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Competitive assessment of price cycles in German retail gasoline markets

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Agenda

- Introduction
- How to judge Edgeworth Cycles from a theoretical perspective?
- How to judge the findings of the empirical literature on Edgeworth Cycles?
- Does the empirical evidence prove collective evidence of the five largest firms?
- Conclusion

Introduction

Background to E.CA's study

- During the FCO's inqury E.CA Economics was asked by the Association of the German mineral oil industry (Mineralölwirtschaftsverband) to carry out an empirical analysis using a similar dataset the FCO had requested
  - The dataset included information from a narrower set of firms (most members of the association only)
  - And it included information one sample city only (Hamburg)
  - Dataset allowed to assess the volume weighted average price
- Key results of our empirical analysis - which were fully confirmed by the FCO's investigation – were:
  - Presence of price cycles resembling Edgeworth Cycles as predicted by Maskin & Tirole (1988) and extensions
  - Increasing difference between minimum and maximum price within a cycle over time (increasing amplitude)
  - Decreasing duration of price cycles over time (decreasing fequency)
- Substantial differences remained on
  - how to judge Edgeworth Cycles from a theoretical perspective (some convergence of opinions though)
  - how to judge the findings of the empirical literature on Edgeworth Cycles
  - And – most importantly – on whether the empirical evidence proves collective dominance of the 5 largest firms

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How to judge Edgeworth Cycles from a theoretical perspective

Supergame framework vs Edgeworth Cycle

- The usual framework for analysis of collective dominance is the supergame framework (Friedman (1971), Ivaldi et al. (2003))
  - Tacit collusion arises here through credible threat of retaliation
  - The framework was endorsed by European courts (as reflected in the *Airtours/ Impala* criteria)
  - The FCO typically also relies on this framework to assess collective dominance
- Price cycles emerge as equilibrium of the dynamic model of Maskin & Tirole (1988)
  - The model assumes some commitment (prices are fixed in the short run) and markov strategies
  - It has two equilibria: Edgeworth Cycles and (stable) focal prices
  - Price cycle equilibrium does not involve punishment
- Maskin & Tirole (1988) label their results as a possible theory of tacit collusion

But is it correct to conclude that price cycles imply collective dominance under European/ German competition law?

