Damages Estimation
An Overview and some Examples

Dr Peter Davis

Substantive and/or Procedural Wisdom?

People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices. It is impossible indeed to prevent such meetings by any law which either could be executed, or would be consistent with liberty and justice.

Adam Smith
The Wealth of Nations [1776]

Ie., Adam Smith says:

1) We should expect loads of cartel attempts absent competition law

2) Direct prevention of meetings raises issues of
   - **Practicality** – catching cartelists
   - **Justice** - convicting only 'guilty' (risk of false positives)
   - **Liberty** - freedom of association

Damages Calculations - Context

- Objectives of a 'damages' calculation?
  - Eg., Deterrence v. Justice for 'victims'

- Context and Information available
  - Administrative procedures – fines
    - Agencies: information gathering powers and skilled staff
  - Private follow on actions – damages to 'victims'
    - Courts: Information available will vary by jurisdiction and ability of judiciary to properly digest even not very subtle economic arguments will vary.

- In an ideal world, the components of a competition system should 'fit together'
  - Aim should be to provide sufficient disincentives to discourage behaviour we don't want while not creating too many 'chilling' effects from false positives/"over"-deterrence.

Overview

- Damages Estimation
  - Direct vs Indirect damages
  - Estimating pass-on rates
- Direct damages methods – some examples
  - Before/after analysis
  - Yardstick
  - Difference in Difference
  - Cost plus

See also Chapter 7, Davis and Garces

Quantitative Techniques for Competition and Antitrust Analysis

Princeton U. Press, 2010.

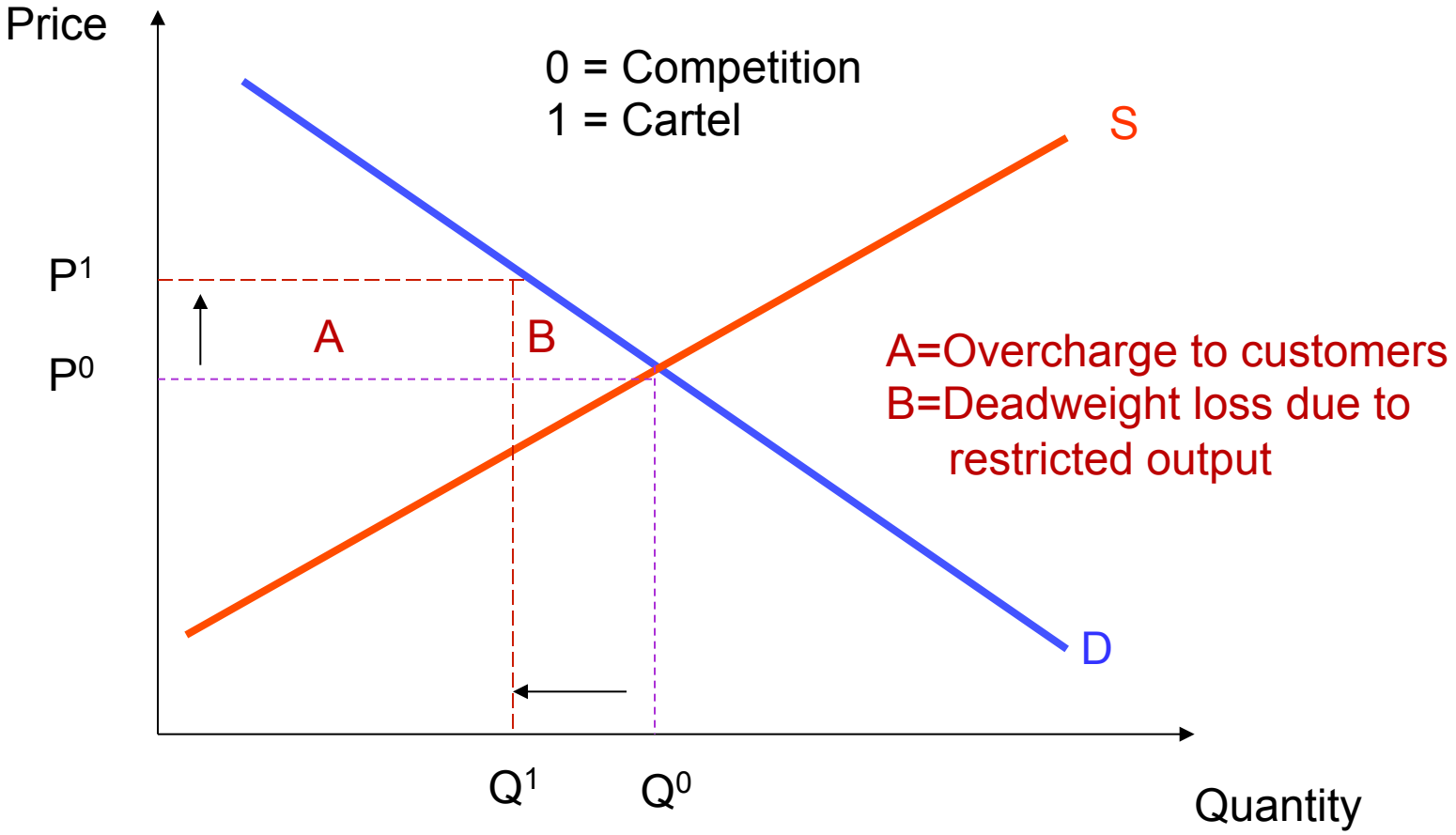
Damages Estimation

- Assume the Question is: How much should be paid to the offended parties as damages (eg., consumers) for harm suffered

