

# What is IO (Industrial Organization)?

- **IO** is an applied microeconomics field that studies:
  - how markets work
  - how firms compete or collude with each other
  - how these interactions determine market structure, firm performance, and social welfare
- In microeconomics courses, you learned about perfect competition and monopoly
- The focus there is on the **behavior of firms** operating in the two most extreme **market structures**
  - E.g., number of firms in the market, their sizes, and the products they offer

# What is IO (Industrial Organization)?

- But in many markets in the real world, the market structure is somewhere between those extreme cases
- We'll study the extreme cases but also the “in-between” cases in detail
- We also explore different types of competition (in addition to price or quantity)
  - e.g., in many markets firms distinguish themselves by selling **differentiated products (ex. Coke vs. Pepsi)**
    - this feature is absent in PC and monopoly

# The IO toolbox

- IO uses mathematical models to explain behavior. The analytical tools that we will use: **microeconomics**, **game theory**, and **regression (econometrics)**
- **Why game theory?** Because in many markets firms interact strategically and game theory models these kind of interactions
  - How should a firm price its product given the pricing decisions of its rivals?
- Regression analysis is an important **statistical tool**:
  - It is a way of quantifying economic relationships and using economic data to test hypotheses about the relationships between economic variables
    - ex. relationship between market structure and profits
    - test: do economic profits increase as the number of firms decreases?
  - You aren't expected to be a regression expert. Regression analysis does not appear in detail in a course of this level. When it does appear I'll try to explain the results to you intuitively.

# What do IO economists *actually* do?

- Academic **IO economists** teach and do research
  - Some develop theories to explain firm behavior
  - Some test whether these theories are consistent with data
- Some **IO economists** work for government agencies that investigate and prosecute antitrust violations (e.g., price-fixing) while others work at consulting firms that defend the accused firms
- Some **IO economists** work at firms analyzing data to help firms make better business decisions
  - Forecasting demand for a potential new product
    - How much demand could the Singapore casinos have expected?
  - Amazon Prime price change
  - Google: Hal Varian, Amazon: Patrick Bajari

# Markets

# Market definition

- Market power and market structure are key concepts in IO
  - Market power is the ability of a firm, or group of firms, to raise price above the competitive price
  - Market structure is a description of the number of firms in the market and of their respective market shares
- To correctly measure market power and market structure we need to first define the relevant market
- Defining the market means specifying the competing products and the geographic area in which competition occurs

# Market definition

- How we define a market is important
  - without consistency, measures of market power and market structure are arbitrary
  - decisions on mergers can turn on market definition
    - *Staples/Office Depot* merger
- but it's not always clear cut how to do so
  - the market for automobiles
    - should we include light trucks, pick-ups, and SUVs?
  - the market for soft drinks
    - which firms compete with Coca Cola and Pepsi?  
what determines which firms compete with Coca Cola and Pepsi? What about Soya Bean drinks?

Evaluation of mergers: By defining a bigger market, then their market share will become smaller.

# Market definition

- Presumably define a market by *closeness* in substitutability of products
  - how close is close?
  - how homogeneous do commodities have to be?
    - Is rayon, a synthetic fiber, in the same market as wool, a natural fiber?
- Geography can matter
  - in some cases the product is expensive to transport, creating separate markets
    - food hawkers in JB don't ship their food to Singapore
  - *but* customers can move
    - what is the relevant market for a beach resort or a ski-slope or the IRs? Legoland?