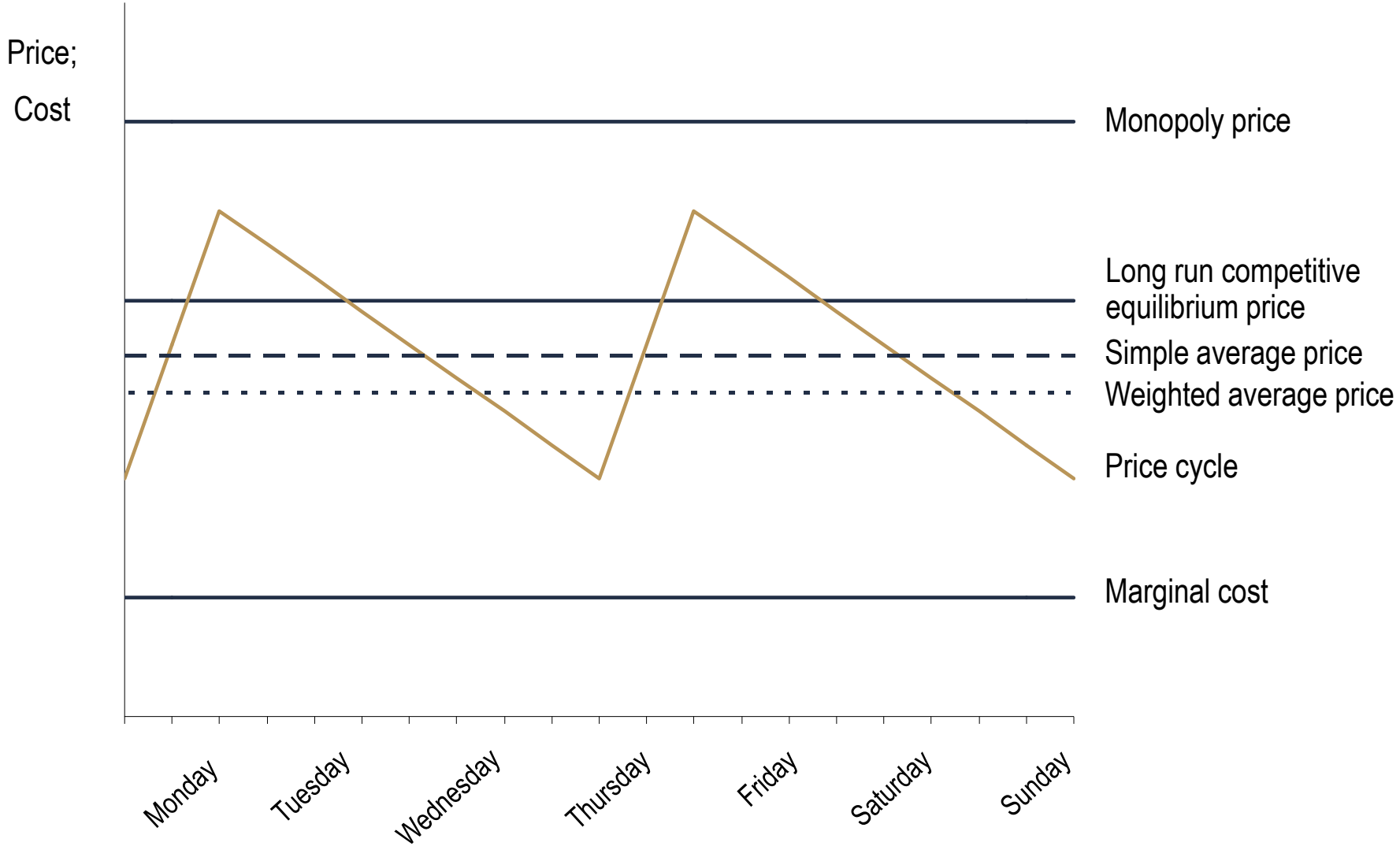
How to judge Edgeworth Cycles from a theoretical perspective (cont.)

There is support for a positive assessment

- Various competition authorities follow this view:
- "*Street-level pricing is cyclical as competitors attempt to increase market share by cutting prices or by restoring prices when operating margins fall to unsustainable levels. […] Price swings of up to 10 per cent are not uncommon. In gasoline retailing, the constant cycle of price changes in a market* ***is actually a sign that the market is competitive***.", (emphasis added), Competition Bureau Canada posted March 2006, retrieved 14.11.2011
- …and by academics:
- "*When a retail gasoline market experiences price cycles, periodic large price increases are the norm, even when there are no changes in the wholesale market that would seem to trigger it. Many fear it is a form of collusion and an indication that prices are anti-competitively high. However, Prof. Noel's research suggest the opposite - that* ***cycles are indicative of a competitive market***." (emphasis added), Professor Michael Noel, retrieved 14.11.2011

How to judge Edgeworth Cycles from a theoretical perspective (cont.)

Background to E.CA's position on Edgeworth-Cycles



How to judge Edgeworth Cycles from a theoretical perspective (cont.)

