# ACE Conference:
# Overcharge Estimation in the Cement Industry

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ESMT Competition Analysis,
Berlin, November 26th 2009

Editorial note:
ESMT Competition Analysis
has been renamed to
E.CA Economics

# Agenda

- Introduction
- The cartel case
- Empirical assessment
- Conclusions

# Introduction

- Hendrik Röller (supported by ESMT CA staff) has been asked to support the court in measuring the overcharge estimation
- In a first meeting we proposed two different methodologies – cross section analysis vs. time series analysis
- From an empirical perspective both methods had its shortcomings – due to the high uncertainty of whether neighboring markets were equally affected by collusion or not time series approach was chosen by the court
- While there is relative high transparency of price, demand and cost data at national level for the German cement industry, regional factors are available to a limited extend only
- Court asked us to proceed with the publicly available information; due to the relatively low legal standard we considered this workable
  - Note: we have not been asked to judge the question of whether some overcharge was earned at all

# The cartel case

- In 2003 the German Competition Authority fined the biggest producers in the German cement market almost 660 Mio. Euro for illegal collusive behavior in terms of setting production quotas for the members of the cartel
- According to the court conduct covered a time period of at least ten years: from 1991 until 2001

  -> no unaffected before-period
- Cartel allegedly affected all German regions, but potentially to a different extent

  -> no unaffected region within Germany
- Cartel ended in a price war

# Challenges

- Procedural environment and data availability
  - Limited publicly available data for estimating the national cartel effect
  - Damages need to be estimated on a regional level (different regional concentration levels), whereas most data is only available on a national level
- How to take into account the price war period?
- Quantity effect to be taken into account?