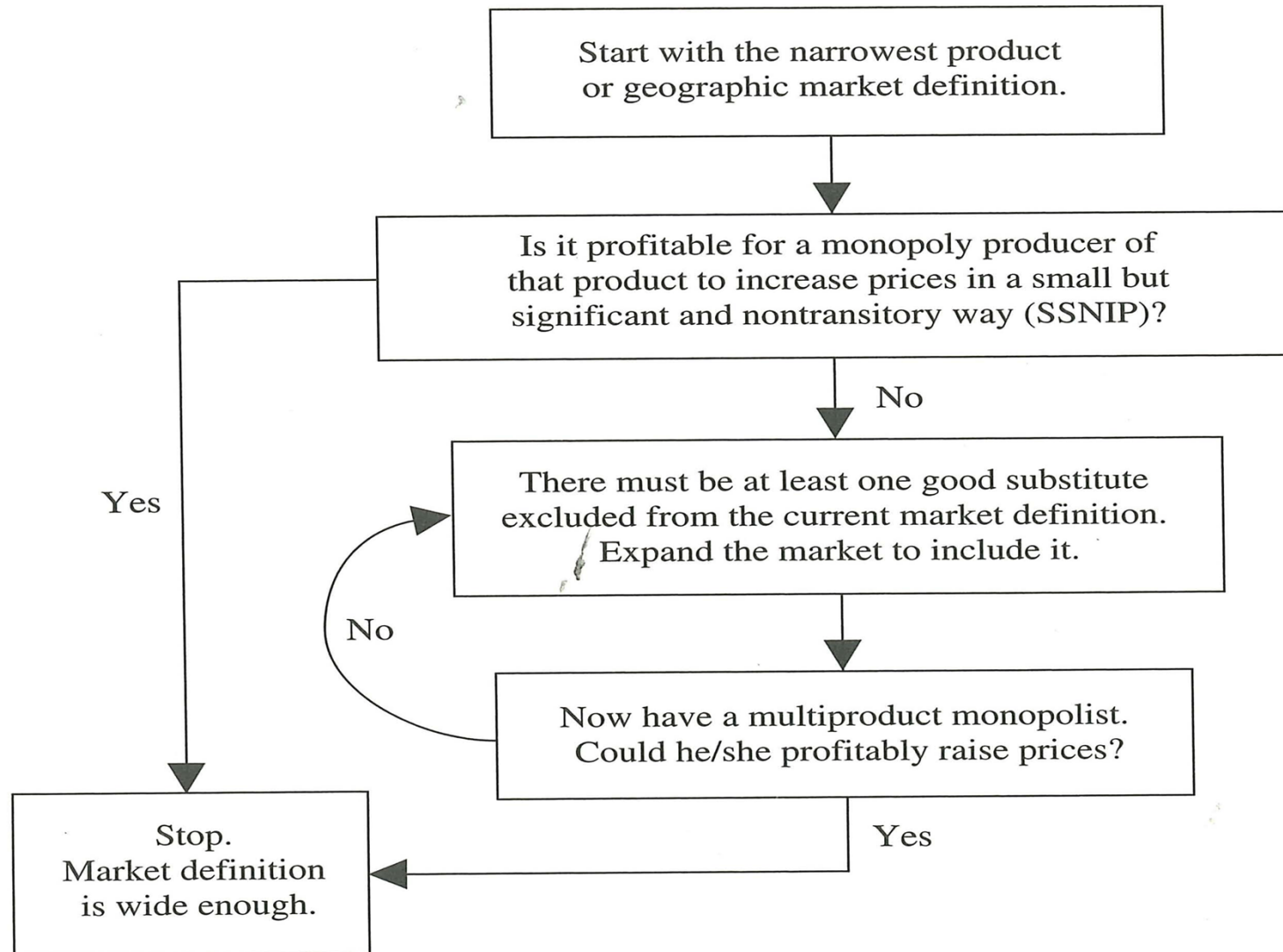
# HMT/SSNIP test

- One way to think about market definition:
  - a market is the smallest collection of products that do not face significant price constraints from products outside the market
  - there aren't any “good” substitutes outside the group
- Hypothetical monopolist test (HMT)/SSNIP test:
  - Define a hypothetical monopolist over a set of products (for a geographic area)
  - Does the monopolist have an incentive to implement a Small but Significant Non-transitory Increase in Price (SSNIP)?
  - If so, then there is no pricing constraint from outside products and the market is defined by the set of products