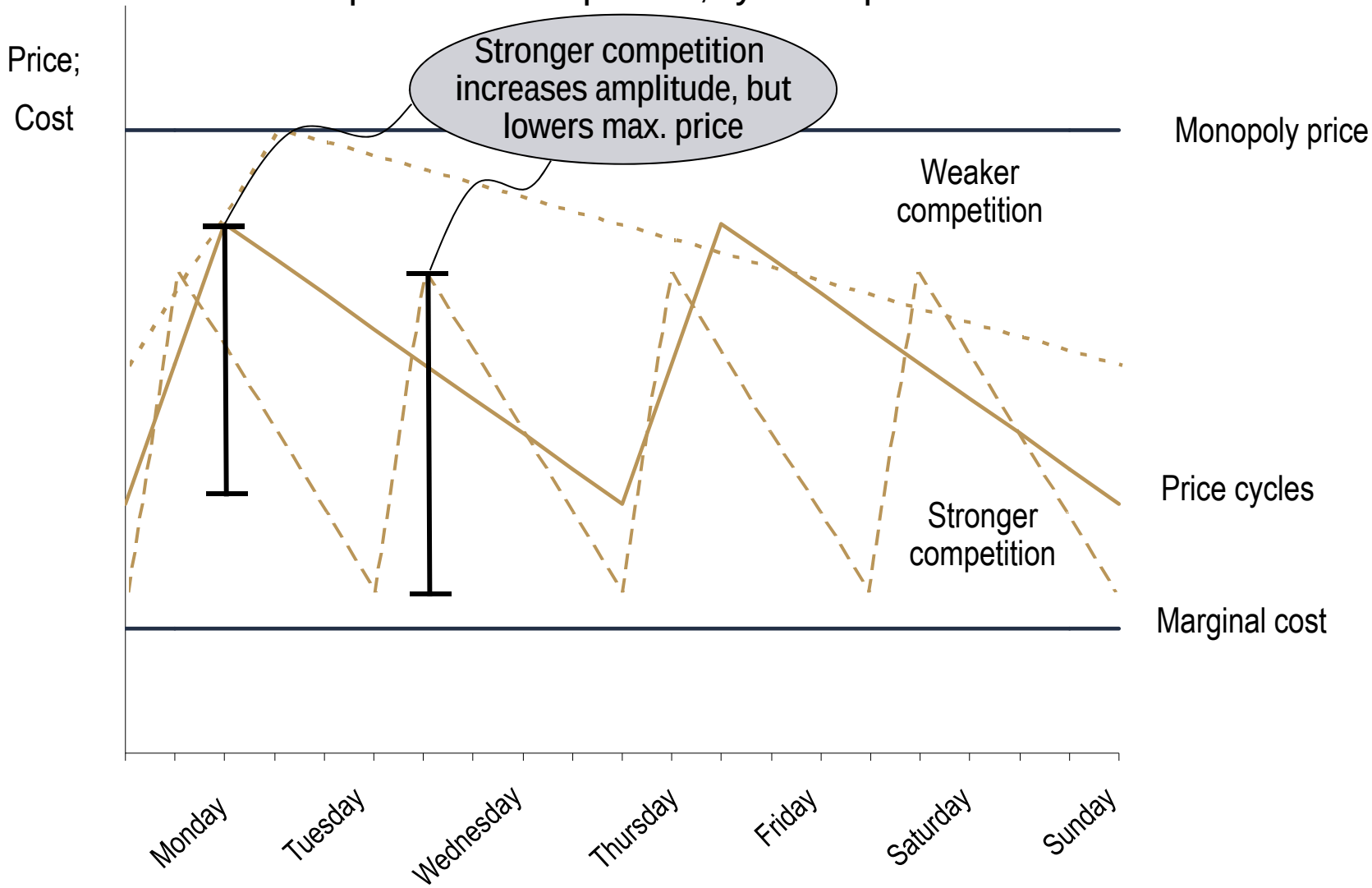
Assessment of welfare consequences requires empirical evidence

- The welfare implications of Edgeworth Cycles are ambigous
  - Prices tend to be lower in the price cycle equilibrium than in the focal price equilibrium (Noel (2008))
  - In the presence of fixed costs equilibrium prices may be no higher than the long run competitive equilibrium
- From a theoretical perspective Edgeworth cycles should be expected in more competitve markets
  - Eckert (2003) shows that focal prices require a certain level of concentration, in the presence of very small firms price cycles are the only equilibrium
  - Noel (2008) shows that price cycles do not occur in equilibrium when differentiation between firms is too strong
- There are additional reasons for a positive assessment
  - Short run price commitment is a key assumption and firms have no direct control over this (it takes some time to react to price changes in gasoline markets)
  - In practice consumers can respond strategically in the presence of price cycles, theory does not consider this potentially positive effect

In our view it is impossible to draw welfare conclusions based on theory alone; empirical evidence is required

How to judge Edgeworth Cycles from a theoretical perspective (cont.)