- Main practical issues:
  - Calculating the "But-for" the cartel prices
  - Dating the cartel (Start/End dates.)
  - Measuring harm

- Practical legal questions often need to be answered for a given jurisdiction before we go very far down this route. For example:
  - Is pass-on defence allowed?
  - Does interest accrue on damages?

The ‘easiest’ case: Damages in Consumer Facing Markets



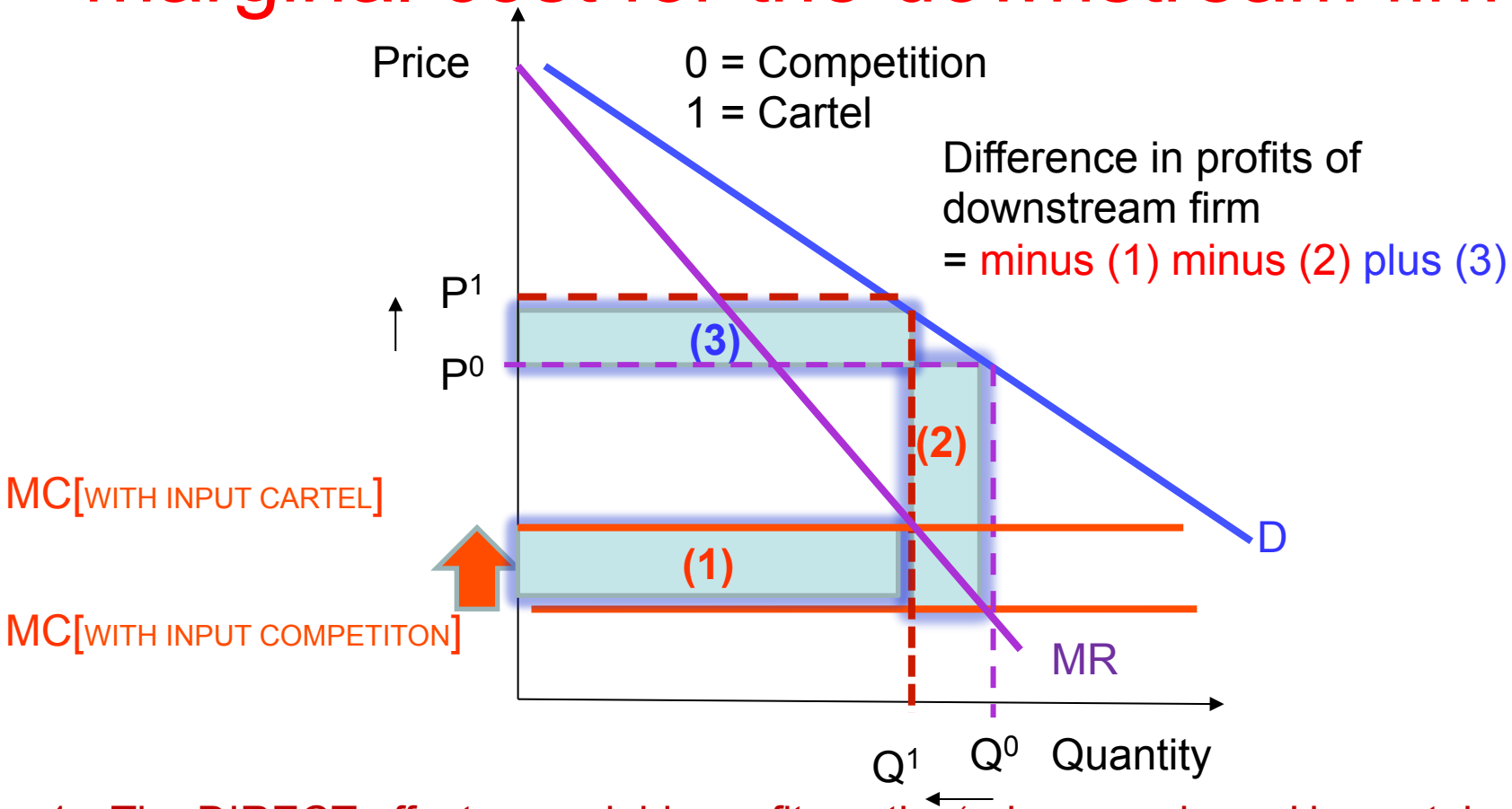
- Much damages estimation involves finding the overcharge, region A.