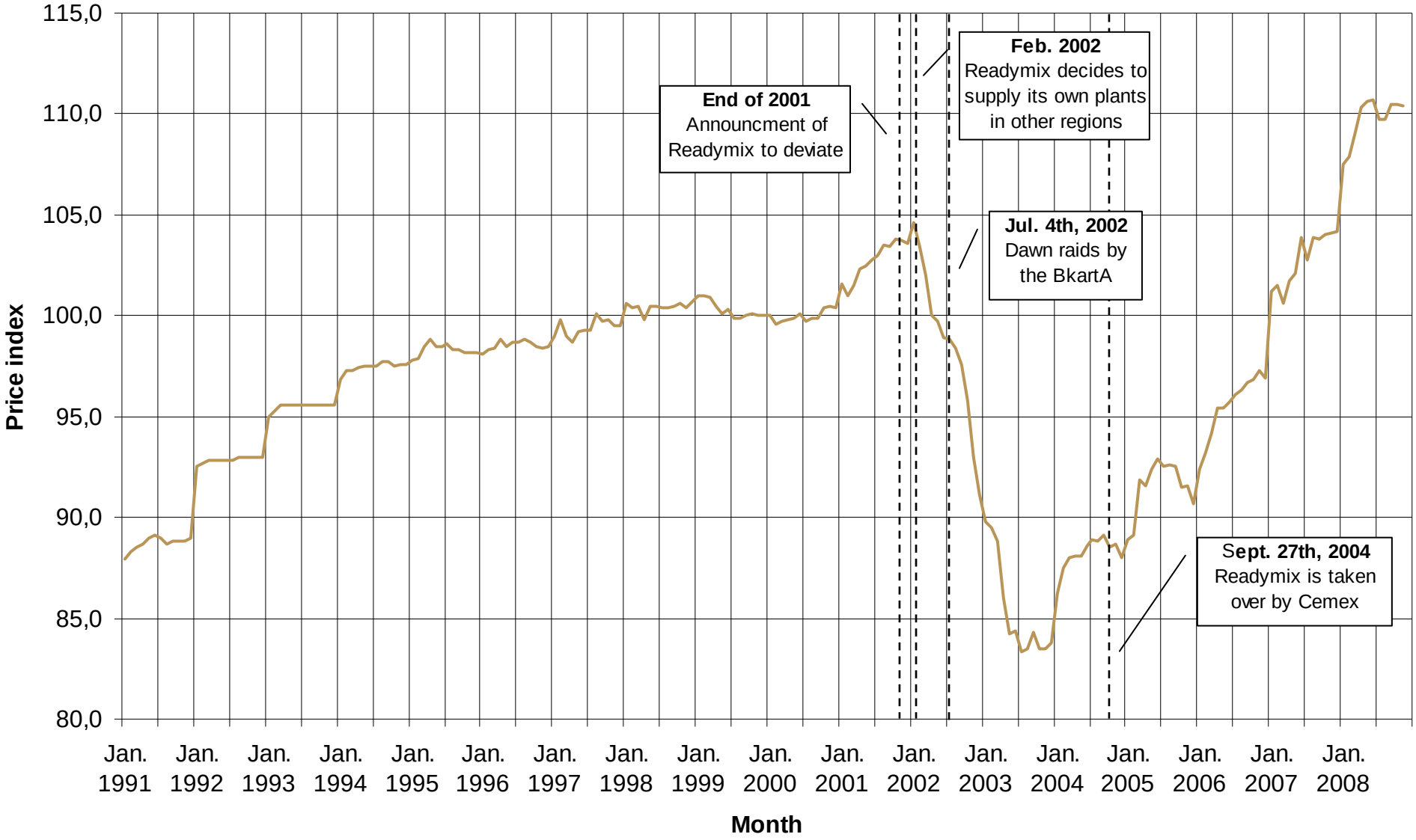
# Econometric approach

- We estimated a standard reduced form dummy model

$$P_t = \delta_0 + \delta_1 S_t + \delta_2 D_t + \delta_3 C_t$$

- In this equation P is the price per period, C represent cost shifters and the D represent demand shifters
- Assuming that all the coefficients except for the constant are similar in both the cartel and post (or pre) -cartel period, one can measure the level effect on prices resulting from the cartel (structural break S) simply by including a dummy-variable.
- In order to estimate such a model on needs:
  - Prices
  - Information on the period of the alleged conduct
  - Variables that control for shifts in demand
  - Variables that control for shifts in costs

# Evolution of German cement prices – price war or normal competition?



# The price war

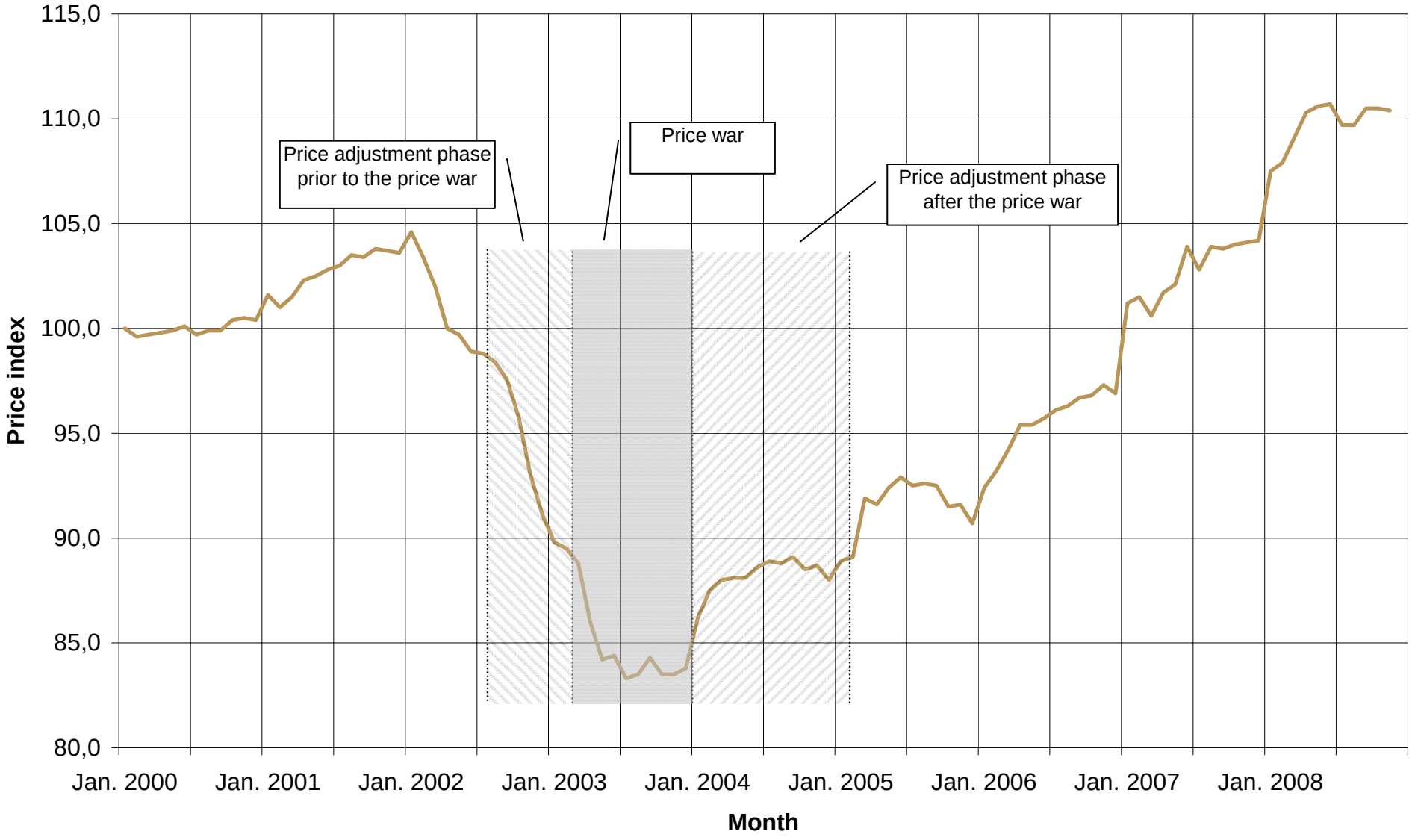
- Constituting element of a price war seen in particular in the **strategic interaction between firms over time**, i.e. short term losses to enforce long term gains
- There are three main reasons why the period after the cartel breakdown is defined as a price war
  - The price evolution shows a movement with a **temporary nature**
  - Various parties have indicated that as a punishment for leaving the cartel, the regions where Readymix was active were **flooded with cement at unprofitable prices**
  - The prices in the relevant period lie **below the long-term average costs** for producing cement
- In our view the right counterfactual to assess overcharges is the **long term, competitive equilibrium price** in the industry
- This disqualifies prices observed during the price war to measure counterfactual price