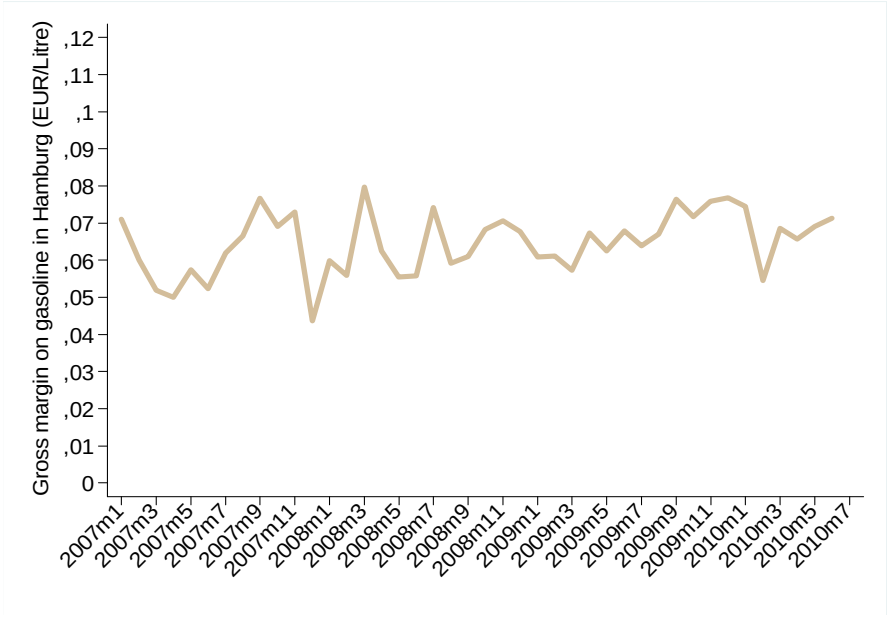
Illustration of relationship between competition, cycle shape and welfare

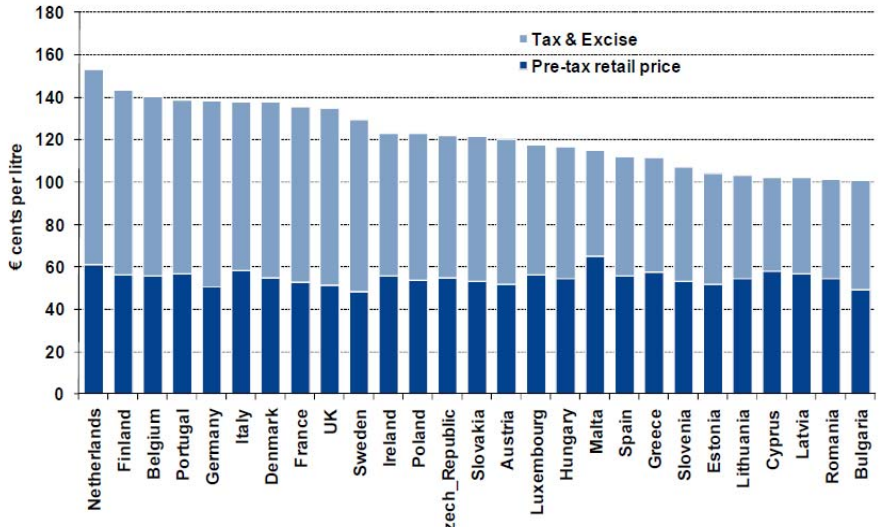


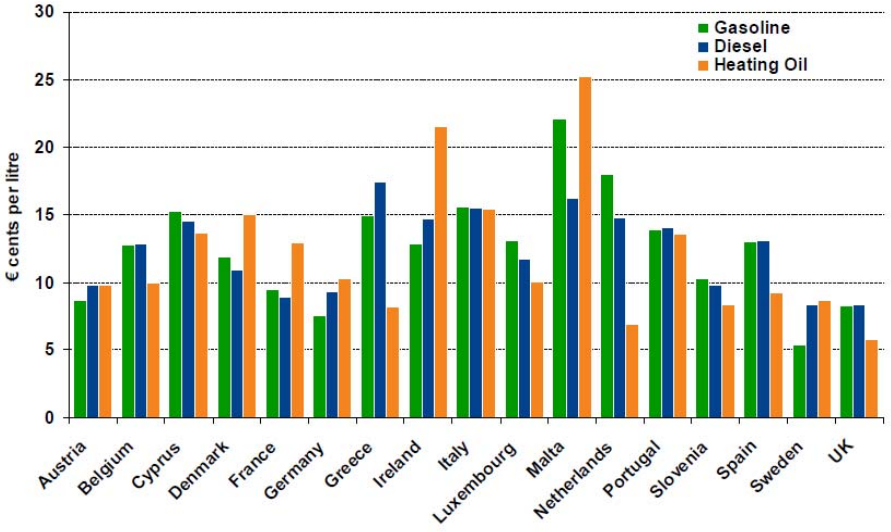
How to judge Edgeworth Cycles from a theoretical perspective (cont.)