Damages with Upstream Cartels

- Suppose (as often case)
  - Cartel was 'upstream'
  - Claimant is a 'downstream' firm
- Then in simplest case the unit prices of the cartel are the unit costs of the downstream firm

The claimants profits with the cartel:	$\pi^1 = (p^1 - c^{CARTEL})q^1$
The claimants profits 'but for' the cartel:	$\pi^0 = (p^0 - c^{COMP})q^0$
Implies the difference is	$\pi^0 - \pi^1 = (p^0 - c^{COMP})q^0 - (p^1 - c^{CARTEL})q^1$

Input Cartel modelled as a shift in marginal cost for the downstream firm



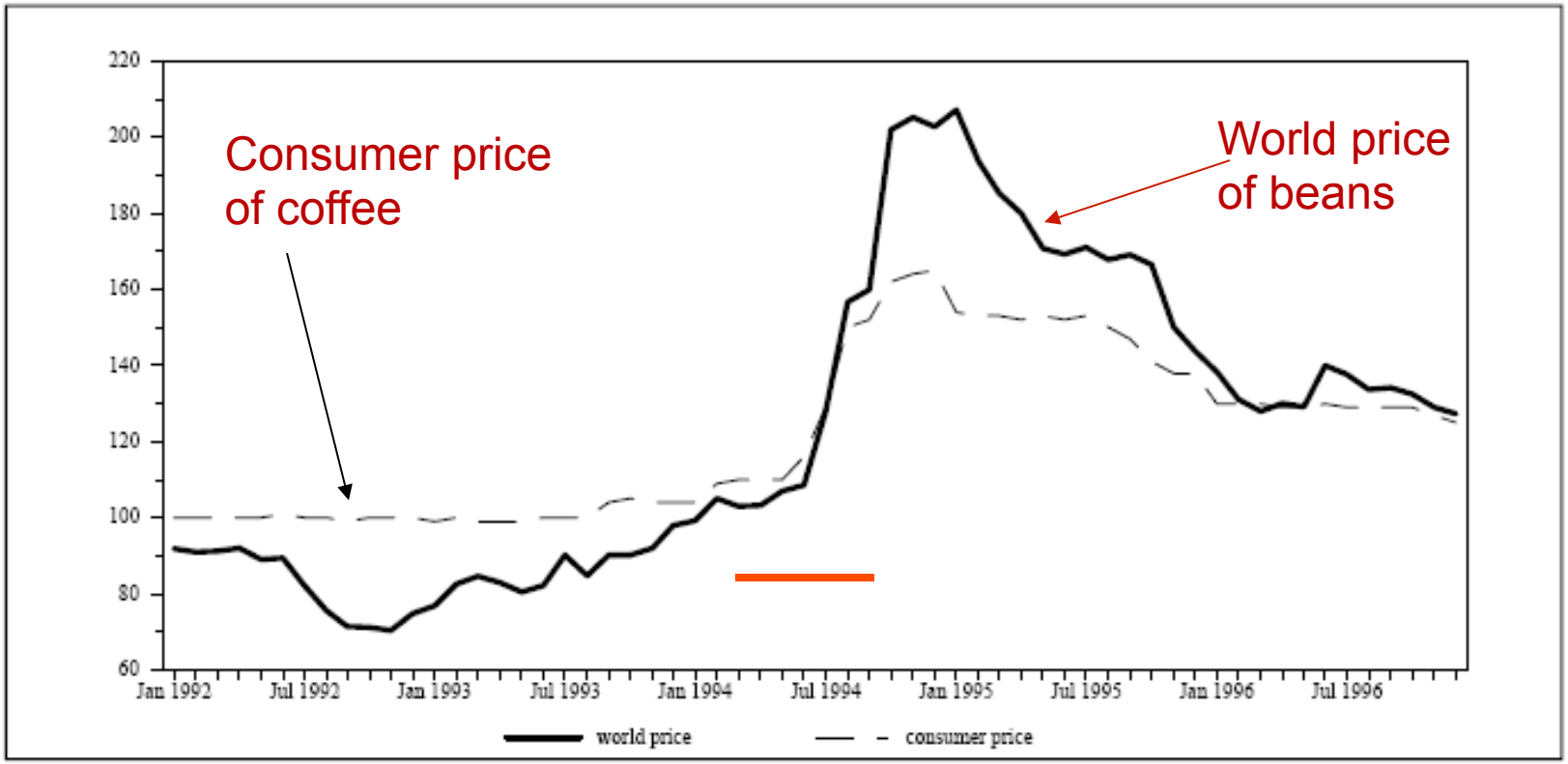
1. The DIRECT effect on variable profits = the 'price overcharge' by cartel
2. An INDRECT effect – 'output effect' - reduces production with price increase
3. An INDRECT effect – 'pass on effect' – increase in costs is passed on to consumers of the downstream firm as higher output prices

- Depending on jurisdiction (2) and (3) may be ignored….

