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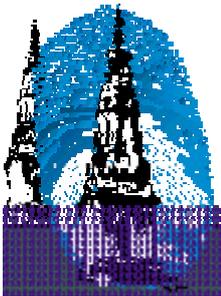
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MEANINGFUL AND MEASURABLE MARKET DOMINATION

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Meaningful and Measurable Market Domination

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ABSTRACT: *The European Court of Justice's definition of when a firm has a dominant position has recently come under attack as being meaningless and impossible to measure. We argue that both attacks are wrong, suggest an economic interpretation of domination and propose how it may be measured using modern time series econometrics. We illustrate the approach empirically.*

Introduction

The European Court of Justice introduced a definition of what it means to have a dominant position already in the Banana Case[1]: "The dominant position thus referred to (by Article [82]) relates to a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording it power *to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers.*" (our emphases). This mantra has been invoked a great many times by the Courts and by competition practitioners since then. However, an economic interpretation and a direct test of this definition have been lacking.

In fact, recently, this definition has come under attack as being meaningless and unmeasurable, see Pearce Azvedo and Walker (2002)[2]. They argue that the definition is meaningless because no firm – not even the textbook monopoly – would set price independently of its customers or consumers: the downward sloping demand curve would discipline its pricing since increasing price causes a loss of revenue after a certain point. In addition they argue that the definition is not operational since a test of indepence of competitors' pricing is not possible.

We beg to disagree! Below we argue that the definition can be given an economically sensible interpretation and we show that it is possible to directly test it by analysing the position of the sole Danish producer of cement. We find that it possessed a dominant position between 1980 and 1998. This analysis builds on our previous work.[3]

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[1] Case 27/76 *United Brands Co. and United Brands Continental BV v European Commission* [1978] 1. C.M.L.R. 429.
[2] João Pearce Azevedo and Mike Walker: "Dominance: Meaning and Measurement," *European Competition Law Review* 23(7): 363-367.
[3] Lisbeth la Cour and Peter Møllgaard "Market Domination: Tests applied to the Danish cement industry," *European Journal of Law and Economics* 14(2): 99-127.

Meaningful economic interpretation of dominance

Traditionally dominance has been approximated by large market share. As a rule of thumb, a firm with a market share of more than forty per cent would be thought to have a dominant position. This approach, however, is grossly out of line with economic theory: Bertrand competition between two identical firms would (often) lead to market shares of fifty per cent to each firm, yet they would have no market power at all. In addition, such an approximation is complicated by the fact that markets have to be defined before market shares can be calculated. Thus this definition is certainly meaningless and hard to measure.

The European Court of Justice on the other hand provided a definition that can be given an economic interpretation. We first note that the ECJ's requirement is not absolute: The firm should behave independently to *an appreciable extent.* We take that to mean that its decisions should be fairly insensitive (or inelastic) to actions and reactions of competitors, customers and, ultimately, consumers. The firm at hand is able to behave independently of its competitors if their prices do not react a lot to its price changes, that is rivals' prices are relatively insensitive to its price. In economics, sensitivity is typically measured by an elasticity. Define the elasticity of the rivals' prices (P) with respect to the firm's own price (p) by *?*:

$$r \equiv \frac{dP/P}{dp/p}$$

The *rivals' price elasticity* measures the percentage change in rivals' prices that follow from a one per cent change in the allegedly dominant firm's price. If the rivals' price elasticity is low, the firm may set its *price* relatively independently of its competitors.

We have here assumed that all rivals react in the same way so that their elasticity is the same. This is only for the sake of simplicity and to save notation. The method extends trivially to situations where different rivals have different responses.

It may of course be that rivals keep their price constant when the allegedly dominant firm raises its price because their sales volume increases as a result of their competitor's price increase. For this reason it is not enough to look at the rival's *price* elasticity, we must also look at the *rivals' quantity elasticity*, *μ*:

$$m \equiv \frac{dQ/Q}{dp/p}$$

Q is the rivals' combined quantity. The rivals' quantity elasticity shows the percentage change in rivals' quantity that follows from a one per cent change in the firm's price. A low value of *μ* indicates that its rival's quantity response is limited and so signals independence of competitors.

