNIP) above the prevailing prices in one or more products in the grouping, including at least one of the products of the merging firms

   - ❑ The test is satisfied when the profits gained from the increase in margin in the inframarginal sales outweigh the profits lost from the loss of the marginal sales

Summary

3. Critical loss in homogeneous product markets

   ❑ In the standard models, the hypothetical monopolist increases price by reducing output, which creates a scarcity in the product. Inframarginal customers then bid up the price in order to clear the market.

   ❑ While small reductions in output may increase profits, sufficiently large reductions will reduce profits below the prevailing level

   ❑ The output reduction beyond which any further reduction is unprofitable is call the *critical loss*

     ▪ The critical loss is the output reduction where the profits gained from the increase in margin in the inframarginal sales just equal the profits lost from the loss of the marginal sales

   ❑ *Test*: If the actual loss of sales due to a SSNIP is less than the critical loss, the SSNIP will be profitable and the candidate market will be a relevant market

Summary

4. **One-product SSNIP tests in differentiated products markets**
   - In differentiated products market, different products can have different prices and margins
   - The Merger Guidelines recognize as relevant markets products grouping where the hypothetical monopolist can profitably increase the price of one product, provided it is a product of one of the merging firms
   - The same basic critical loss analysis applies with one significant modification: When the product with the SSNIP loses marginal sales, some of those lost sales are "recaptured" by other products in the candidate market
   - The hypothetical monopolist earns profits on the recaptured sales that can be used to offset profit losses from lost marginal sales
     - The profit for each unit recaptured by any "other" product is the other product's original dollar margin (since the price of the recapturing product is not increased by the SSNIP)
   - The recapture rate on the lost marginal units that is just necessary for the hypothetical monopolist to break even with a SSNIP on one product is called the (one-product) *critical recapture rate*
     - The critical recapture rate is specific to the product on which the SSNIP is imposed, the diversion ratios from that product to other products in the market, and the dollar margins of all products
   - *Test*: For the product on which the SSNIP is imposed, if the actual recapture rate exceeds the critical recapture rate, the SSNIP will be profitable and the candidate market will be a relevant market

Summary

5. Uniform SSNIP tests in differentiated products markets

    ❑ In some differentiated products markets, the prices tend to move together

    ❑ In these situations, it may be most realistic for the hypothetical monopolist to impose a uniform SSNIP on all products in the candidate market

    ❑ The analysis and the test is the same here as it is for the one-product SSNIP recapture test except:

        ▪ The margins of all products in the candidate market are increased by the SSNIP

        ▪ The diversion ratios should take into account that all prices in the candidate market will be increased (so that, in general, the diversion ratios in the uniform SSNIP case should be less than the diversion ratios in the one-product SSNIP case)

Merger Simulation

Merger simulation

- **Warren-Boulton**
    - In addition to critical loss analysis, used "merger simulation" to predict price increases resulting from the merger to test whether a hypothetical monopolist would increase prices postmerger more than a SSNIP

- **Warren–Boulton results**
    - Used Bertrand pricing model
    - Predicted price increases as a result of the merger—
        - TaxACT 83%
        - HRB 37%
        - TurboTax 11%

- **Court**
    - Confirms DDIY as a relevant market
        - But discusses in competitive effects analysis

As did the Court, we will defer an examination of the Warren-Boulton simulation model until the anticompetitive effects analysis

Defendants' Market Definition Rebuttal

Dr. Christine Meyer

- **Three lines of attack:**
  1. Warren-Boulton's analysis is unreliable
  2. Warren-Boulton's analysis failed the smallest market principle
  3. More reliable analysis shows that the relevant product market is all tax preparation methods

Warren-Boulton's analysis is unreliable

1. **IRS switching data did not test for cross-price elasticity**
   - ❑ Merging parties' primary critique
   - ❑ Court:
     - ■ Agreed, but still probative when keeping the limitations in mind (especially since it is the best data available)—but not conclusive