Pass-on in the Coffee Market

Verboven and Bettendorf (2001) European Journal of Ag. Econ

Figure 1 Evolution of coffee price index (1990=100)



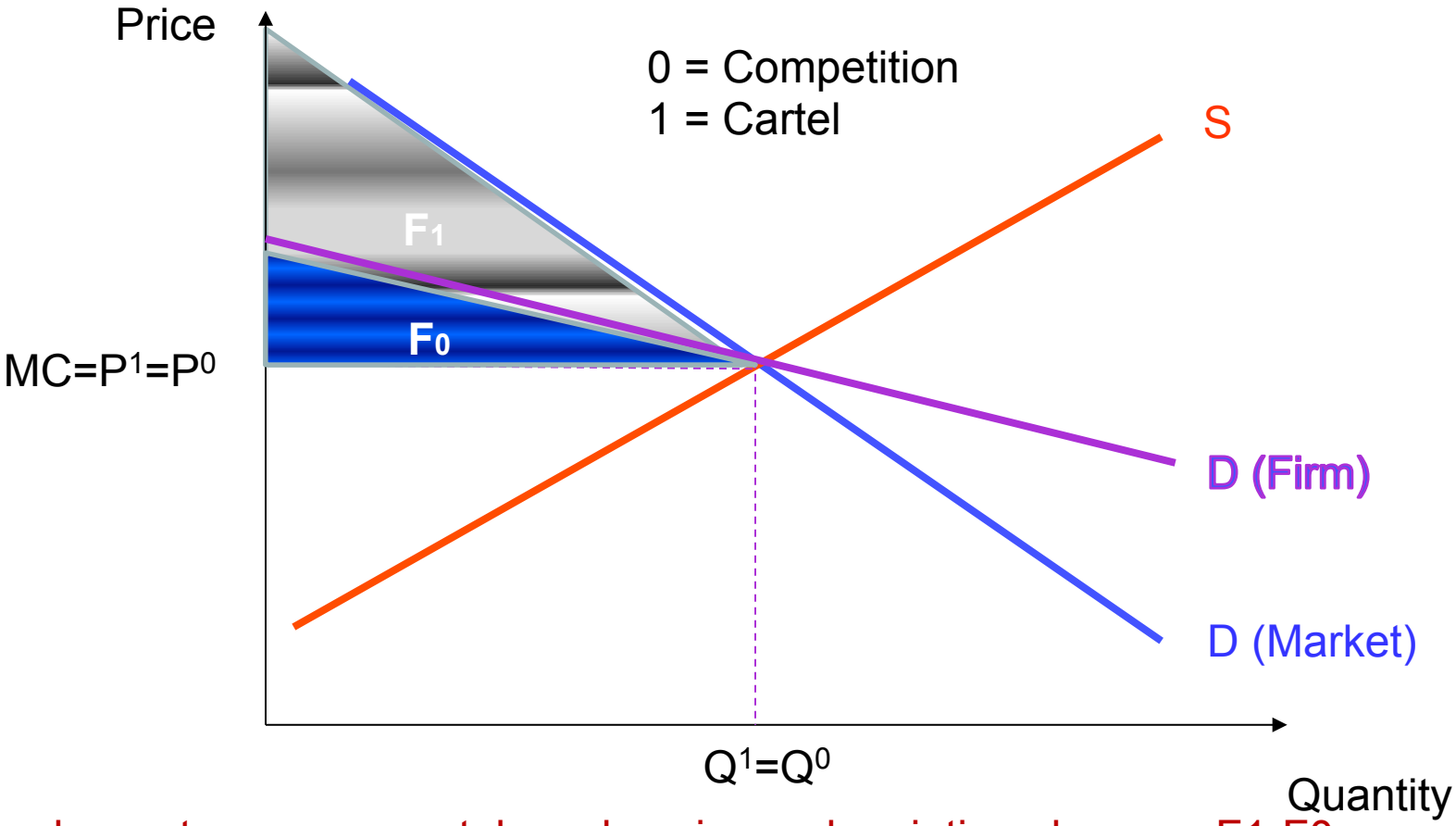
1994 Frost in Brazil – bean prices go up, but consumer prices don't fully adjust – only part of the world bean price increase seems to be 'passed-on' to consumers

During 1994, Bean prices increase 104% (3.23 guilders), consumer prices increased by 45%

More Generally: Facts matter for the 'right' Damages Calculation

- Examples:
  - Whether Upstream/Downstream cartel
    - But also way upstream output is translated into downstream output (eg our example assumed 1 to 1 – eg eggs)
  - Nature of actual pricing structure (eg., contracts versus simple unit prices in the examples)
  - Extent of actual 'pass-through' : extent to which downstream firms cost increases are passed on
    - NB: Pass-through will be difficult to estimate absent 'cost shock' data during competitive period .
    - In models - beware 'magic numbers': eg linear demand and pass-through=1/2
  - Extent of market power
    - in input market absent the cartel
    - in output market (affects ability to pass-through)

(Extreme) Example: Damages in Consumer Facing Markets with Two Part Tariffs (one type of consumer) (Or Perfect Price Discrimination)



- Overcharge to consumers takes place in a subscription charge = F1-F0
- No Deadweight loss due to restricted output as mc pricing in each case to ensure efficient contracting

In terms of available economic approaches – there's nothing spectacularly special about Damage Estimation – just 'doing' basic economics

- We can take a 'model based' approach
  - Damage estimation usually depends on either an explicit or implicit model of competition and cartel outcomes
  - Standard economic models (with all standard pro's and cons.)