The next step is to determine whether the firm has power to behave – to an appreciable extent – independently of customers and ultimately of consumers. Our economic interpretation of this is that customers are relatively insensitive to price changes. In other words, the demand facing the allegedly dominant firm is inelastic. Let q be its quantity sold. Then its *own-price elasticity*, *e*, is:

$$e \equiv \frac{dq/q}{dp/p}$$

The own-price elasticity shows the percentage change in the firm's sales volume following a change in its own price of one per cent. A low own-price elasticity (close to zero) indicates independence of customers and ultimately of consumers since customers' demand is derived from consumers' demand. Since the demand is down-ward sloping, the own-price elasticity is negative. A very high negative value of *e* is a sign that the demand curve disciplines the firm strongly: customers rush away if the price is increased.

Our interpretation of the ECJ's definition of a dominant position is thus that all three elasticities are close to zero. If that is the case the firm may

1. change its price without a price response from its competitors;
2. change its price without a quantity response from its competitors; and
3. change its price without a quantity response from its customers (and consumers).

We would thus argue that it is able to behave to an appreciable extent independently of its competitors, of its customers and ultimately of its customers.

Further economic meaning of dominance

In addition to the immediate interpretation of the three elasticities it turns out that they are connected in a simple way with the competitors' market shares. This relationship thus provides further economic meaning to the ECJ's definition. Let *s* be rivals' market share measured in volumes and *S* the market share in values:

$$s \equiv \frac{Q}{Q+q} \qquad and \qquad \Sigma \equiv \frac{QP}{QP+qp}.$$

The elasticities of the rivals' market shares with respect to own-price changes by the allegedly dominant firm measure how quickly the firm will lose market shares if it raises its price. We can show[4] that *the elasticity of rivals' market share of volumes* can be calculated simply as

$$\frac{ds/s}{dp/p} = (1-s)(m-e)$$

A one per cent increase in the price of the firm will thus cause competitors' market share to increase rapidly – and hence the firm's market share to decrease rapidly,

1. the larger is the market share of the allegedly dominant firm (1-*s*);
2. the larger is the rivals' quantity elasticity (μ); and
3. the more elastic is the firm's own price elasticity of demand (e).

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[4] For proofs of the following propositions see Appendix A of la Cour and Møllgaard, op.cit.

On the other hand, if competitors and customers reactions are limited so μ and e are close to zero then the *elasticity of rivals' market share in volumes* will also be close to zero (but positive).

The *elasticity of rivals' market shares of values* may be calculated in similar fashion and just includes the *rivals' price elasticity, ?*:

$$\frac{d\Sigma/\Sigma}{dp/p} = (1-\Sigma)(\boldsymbol{r} - 1 + \boldsymbol{m} - \boldsymbol{e})$$

The interpretation is as before as regards the rivals' quantity elasticity and the firm's own-price elasticity. In addition, we now see that if rivals' price elasticity is high, that tends to make the firm lose market shares rapidly following a one-percent increase of price. On the other hand, if *?* is smaller than one then the elasticity of market share measured in values is lower than the elasticity of market shares measured in volumes since the percentage increase in the firm's own price exceeds that of it rivals. Further note that it is entirely possible that the elasticity of market shares measured in values is negative. This would be the case if *?*, μ, and *e* are all close to zero.

Direct measurement of dominance à la ECJ

To measure dominance in the sense of the European Court of Justice directly, we thus just need to estimate three elasticities:

1. the rivals' price elasticity, *?*;
2. the rivals' quantity elasticity, μ; and
3. the firm's own price elasticity of demand, *e*.

Estimation requires that we get the following time series data:

- *p*: allegedly dominant firm's price
- *q*: allegedly dominant firm's quantity
- *P*: rivals' price(s)
- *Q*: rivals' quantity
- Other variables necessary for regressions to be well specified.