Margin analysis inconclusive

- An analysis of margins shows that
  - Margins in Hamburg have remained roughly constant over time (FCO Annex to final report, p.51)
  - Are relatively low in Germany compared with other countries (Pöyry, 2009, Tables 11 and 9)







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How to judge the findings of the empirical literature on Edgeworth Cycles?

Opposing views are held regarding the results from the empicial literature

- FCO: „*Overall one can conclude that the empirical literature on fuel markets outside Germany does not come to a clear result with regard to the relationship between cyclicality of markets and (average) price levels*“ (Final report, p.128)
- This is not how we (and others) read the literature:
- "*In his Ph.D. dissertation, Noel notes that* ***margins are lower under Edgeworth Cycles than under other equilibrium types****, controlling for differences in margins across cities and time.* ***The majority of other articles, but not all, find a similar result."*** Professor Noel*http://weber.ucsd.edu/~mdnoel/index.html*
- A working paper by the US Federal Trade Commission at the time of our research arrived at the following – understandably – careful conclusion:
- "*[…] we find that cycling cites on average have no higher and in some cases lower retail prices. While additional research may lead to a more robust conclusion on this point, the current finding is disconnected from the dynamic model which is suggestive of tacit collusion and the literature examining tacit or explicit collusion in Canada and Australia.*" Zimmerman et al. (2010), p. 20-21
- And further:
- "*The puzzle of why price cycles exist if prices are no higher and seem to be lower in cycling cities is a topic for further research as well.*" Zimmerman et al. (2010), p. 21

How to judge the findings of the empirical literature on Edgeworth Cycles?

Paper	Region	Sample	Direction and magnitude of price difference
Doyle et al., (2010), „Edgeworth Cycles Revisited“, Energy Economics	USA	115 MSA, daily prices 2000-2001	Lower prices ca. 1-2 US Cent per Gallone (20 – 40% of net margin)
Noel, M., (2004), „Edgeworth Price Cycles, Cost based Pricing and Sticky Pricing in Retail Gasoline Markets“, Working Paper, UCSD	Canada	19 Cities, weekly prices 1989-1999	Lower prices ca. 1 Canadian Cent per Gallone (ca. 15% of gross margin)
Wang, Z., (2009), „Mixed Strategy in Oligopoly Pricing: Evidence from Gasoline Price Cycles before and under a Timing Regulation“, Journal of Political Economy	Australia	3 Cities, weekly average prices 2001-2003	Higher prices ca. 0,09 - 1,8 Australian Cent per Litre
Zimmerman et al., (2010), „Edgeworth Price Cycles in Gasoline: Evidence from the U.S.“, FTC Working Paper	USA	355 Cities, annual (based on weekly) average prices 2001-2007	Lower prices ca. 3 US Cent per Gallone (ca. 21% of gross margin)
Zimmerman et al., (2011), „Edgeworth Price Cycles in Gasoline: Evidence from the U.S.“, revised version	USA	Difference in difference approach using daily prices from (up to) 350 cities spanning the period 1996-2010	Lower prices ca. 1 US Cent per Gallone

How to judge the findings of the empirical literature on Edgeworth Cycles?