- Or we can take a statistical 'data-led' approach
  - Unlike eg mergers where we're inherently forecasting the future – what will the post-merger world look like - we will sometimes have at least some data from 'past conduct'

- Or a combination of the two

- In each case the key question will be what's identifying the results we're obtaining

Examples: Methods for Quantification (Or in techy talk: Possible sources of data variation for Identification)

1. Before and after method
   - compare prices before/after the cartel to those prices in the cartel period
2. Yard-stick method
   - Compare prices across ‘like’ markets
3. Differences in Differences
   - Crudely: Attempts to combine 1 and 2 to help identify the impact of a cartel on prices
4. Cost-plus method
   - Measure costs directly

- These methods are used in lots of contexts to help identify the effect of ‘A’ on ‘B’ where here this is the effect of cartel on prices (or outcomes more generally)
- The question could equally be ‘effect of a merger on prices’ or ‘effect of an abuse on prices’

Method 1- Using Before and After Method

- Historically used for ex-post merger evaluation (not always successfully)

- Eg,. use time series variation (Before/After)
- Pick the price before or after the cartel started
- Compare the prices before/after and during

- Damages:

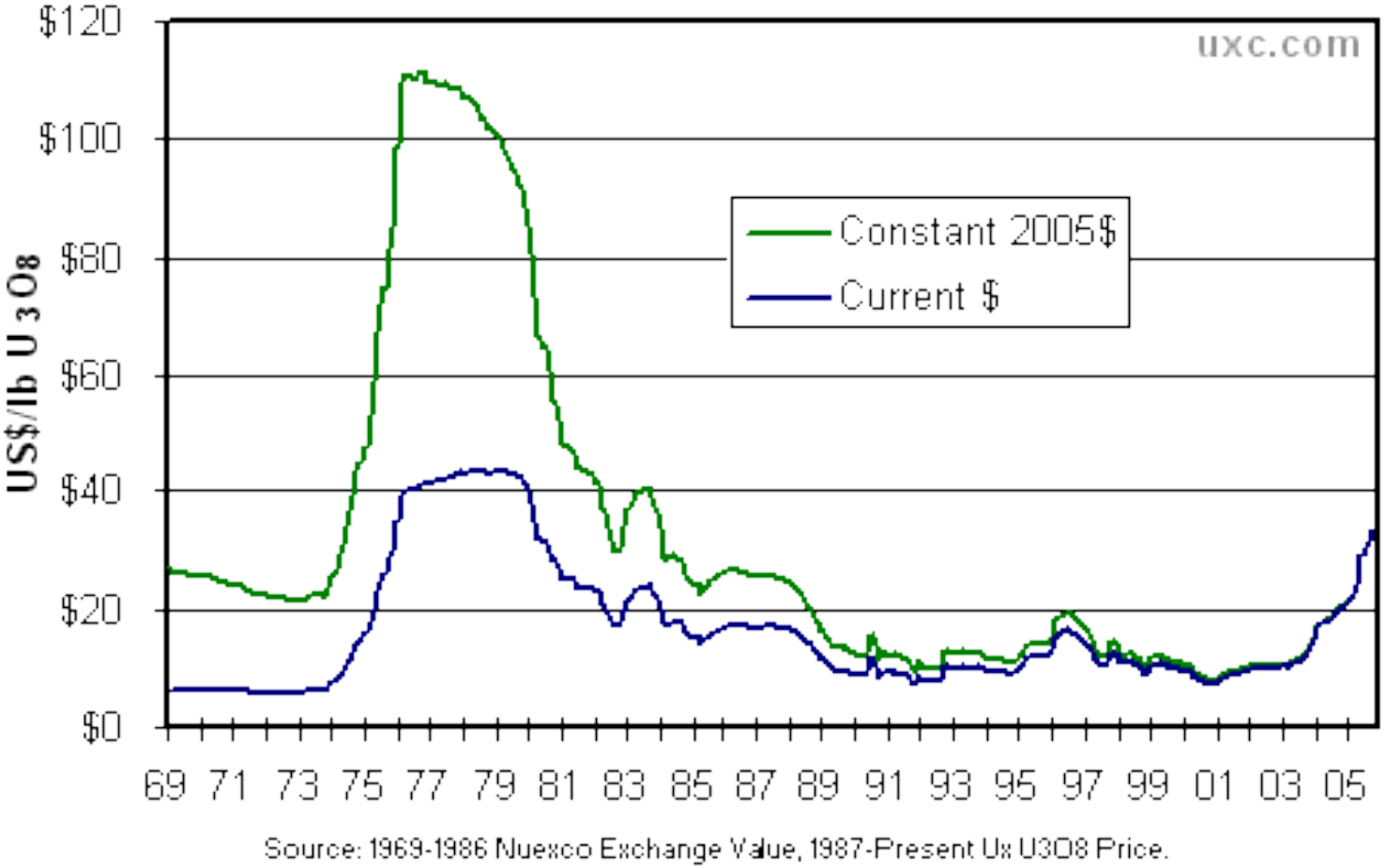
$$Damages_t = (P_t^{Cartel} - P_t^{Competition}) * Q_t^{Cartel}$$

Cartel prices and output

- Computed and summed (possibly NPV'd) over the period of the cartel

- Beware causality: Eg., Kylie Minogue (cant get you out of my head) versus Enterprise Act 2002

The Uranium Cartel
(Guess when?)