# HMT/SSNIP test

- Consider all brands of still bottled water
- The price of batteries is unlikely to exert a price constraint on the price of water and can therefore be removed from consideration
- But what about the price of sparkling water?
- The HMT/SSNIP test asks whether a hypothetical monopolist of still bottled water could increase prices by 5-10% from the *competitive price* without losing profits to sparkling water producers
- If yes, sparkling water is not in the same market as still water
- If no, sparkling water should be included in the market definition
  - A hypothetical monopolist would have to own all still and sparkling water products to be able to exercise market power

# HMT/SSNIP test



# HMT/SSNIP test - qualitative evidence

- The first step of any market definition exercise
- Allows us to narrow down the set of possibilities to those that are plausible and substantive
- Common sense: the price of ice cream is not sensitive to the price of hammers → they are not in the same market
- Supplemental “low tech” quantitative evidence such as a survey
  - Would you ever consider product A as an alternative to product B?

# HMT/SSNIP test - qualitative evidence

- ex. proposed merger of Ryanair and Aer Lingus in Europe
- Would you ever consider a flight to/from Belfast as an alternative to using the Dublin airport?

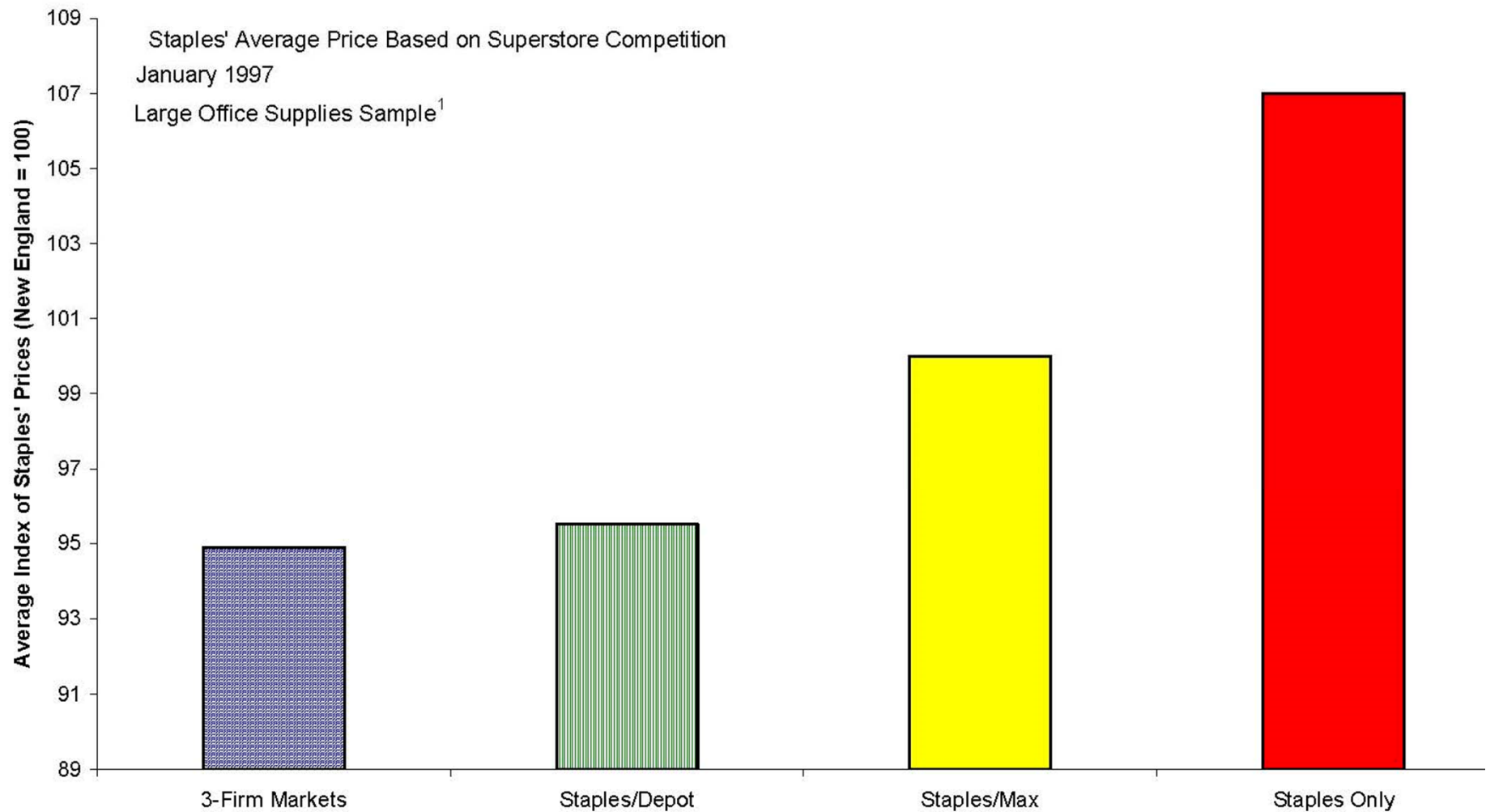
Valid	Frequency	Percent	Valid percent	Cumulative percent
Yes	445	16.6	16.6	16.6
No	1,751	65.5	65.5	82.1
Do not know	388	14.5	14.5	96.6
No answer	90	3.4	3.4	100.0
Total:	2,674	100.0	100.0	—