- But how long did the price war last?

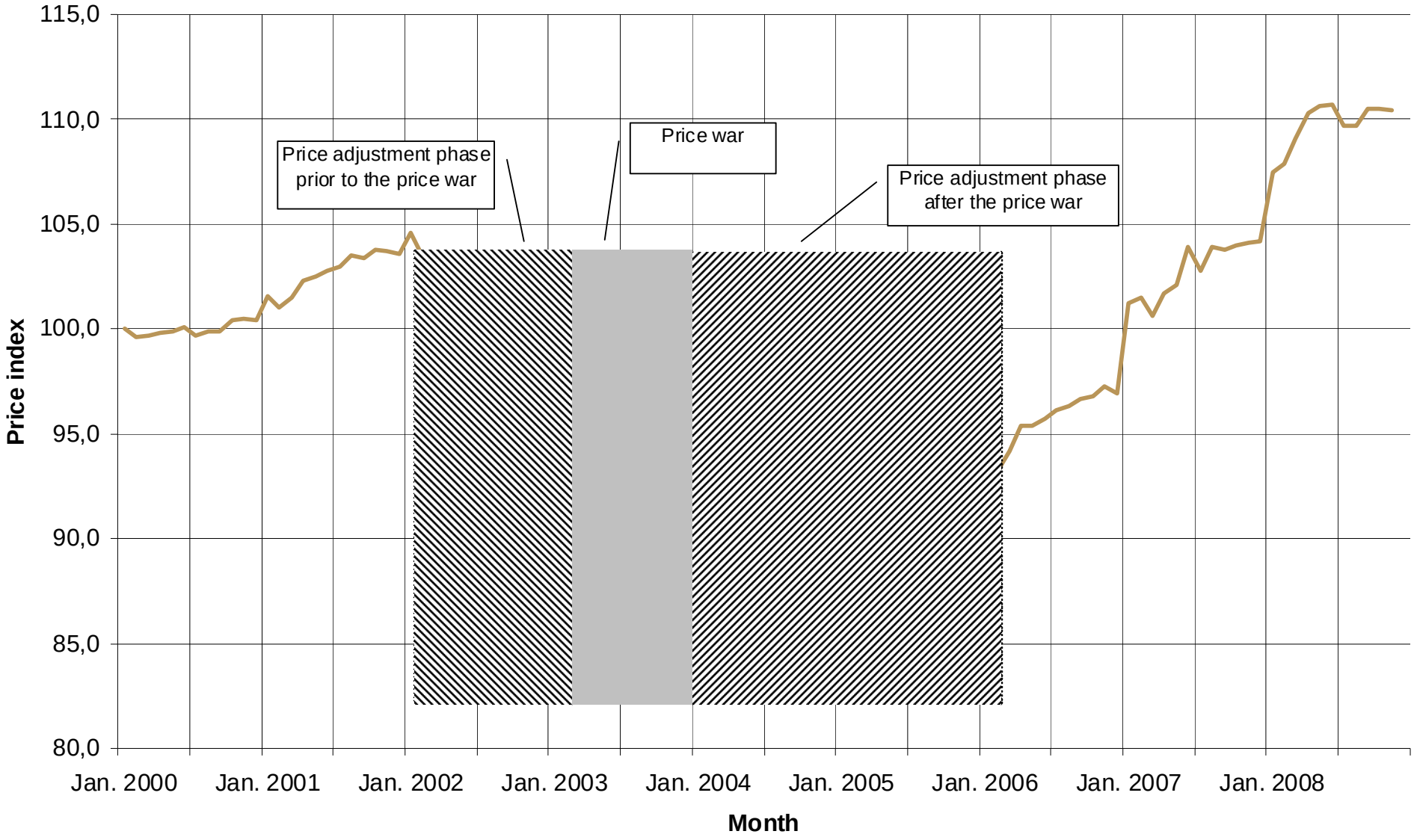
# The price war

- Given the limited number of observations, simple exclusion did not seem appropriate
- Hence, we controlled for the price war by modeling three separate periods (“bath tube approach”) :
  - A period where prices fall steeply
  - A period where prices remain temporarily stable at an unprofitable level
  - A period where prices recover, twice as long as the price fall period
- Length of periods determined by
  - Chronology of events
  - Monthly dummies over the period Feb 2002 to September 04
  - Assumption that the price recovery takes double the time than price decline