Price of Uranium 308.

NB: Answer = 1972 - 1975

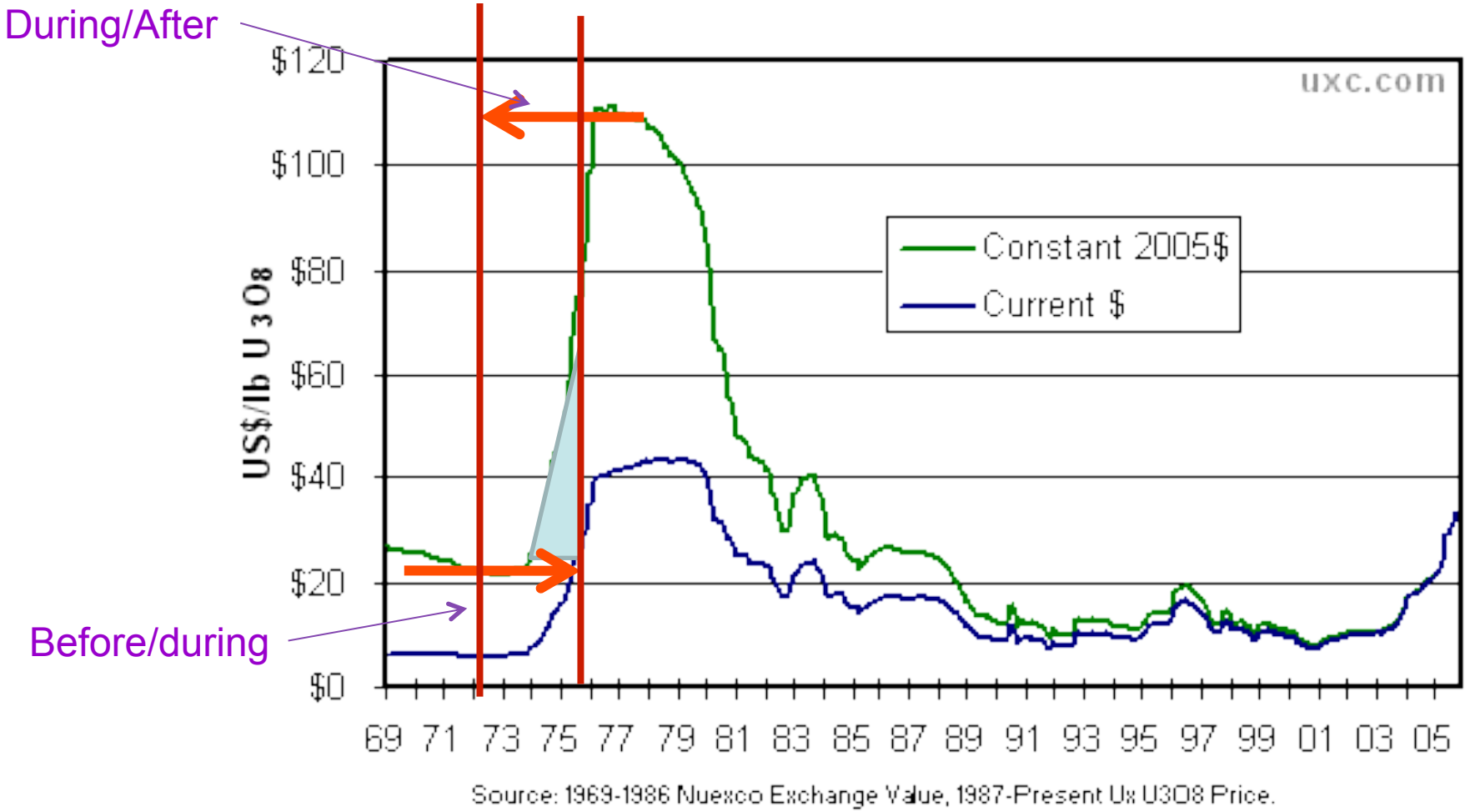
Before and During – or During and After?

- Simplest version of the Before and After model suggests effectively drawing a horizontal line on the picture from before the cartel to during the cartel period and adding up the difference in prices

- But can instead draw line from ‘right to left’ – ie afterwards back into the cartel period.

- Difficulty is that after periods of explicit coordination we sometimes (for example) get a period of tacit coordination .