# HMT/SSNIP test - qualitative evidence

- Staples/Office Depot
    - The government established that office supply superstores (OSS) supplied a distinct set of products and services compared to other stores selling office supplies
    - Internal documents indicated that the OSS's feared competition from each other but not from traditional stores
    - Evidence that the OSS's pricing depended on the presence or absence of the other OSS's but not on other stores
- strong evidence that all the other stores are not considered in the market



## STAPLES' PRICES ARE HIGHER WITH LESS SUPERSTORE COMPETITION



# HMT/SSNIP test - quantitative evidence

- Price differences and correlation are the most common statistics used
- Easy to compute and only need a small amount of data
- Idea: if products are substitutes, their prices should move together
  - Consider Coke and Pepsi, clearly in the same market
  - A supply shock occurs to Coke causing its price to increase
  - Since Pepsi is substitutable for Coke, some buyers of Coke will shift to Pepsi, which will also increase the price of Pepsi → prices are positively correlated
  - If Coke and Pepsi weren't in the same market, then the increase in the price of Coke would not affect the price of Pepsi



# Nestle-Perrier merger

- Key question: is the relevant market the market for still water, the market for all water, or the market for nonalcoholic drinks?
- Price correlations were calculated for brands in the different categories
- Still water: A – C, sparkling water: D – F, soft drinks: G – I

	A	B	C	D	E	F	G	H	I
A	1								
B	0.93	1							
C	0.91	0.94	1						
D	0.91	0.85	0.86	1					
E	0.94	0.97	0.95	0.92	1				
F	0.93	0.99	0.96	0.88	0.99	1			
G	0.11	0.05	-0.01	0.33	-0.02	0.01	1		
H	-0.57	-0.55	0.25	0.16	0.24	0.27	0.17	1	
I	-0.77	-0.75	-0.81	-0.86	-0.86	-0.79	0.33	-0.11	1

strong evidence  
that still water  
and sparkling water  
are in the same market

negative correlations, soft drinks are not in the market

- Fairly clear that the market definition should include still and sparkling water but exclude soft drinks

# HMT/SSNIP test - quantitative evidence

- Cross-price elasticity
  - measures the sensitivity of one product to the price change of another
  - suppose there is a proposed merger between two sellers of bananas
  - a small cross-price elasticity between bananas and another fruit tells us that the other fruit is not perceived as a substitute for bananas and suggests that bananas and the other fruit are not in the same market
- Own-price elasticity
  - a price elasticity of -0.2 for bananas tells us that a 10% increase in the price of bananas leads to a 2% decrease in the quantity demanded
  - a very small number of buyers will turn to other fruits
  - don't include other fruits in the market definition of bananas