# Illustration of three periods in the price war



# Illustration of three periods in the price war – alternative specification



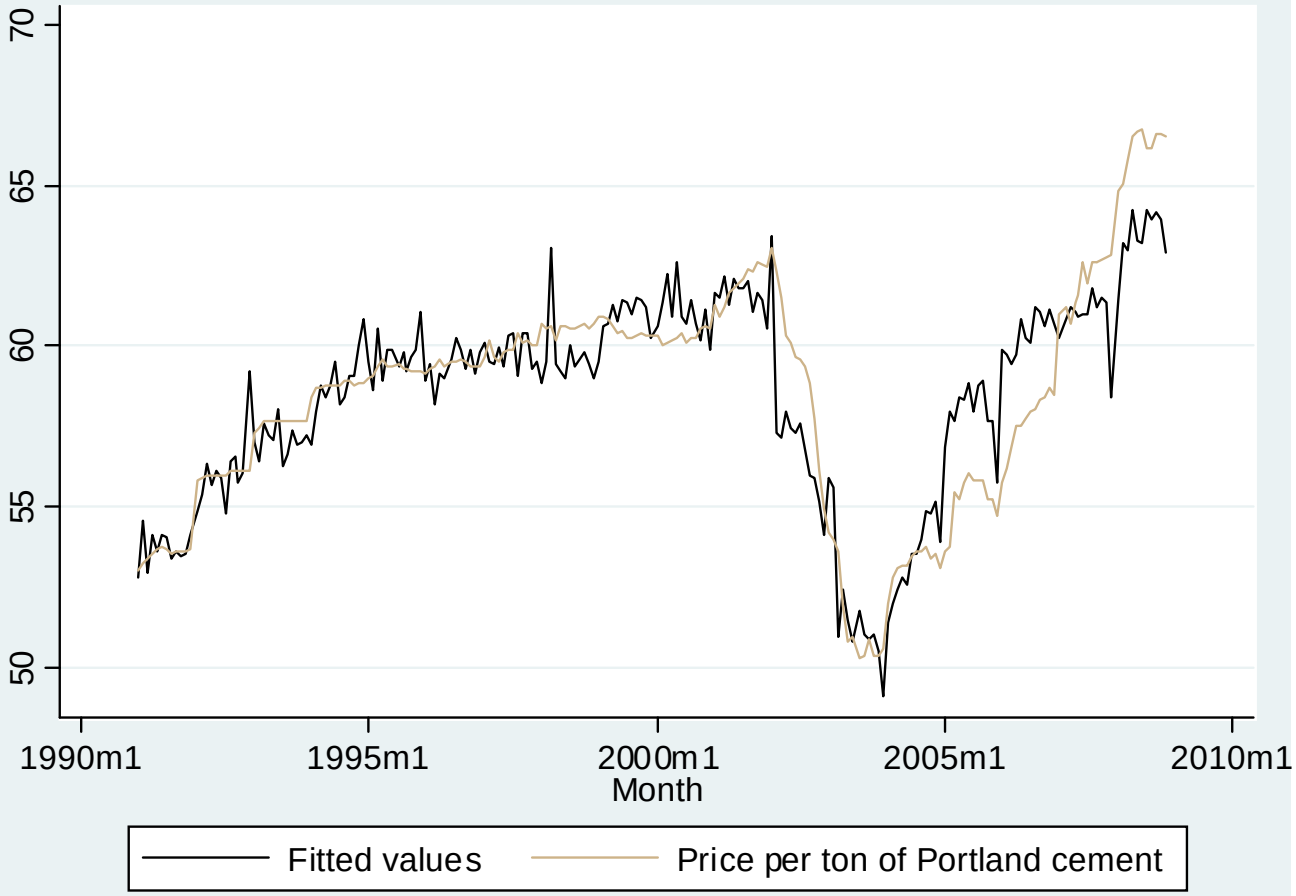
# Estimation results

| Variable | Est1 | Est2 | Est3 | Est4 |
|---|---|---|---|---|
| Constant | 39,804*** | 45,482*** | 42,887*** | 42,797*** |
| Cartel indicator for 1991-1997 | 13,628*** | 8,950*** | 5,037*** | 5,990*** |
| Cartel indicator for 1998-2002 | 9,887*** | 6,774*** | 4,319*** | 4,977*** |
| Timetrend | 0,103*** | 0,079*** | 0,070*** | 0,078*** |
| Indicator price adj. before price war | | -2,010 | -2,330** | -1,761 |
| Price war indicator | | -6,487*** | -6,888*** | -6,415*** |
| Indicator price adj. after price war | | -7,462*** | -7,809*** | -7,274*** |
| Construction turnover per capita | | | 7,928*** | 10,483*** |
| East-German effect | | | | -13,266*** |
| N | 215 | 215 | 215 | 215 |
| r2 | 0,546 | 0,715 | 0,778 | 0,786 |

| Variable | Est4 | Est5 | Est6 | Est7 | Est8 |
|---|---|---|---|---|---|
| Constant | 42,797*** | 41,642*** | 41,038*** | 35,596*** | 29,880*** |
| Cartel indicator for 1991-1997 | 5,990*** | 6,252*** | 6,250*** | 5,886*** | 5,810*** |
| Cartel indicator for 1998-2002 | 4,977*** | 4,898*** | 4,888*** | 4,542*** | 5,065*** |
| Timetrend | 0,078*** | 0,075*** | 0,073*** | 0,078*** | 0,076*** |
| Indicator price adj. before price war | -1,761 | -1,686 | -1,726 | -3,451*** | -2,881** |
| Price war indicator | -6,415*** | -6,608*** | -6,629*** | -6,803*** | -6,535*** |
| Indicator price adj. after price war | -7,274*** | -7,180*** | -7,208*** | -7,182*** | -6,805*** |
| Construction turnover per capita | 10,483*** | 12,290*** | 12,259*** | 15,243*** | 14,587*** |
| East-German effect | -13,266*** | -11,235** | -10,988** | -18,630*** | -13,070** |
| Easteuropean cement imports per capita | | -332,228** | -334,469** | -372,888** | -432,377*** |
| Wage costs per employee | | | 0,257 | 0,098 | 0,249 |
| Nr. or employees per ton | | | | 0,957*** | 1,025*** |
| Price index electricity | | | | | 0,034** |
| N | 215 | 215 | 215 | 215 | 215 |
| r2 | 0,786 | 0,790 | 0,791 | 0,801 | 0,805 |