During/After shows zero effect of the cartel in this dataset



A Caveat and Pro's and Cons of Sophistication

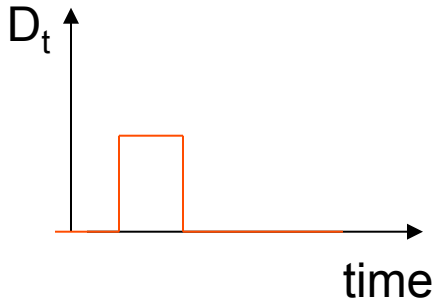
- But Ec 101 says observed outcomes - prices and quantities - depend on costs and demand shifters as well as the market shifters
- In principle we should control for all relevant demand and cost shifters
- But often have only a small amount of data…. And will inevitably get zero measured effects if you attempt to control for "too many" variables than your data can handle....
- Judge can be made aware if this is what defendants experts have done…

x_{jt}

The 'Dummy Variable' Approach

- Intuitively then we might run the regression

$$p_t = \alpha + \gamma D_t + x_t \beta + \varepsilon_t$$



- Where
- D_t is a dummy variable taking on the value 1 if the cartel were active in period t and 0 otherwise
- x_t is a vector of demand and cost factors that affect the price but aren't controlled by the cartel
  - Defendants will typically want to include lots of x's – ideally to make $\gamma = 0$ so that no damages
- This is the 'top hat' model

Specification Testing

- Must be very careful to do lots of specification testing with reduced form models like this.
- In particular most 'standard' typical empirical model doesn't fit well with most standard theoretical model. Empirical: $p_t = \alpha + \gamma D_t + x_t \beta + \varepsilon_t$
- Example: For simplest model
  - Demand $p_t = a_t - bQ_t$
  - Cartel prices: $p_t = \frac{a_t}{2} + \frac{c_t}{2}$
  - Perfectly Competitive prices: $p_t = c_t$
  - Then correctly specified theoretically motivated model would be

$$p_t = c_t + \left(\frac{a_t}{2} - \frac{c_t}{2} \right) D_t^{cartel}$$

i.e., not obvious the impact of the cartel should be well captured by a simple shift of the intercept – as in the empirical 'top hat' model

Method 2: Yard-Stick Method

- Compare prices across 'like' markets
  - Perhaps
    - Markets in the same state or country
    - Must be 'similar' in terms of demand, cost *and* market structure

$$p_m = \alpha + \gamma D_m + x_m \beta + \varepsilon_m$$

Indicator variable 1/0 across markets

- Ie., using cross-market variation where some markets had a cartel and others didn't.
- Probably very tough to get 'similar' markets but where was not collusion going on!

Method 3: Differences in Differences Method

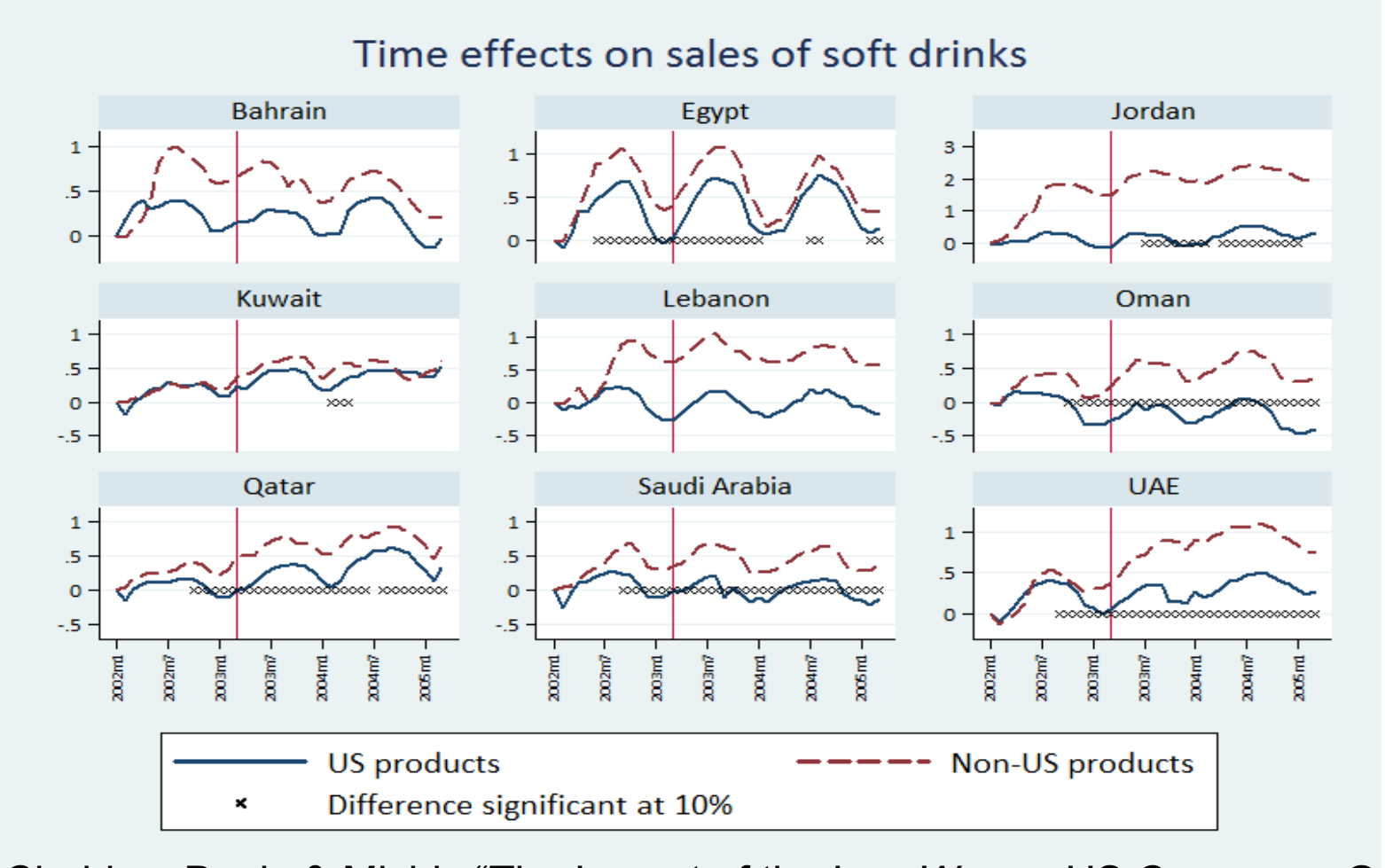
- In an ideal experimental world we'd have
  - some cartelised markets/products and others which weren't and we'd follow each market/products over-time from before the cartel to afterwards
  - NB: In a really ideal world, the markets would be randomly assigned to be cartelised (or not)
- That way we could easily compute the impact of a cartel on a given market
- Since costs/demands evolve over time we can use the "control" markets/products to try to rule out