And there is additional positive evidence

- Published studies analyse simple average prices
  - Evidence suggests, however, that consumers buy petrol more frequently when prices are low
  - In that case volume weighted average prices will be lower than simple (time weighted) average prices
  - The studies would underestimate the positive impact of price cycling on price levels
  - Noel (2011) shows that consumers in Toronto, Canada could save as much as 3.9% by timing their purchases optimally
  - In our dataset volume weighted prices were indeed lower than simple average prices
- Finally, Lewis (2009) and Noel & Lewis (2011) show that asymmetric cost pass-through is weaker in markets with price cycles than in other markets
  - Although it is still unclear what causes asymmetric pass-through, results show that it is less severe in markets with price cycles should be taken as positive evidence

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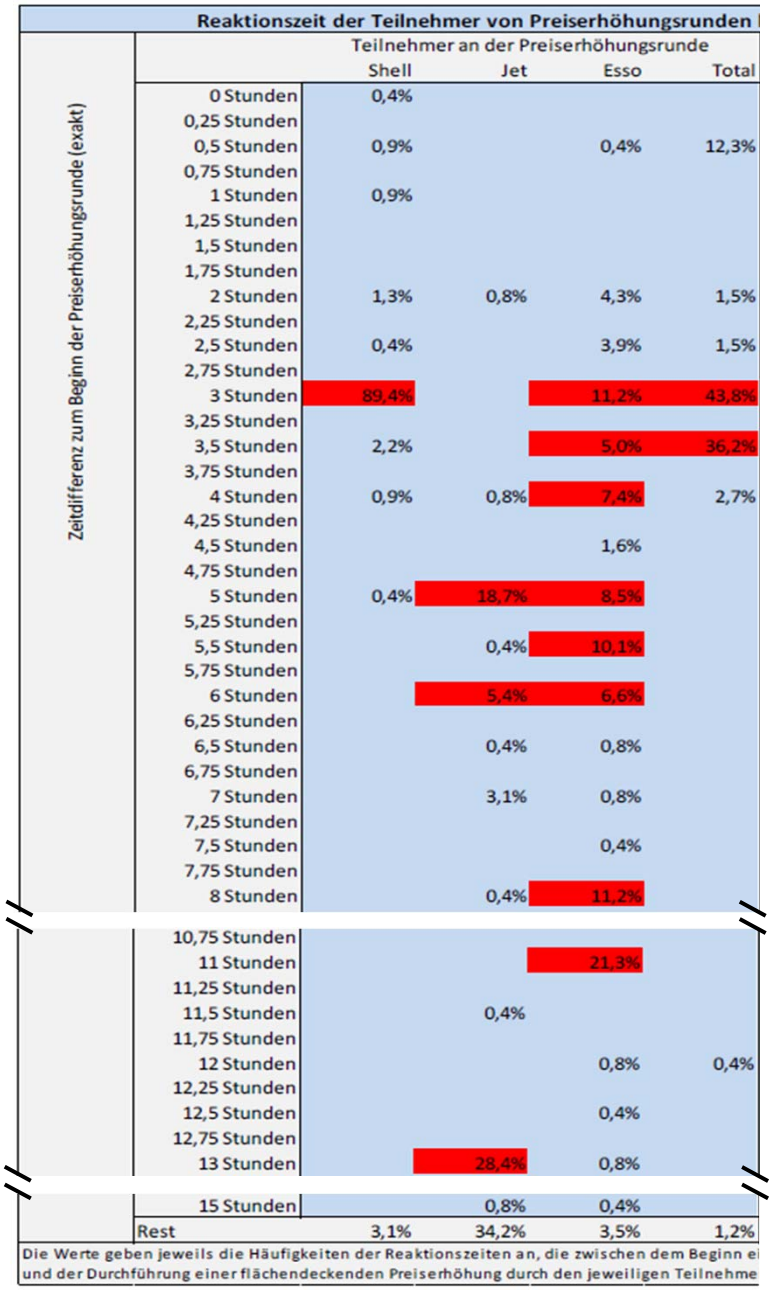