# Market concentration

- Industries have very different market structures
  - ready-to-eat breakfast cereals: high concentration
  - newspapers: low concentration (taken nationwide)
- How best to measure market concentration?
  - preference is for a *single number* – easy to interpret and compare
  - **concentration ratio:  $CR_n$  (or  $C_n$ )** is the total market share of the **top  $n$  firms** use either a C8 or a C4
  - **Herfindahl-Hirschman index:  $HHI$**  = sum of squared market shares (out of 100)

$$HHI = \sum_{i=1}^n s_i^2$$

# Market concentration

- HHI is a useful statistic because there is a direct relationship between the average markup in a market and the HHI, which we will derive later
- monopoly:  $HHI = 10,000$
- perfect competition:  $HHI \approx 0$  (i.e., very small)
- Horizontal merger guidelines in the U.S. consider markets with an HHI greater than 1,800 highly concentrated

if the market is already concentrated, then there is a cause for deeper analysis

# Measure of concentration

- Changes in concentration indices due to a merger

Firm Rank	Market Share (%)	Squared Market Share
1	25	625
2	25	625
3	25	625
4 } 5 }	5 } 5 }	25 } 25 }
6	5	25
7	5	25
8	5	25
<b>Concentration Index</b>	<b>CR<sub>4</sub> = 80</b>	<b>HHI = 2,000</b>
	<b>85</b>	<b>2,050</b>
	after merger	after merger

Suppose that firms 4 and 5 merge

10

100

# Market concentration

- Grand Metropolitan and Guinness, two-large liquor producers, proposed a merger in 1997 that was challenged as anticompetitive by the Federal Trade Commission (FTC)

<b>Liquor Market</b>		
<b>Scotch Whiskey, Gin, and Vodka - by Owner:</b>		
<b>Owner</b>	<b>Dollar Share</b>	<b>Volume Share</b>
<b>Guinness</b>	<b>24%</b>	<b>21%</b>
<b>Grand Metropolitan</b>	<b>22%</b>	<b>23%</b>
American Brands, USA	9%	11%
Seagram Company Ltd, Canada	7%	8%
Grant Wm & Sons Ltd, UK	5%	4%
Other	33%	34%

# Market concentration

- The FTC predicted a high post-merger HHI for premium scotch and premium gin

Industry	Pre-Acquisition Owner of Brands	Primary Brands	Market Share	Post-Merger HHI	Change in HHI
Cereal <sup>1</sup>	General Mills	Cheerios, Wheaties	28%	2357	238
	Ralcorp	Chex	4%		
Liquor <sup>2</sup>	Guinness	Tanqueray, Scoresby	21%	2026	935
	Grand Metropolitan	J&B, Johnny Walker, Smirnoff	22%		

although the overall HHI is not big, the change is big and thus prices are likely to be affected.

- The companies agreed to diverge some of their brands and the merger proceeded

Anti-trust agencies mostly consider producer surplus

# CR and HHI for some markets

**TABLE 8.3**

**1997 Concentration Ratios in Selected Manufacturing Industries**

Product Grouping	C4	C8	HHI*
Meat products	35	48	393
Breakfast cereal	83	94	2,446
Distilleries	60	77	1,076
Cigarettes	99	NR	NR
Men's and boy's suits and coats	42	56	846
Sawmills	15	20	87
Folding paperboard boxes	25	38	246
Book printing	32	45	364
Petroleum refining	29	49	422
Tires and inner tubes	68	86	1,518
Blast iron and steel mills	33	53	445
Household refrigerators and freezers	82	97	2,025
Motor vehicles and car bodies	87	94	NR
Computers	40	68	658

\*Herfindahl-Hirschman Index for the 50 largest companies. NR indicates that the index is not reported.

Source: *Census of Manufactures: Concentration Ratios in Manufacturing* (2001, Table 2).

the more homogeneous a product, the lower HHI.