- Might run a regression of form:

$$p_{jt} = \alpha_j + \tau_t + \gamma D_{jt}^{cartel} + x_{jt}\beta + \varepsilon_{jt}$$

Example: Effect of Gulf-War on sales of US and Non-US products

$$\ln Q_{jt} = \alpha_j + \tau_t^{US(j)} + \tau_t^{Non-US(j)} + x_{jt}\beta + \varepsilon_{jt}$$



From: Clerides, Davis & Michis "The Impact of the Iraq *War* on US Consumer Goods Sales in Arab Countries " mimeo

Method 4 – '*Cost plus*'

- Directly compute the 'but for' price from cost data - including a 'reasonable' ['normal' competitive] economic return
- Sounds like a nice simple method. But….
- Leads immediately to a discussion of
  - the right measure of costs? (Eg mc, LRIC, LRIC+, Fully allocated)
  - The right measurement of costs (eg accounting data)
- Such discussions will be very familiar from other contexts (eg., regulated industries)

Eg., Problems with 'Cost' Based Approaches

- Firms are heterogeneous: Some firms are highly efficient while others are less efficient. In homogenous product markets, competitive prices are set by least efficient producing firm's mc, not the most efficient firm's mc.

- Competitive prices usually don't depend just on a single firm's costs
  - Only exception is perfect competition so that needs to be the relevant competitive price 'but-for' the cartel.
  - More typically 'competitive' prices will be considerably above marginal cost – Bertrand's result is a paradox.

- What is a 'normal' return on capital employed?
  - Lots of measurement issues
  - Dynamic vs Static returns – we want to make returns on product innovation (shifting out demand) and process innovation (reducing marginal costs) positive.

Damages via Simulation

- Directly (fully) specify/estimate components of an economic model
  - Model of Demand
  - Model of Costs (cost data not required)
  - Strategic variables (eg prices)
  - Nature of equilibrium (eg., static nash)

- Then just perform counterfactual simulation
  - Calculate how prices change with and without collusion

- Models can get as sophisticated as in other contexts – Eg., merger simulation (and have a huge amount in common)
  - But in practical settings shouldn't get "too complex."

Data and Methods for Timing

- Timing important – determines at least the total volume affected

1. Direct ‘data’ - ie documents
   - Diaries, emails mentioning meeting dates, memos describing pricing schemes
2. Statistical approach
   - ‘Structural Break’ analysis

- NB: These are really complements, not substitutes - documents will be very helpful even if ultimately we quantify using a statistical approach

Structural Break Analysis

- Define dummy variables to allow for multiple possible starting dates and finishing dates

$$p_t = x_t'\beta + \alpha_1 D_t^{APRIL-99 to May 99} + \alpha_2 D_t^{JUNE-99} + \varepsilon_t$$

Dummy for the period April 99 to end of May 99

Cartel period dummy for June 99 to end of cartel

- This specification nests two timing options
  - If $\alpha_1 = \alpha_2$ then timing is April 99 to end date
  - If $\alpha_1 = 0$ then timing is June 99 to end date

Conclusions

- Variety of methods for estimating damages
  - Both direct and indirect
- Basically there's a standard economic toolkit and nothing very much different here (other than the context)
  - Can do analysis in a 'data-led' way or a 'model-led' way.
  - Typically best results involve a combination – so we find out what the answer depends on and so a judge can take a view….
- A level of economic sophistication is required of judges – but no more (and sometimes less) than in anything else we do these days….
- The issue of 'how to communicate good economics and uncover bad economics' is a big issue but not obviously more of an issue for damage estimation than in other arenas within competition law