Reaktionszeit der Teilnehmer von Preiserhöhungsrunden

Zeitdifferenz zum Beginn der Preiserhöhungsrunde (exakt)	Teilnehmer an der Preiserhöhungsrunde: Shell	Jet	Esso	Total
0 Stunden	0,4%			
0,25 Stunden				
0,5 Stunden	0,9%		0,4%	12,3%
0,75 Stunden				
1 Stunden	0,9%			
1,25 Stunden				
1,5 Stunden				
1,75 Stunden				
2 Stunden	1,3%	0,8%	4,3%	1,5%
2,25 Stunden				
2,5 Stunden	0,4%		3,9%	1,5%
2,75 Stunden				
3 Stunden	89,4%		11,2%	43,8%
3,25 Stunden				
3,5 Stunden	2,2%		5,0%	36,2%
3,75 Stunden				
4 Stunden	0,9%	0,8%	7,4%	2,7%
4,25 Stunden				
4,5 Stunden			1,6%	
4,75 Stunden				
5 Stunden	0,4%	18,7%	8,5%	
5,25 Stunden				
5,5 Stunden		0,4%	10,1%	
5,75 Stunden				
6 Stunden		5,4%	6,6%	
6,25 Stunden				
6,5 Stunden		0,4%	0,8%	
6,75 Stunden				
7 Stunden		3,1%	0,8%	
7,25 Stunden				
7,5 Stunden			0,4%	
7,75 Stunden				
8 Stunden		0,4%	11,2%	
10,75 Stunden				
11 Stunden			21,3%	
11,25 Stunden				
11,5 Stunden		0,4%		
11,75 Stunden				
12 Stunden			0,8%	0,4%
12,25 Stunden				
12,5 Stunden			0,4%	
12,75 Stunden				
13 Stunden		28,4%	0,8%	
15 Stunden		0,8%	0,4%	
Rest	3,1%	34,2%	3,5%	1,2%

Die Werte geben jeweils die Häufigkeiten der Reaktionszeiten an, die zwischen dem Beginn e
und der Durchführung einer flächendeckenden Preiserhöhung durch den jeweiligen Teilnehme

Price patterns

- The FCO interprets the identified patterns during price increases as proof of coordination among the supposedly dominant companies and (at least) as evidence for collective dominance
- In our view the patterns are not as clear as the FCO claims
  - In particular Esso displays a hardly predictable behaviour
  - Jet follows in 28% of the cases only with large delay; 34% of Jet's price increases are not captured by the analysis (for exact price windows)
- The analysis of the FCO also does not define a competitive benchmark
  - Only the reactions of Shell, Aral, Jet, Esso, and Total are analysed; reactions of other competitors are not investigated
  - It is not clear how observed reaction times can be judged as indicative of coordination
  - What would be the conclusion if firms outside of that group react faster than, for example, Esso or Jet?

Source: Bundeskartellamt – Sektoruntersuchung Kraftstoffe, Abschlussbericht Mai 2011

Does the empirical evidence prove collective evidence of the five largest firms?

Alternative explanations for price increase patterns

- Eckert (2003) has shown that in theory larger firms have a stronger incentive to implement price increases, this has been confirmed empirically by other authors (e.g. Noel, 2007)
- Based on this result the identity of firms actually leading price increases is consistent with what we would expect from a theoretical perspective:
  - Visible -> firms that are more visible to others have a stronger incentive to lead price increases
  - Countrywide-> high transaction costs imply that price increases should be implemented centrally, not locally
  - Partial differentiation -> temporary price differences after increases are less costly for firms with some “loyal customers”
- There are also factors that may drive the timing of price increases, but do not imply coordination between firms
  - Atkinson (2008, p.11) for example emphasizes that price increases typically take place at times whene demand is low: „*[…] the first stations to raise their prices to their peaks always do so between noon and 2:00PM, which is when travel demand in Guelph is relatively low.*“

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Conclusion (cont.)

Insufficient support for the claim of collective dominance

- Standard Edgeworth Cycles are certainly not indicative of collective dominance
- Empirical evidence suggests Edgeworth Cycles have a favourable impact on consumer welfare
- "Degenerate price cycles" are problematic; however, rigorous analysis within the *Airtours* criteria is required to show price cycles are actually "degenerate"
- Irrespective of this, evidence on pricing patterns put forward by the FCO contradicts its claim of a collectively dominant position by the 5 largest firms

Thank you!

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