For illustrative purposes alone we have carried out an analysis of the market position on the Danish market of the only Danish producer of cement, Aalborg Portland (AP in the following). The last twenty years AP's share of Danish demand for cement has been roughly constant at 85 per cent. So if the Danish market is taken to be the relevant market, it would normally be assumed to hold a dominant position. However imports account for 15 per cent of demand and AP exports 30 of production, so it is not at given thing that Denmark is the relevant geographic market.

Through official manufacturing and trade statistics we collected quarterly data on the value and volume of Danish production (by AP), imports and exports from 1980 to 1998. We calculated domestic sales and sales volume by AP by subtracting exports from production. This may give rise to a small measurement error since cement is storable which means that all cement that is produced in a quarter is not necessarily sold in that quarter. An antitrust authority would have access to much more reliable data directly from the company. We found AP's price and its rivals' price by dividing

value by volume for domestic sales and imports respectively. These *unit values* are only approximations to the prices charged in the market, but are the best we could get. Again antitrust authorities could collect more precise data.

The elasticities are estimated in three regressions. Each of these may be seen as further refinements of regressions as suggested by the Office of Fair Trading:[5] the rivals' price elasticity is estimated using dynamic price regressions and co-integration analysis,[6] the rivals' quantity elasticity is estimated using an import penetration test,[7] and the own-price elasticity is estimated using residual demand analysis.[8]

Using our dataset and modern time series econometrics,[9] we first estimated the *rivals' price elasticity*, *?*, by searching for long-run and short-run relationships between AP's price and import prices. The two price series turned out not to be stationary[10] and not to co-integrate and we thus found no long-run relationship between the two. We did not find any short-run correlation between prices. A visual inspection of the graph below supports these findings. We thus conclude that for the Danish market for cement between 1980 and 1998, rivals' price elasticity was 0.

Prices in the Danish Cement Market

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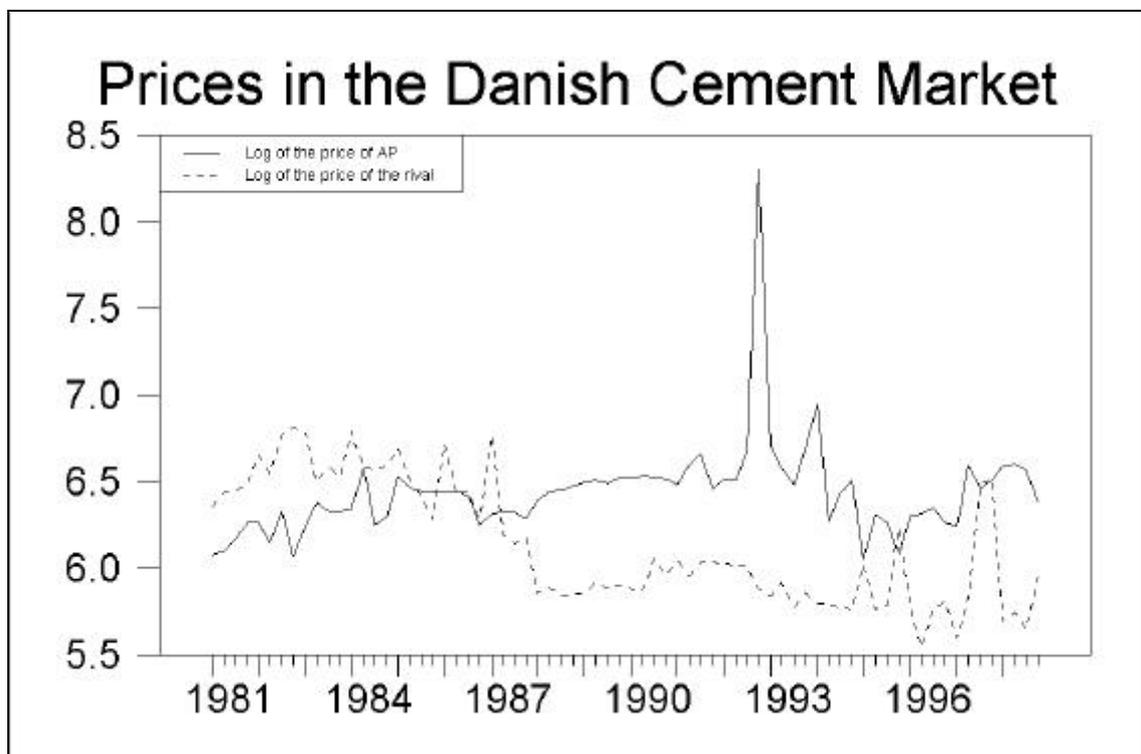
[5] Office of Fair Trading (1999) "Quantitative techniques in competition analysis," *Research Paper* 17 (prepared by LECG Ltd).