2. **DDIY excludes assisted (closest substitute to HRB) and manual (closest to TaxACT)**
   - ❑ Meyer used "simulated diversion data" (from survey) to detect close substitutes
   - ❑ Court:
     - ■ Survey data unreliable (omitted prices for many choices)
     - ■ Meyer erred in aggregating all assisted into one product and all manual into one product, while disaggregating within DDIY

3. **Even using IRS switching data, RWB did not include all closest substitutes**
   - ❑ Court: Not correct if products are properly disaggregated:
     - ■ HRB: 56.8% to DDIY; 36.9% to assisted; 6.3% to manual
     - ■ TaxACT: 52.7% to DDIY; 40.1% to assisted; 7.3% to manual

Failed the "smallest market principle"

- **Merging parties' criticism:**
  - Using critical loss analysis, HRB+Intuit and TaxACT+Intuit alone are both smaller relevant markets
    - Presumably, HRB+Intuit was not a market under the HMT because of the large diversions to Intuit
  - Tried to discredit Warren-Boulton's initial provisional market of all DDIY products

- **Warren-Boulton response:**
  - Markets need to make sense
  - These smaller markets do not make sense
    - Presumably in light of functional similarities and document evidence

- **Court:**
  - Warren-Boulton's critical loss analysis is supportive of DDIY as the relevant market, but not dispositive

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Georgetown University Law Center

148

Meyer's affirmative market definition case

1. Review of party documents (rejected by court)

2. Assisted is the most popular method across complexity levels
   - Simple returns: 44% assisted
                           37% DDIY

   - Court:
     - Still correlates with complexity
     - Says nothing about how consumers would switch in the wake of a SSNIP

Meyer's affirmative market definition case

3. **"Pricing simulator" (dynamic excel spreadsheet)**
   - Developed by HRB in 2009—uses discrete choice survey of 6119 respondents
   - Choices:
     - Online DIY
     - Software DIY
     - CPA/accountant
     - Manual (including friends/family)
   - Meyer
     - Used simulator to calculate diversion ratios
     - Found HRB largest diversion to CPA/accountant, second largest to manual
   - Court: Analysis critically flawed
     - Not all of the options in the survey had prices associated with them (including CPA/accountant HRB retail office, pen & paper)
     - Respondents appear not to have appreciated or considered price differences → renders analysis unreliable
   - Warren-Boulton
     - Pricing simulator also has demand increasing for some products (TaxCut Online Basic) with price increases (violates assumption of downward-sloping demand curve)
     - Some results inconsistent and anomalous

Meyer's affirmative market definition case

4. 2011 email survey of TaxACT customers

  - Jointly commissioned by TaxACT and HRB

  - One primary question: "If you had become dissatisfied with TaxACT's price, functionality, or quality, which of these products or services would you have considered using to prepare your federal taxes?"

  - Provided a list of options and asked respondent to select—
    - all applicable alternative options, and
    - The respondent's top choice

  - Sent out 46,899 requests—ultimately 1089 responded

  - Survey results showed that—
    - 27-34% would switch to manual
    - 4-10% to HRB At Home

  - Meyer: Shows that TaxACT and HRB are not close substitutes

  - Dr. Ravi Dhar (FTC's rebuttal expert)
    - Survey asks about switching, not diversion in response to price changes
    - IRS data does same and is much more complete and extensive

  - Court:
    - Survey is not reliable – REJECTED
    - Other critiques (e.g., high level of nonresponses (>98%) could have biased result)

Conclusion on expert testimony

- Court:
    - Viewed Warren-Boulton analysis as more persuasive generally
    - With Meyer's testimony based on the pricing simulator and email survey rejected, little else remains of her affirmative market definition testimony
    - Although RWB analysis is not conclusive, it tends to confirm conclusions drawn from other evidence in the case

Court finding of fact: DDIY is the relevant product market