legend: * p<.1; ** p<.05; *** p<.01

# Real prices vs. predicted prices




Reasonable fit in particular during the cartel period

# Estimation to assess the effect of market structure

| Variable | Est8 | Est9 | Est9_IV |
|---|---|---|---|
| Constant | 29,880*** | 40,540*** | -4,022 |
| Cartel indicator for 1991-1997 | 5,810*** | 5,675*** | 6,241*** |
| Cartel indicator for 1998-2002 | 5,065*** | 5,327*** | 4,231*** |
| Timetrend | 0,076*** | 0,084*** | 0,049*** |
| Indicator price adj. before price war | -2,881** | -2,938** | -2,699* |
| Price war indicator | -6,535*** | -6,532*** | -6,544*** |
| Indicator price adj. after price war | -6,805*** | -6,740*** | -7,009*** |
| Construction turnover per capita | 14,587*** | 13,499*** | 18,047*** |
| East-German effect | -13,070** | -10,807* | -20,265*** |
| Easteuropean cement imports per capita | -432,377*** | -438,084*** | -414,227** |
| Wage costs per employee | 0,249 | 0,235 | 0,294 |
| Nr. or employees per ton | 1,025*** | 0,916*** | 1,373*** |
| Price index electricity | 0,034** | 0,027 | 0,058*** |
| HHI 250km around urban centre | | -0,003** | 0,011** |
| N | 215 | 215 | 215 |
| r2 | 0,805 | 0,809 | 0,739 |

legend: * p<.1; ** p<.05; *** p<.01

- As market structure (HHI) is an endogenous parameter one needs to use IV estimation
- In estimation Est9 one can observe the negative correlation, which is likely caused by the effect of low prices on consolidation in the industry
- Using an IV approach with the regional building activities as instruments for concentration in the cement industry, a positive coefficient is estimated (Est9_IV): a more concentrated industry (higher HHI) leads to higher prices
- The coefficient is implausibly high, however and therefore a lower „correction“ is made to the regional but for prices based on their HHI score

# Estimation results - conclusions

- Cartel dummy stays relative stable around 5€ per ton
- Alternative specification of longer price war results in slightly lower estimates (around 4,50€ per ton)
- Alternative specification with lagged dependent variable results in slightly higher estimates

We considered EST8 a plausible base for estimating the average national price effect of the cartel

# Regionalization and calculation of damages

- As the relevant markets are defined to be regional, damages should also be calculated on a regional level
- Using the coefficients obtained from the richest model (Est8), yearly regional but-for-prices were simulated using
  - Regional number of employees per ton of cement produced
  - Regional cost per employee
  - Regional turnover in the building industry per head
  - Imports from Eastern Europe where divided between east and south Germany based on historical regional import statistics
  - Regional dummy for East German regions
  - For the other variables the national levels were used
  - A correction to the but-for-price was made based on the deviation of the regional HHI from the national HHI
- The difference was calculated between a plant‘s actual yearly price and the but-for-price for the relevant region

# The quantity effect

- The higher prices that result from an effective cartel, normally result in lower sales for the cartel members when compared to a competitive situation
- One can calculate this easily by multiplying the product of the price effect and the volume with (1+ ε)

$$\Delta TR = \Delta P * Q + \varepsilon * \Delta P * Q = (1 + \varepsilon) * \Delta P * Q$$

- In order to perform such a correction, one needs to have an estimate for the price elasticity in the relevant industry
- As there was not sufficient time to perform a proper price elasticity estimation, a literature study was done to determine a valid approximation for the German Cement markets: -0.4 to -0.6
- The upper bound was taken due to the fact that an effective cartel operates in the elastic part of the demand

# Conclusion

-> Working with publicly available data allowed an assessment in relatively short time

<- But it also led to significant reductions in the fines due to „security discounts“

- There are conceptional questions of whether periods of price war shall be taken into account (“normal part of a competitive equilibrium”)
- The quantity effect seems a reasonable element – but opens the door to a detailed assessment of demand elasticity

# Thank you!

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