[6] OFT, *op.cit*. at p. 63.

[7] OFT, *op.cit*. at p. 81.

[8] OFT, *op.cit*. at p. 69.

[9] For the details of the analysis, see section 3 of la Cour and Møllgaard (op.cit).

[10] See Hugh Wills (2002) "Market Definition: How Stationarity Tests Can Improve Accuracy," *European Competition Law Review* 23(1): 4-6. Our approach is more flexible since we do not restrict our analysis to relative prices but look at the co-integrating relationship between the prices. Wills is more restrictive since he imposes a strong restriction on the data by only looking at relative prices.

We then estimated *rivals' quantity elasticity*, μ, using similar techniques. To estimate elasticities we transformed all variables by taking logarithms (log). In addition, to correctly specify the model we had to control for variations in the demand for cement by including building activity (measured by construction employment, L). The estimated regression is

$$\log Q = 0.60 \log p - 1.60 \log P + 0.54 \log L + 0.02 trend$$

The most important finding is that the rivals' quantity elasticity is estimated at $\mu = 0.60$. This means that competitors' response to price changes is relatively limited. In addition, the demand facing importers is elastic (elasticy –1.60) and is increasing in building activity as one should expect. Also observe that there is a small upward trend in imports.

Finally we estimate AP's *own-price elasticity*, *e*. The estimated regression is:

$$\log q = -0.27 \log p + 0.33 \log P + 2.79 \log L + 0.01 trend$$

Again we are most interested in the estimate of $e = -0.27$, although it is reassuring that the regression may be interpreted as a demand curve facing AP: its sales volume increases with increases of the rivals' price, with construction activity and with time.

We are now able to conclude that AP holds a dominant position on the Danish market:

1. Rivals' price elasticity is zero: $? = 0$;
2. Rivals' quantity elasticity is low: $\mu = 0.60$
3. AP's demand is inelastic: $e = -0.27$.

AP's average market shares in volumes and values are $s = 0.84$ and $S = 0.89$, respectively. Using these numbers, our method allows us to calculate the elasticities of rivals market shares with respect to AP's price. In volumes this is

$$\frac{ds/s}{dp/p} = 0.84(0.60 + 0.27) = 0.731$$

while in values it becomes

$$\frac{d\Sigma/\Sigma}{dp/p} = 0.89(0 - 1 + 0.60 + 0.27) = -0.116$$

Thus the market shares' elasticities are low and have opposite signs: Market shares are insensitive to changes of the price, reinforcing the conclusion that AP held a dominant position between 1980 and 1998.

Conclusion

The European Court of Justice's definition of a dominant position makes economic sense and is measurable. We find that estimating three elasticities is enough to provide two simple statitics measuring market dominance: rivals' price elasticity, rivals' quantity elasticity and the allegedly

dominant firm's own-price elasticity. In combination these three numbers indicate how sensitive market shares are to price changes of the allegedly dominant firm. We find that this definition is attractive since it avoids mixing *abuse* of dominance with *existence* of dominance as other definitions easily do.