

Agenda

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Flat screens, raised prices: pursuing the global LCD cartel

The investigations into a cartel in liquid crystal displays have grown significantly since the start of the first investigation in 2006. They have so far led to fines of millions of dollars across jurisdictions, criminal convictions of top executives, private damages actions and representative class actions. From an economics perspective, the case involves equally diverse issues, and highlights the need for careful consideration of sophisticated economic approaches when assessing the magnitude of damages

A cartel involving most large suppliers of liquid crystal displays (LCD) was brought to the fore in 2006 when authorities across jurisdictions began to investigate possible price-fixing activity in the supply of thin-film transistor LCDs (TFT-LCDs). These LCDs are used to display images on computer monitors, laptops, televisions, mobile phones and other electronic devices. The scale and breadth of the case have since grown:

- multiple investigations have been undertaken across the world—in the USA, Europe, Brazil, China, Japan and South Korea;
- several large global players, including AUO Optronics, Epson, Hitachi, LG Philips, Samsung and Sharp, have pleaded or been found guilty;
- the US Department of Justice (DoJ) and the European Commission alone have imposed fines in excess of \$2 billion;
- there have been several criminal convictions of senior executives.

In addition, the cartel members have faced claims for damages from direct purchasers including Dell, Motorola, Nokia and others, and from indirect purchasers including AT&T, US electronics retailer Best Buy, and others.¹

Although the investigations and related lawsuits are not yet all closed, the developments so far have highlighted some interesting issues, both legal and economic.

Background to the investigation

The LCD cartel involved most of the large manufacturers and accounted for the vast majority of the global market for LCDs. While some uncertainty surrounds the exact dates of its operation, the US DoJ, the European Commission and other authorities found that the cartel was active from at least 1999 to 2006. According to the authorities, the cartel members participated in regular, almost monthly, multilateral meetings—known in the industry as ‘Crystal Meetings’—in order to agree on prices and other decisions, and to monitor and enforce the agreements among the members. The evidence also highlights bilateral communications through face-to-face meetings, direct emails, and, on some occasions, indirect information exchange through a third cartel member. The discussions spanned a wide range of parameters, covering past prices, future price strategies, production plans, and capacity utilisation, and a wide variety of LCDs including those used in televisions, computers and mobile phones.²

The operation of the cartel was weakened from 2006 when Samsung notified the US DoJ about it under the DoJ’s leniency programme. Since then, the cartel has faced significant fines across jurisdictions, along with criminal indictments of many senior executives involving prison sentences and criminal fines. The cartel members have paid more than \$1.3 billion in criminal fines in the USA, with one individual fine as high as \$400m (paid by LG Philips)—one of the largest fines ever imposed by the DoJ.³ In 2010, the Commission imposed a total fine of nearly €650m, with a largest individual fine of €300m (paid by Chimei InnoLux Corporation).⁴ The cartel members continue to face additional fines in other jurisdictions.⁵

The scale of the penalties, and in particular the use of criminal convictions, highlights the increasing role of a multi-pronged approach to enforcement across jurisdictions. This case also highlights the effectiveness of the leniency programme in uncovering and prosecuting cartels. (The LCD investigation was accompanied or shortly followed by similar investigations into price-fixing by the same group of companies in relation to the supply of cathode ray tubes and dynamic random access memory.)

Damages claims

In addition, the case highlights the increasing importance of private actions in enforcement regimes across the globe. The LCD cartel faced numerous private actions from direct and indirect purchasers, as well as class actions by direct customers of the cartel and by end-consumers who purchased televisions, monitors and notebooks (most of the claims were brought in the US courts). Many of these claimants have settled since, with the defendants paying significant settlement amounts. Figure 1 presents the timeline of the damages actions and subsequent settlements.

The scale of the damages actions is also evident from the number of experts who acted for the various parties:

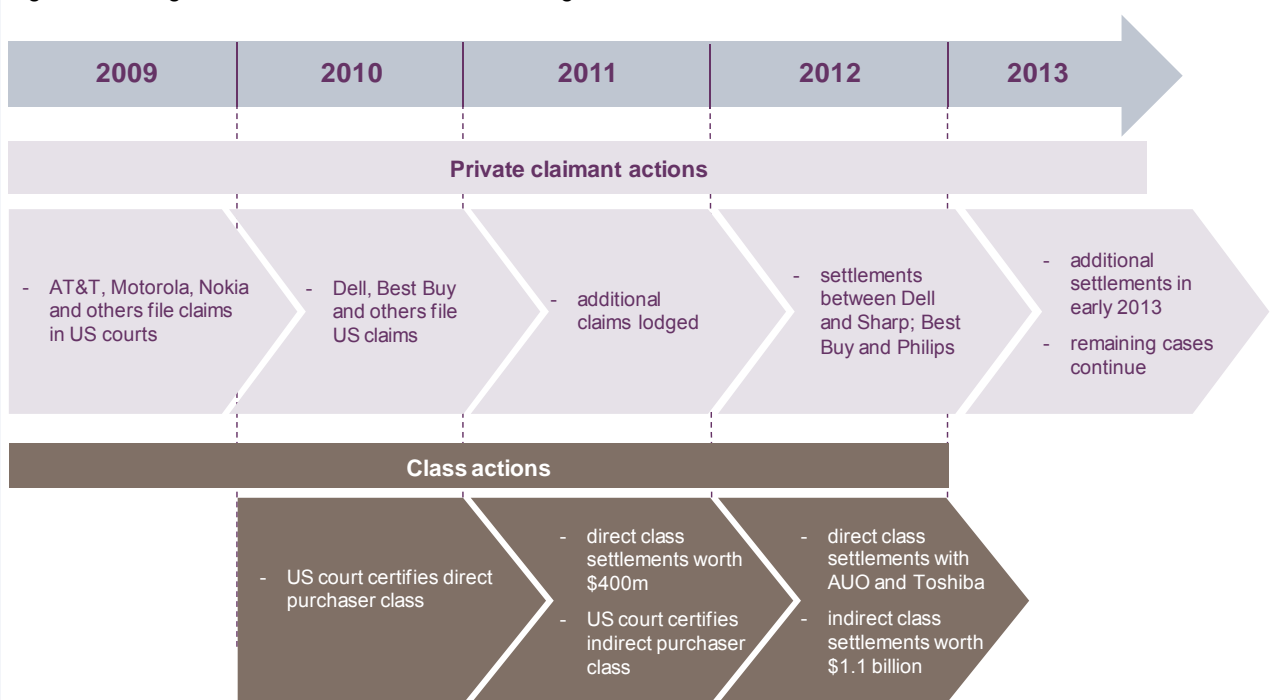
- more than 12 economic experts were retained by defendants and claimants to give their expert opinion on the economics of the LCD cartel and the damages suffered (or not) by the claimants due to the cartel;
- numerous other experts were called on to provide their opinion on technical aspects of the LCD industry that affect the costs of production and thereby prices;
- more than 40 expert reports were exchanged between parties;
- numerous expert depositions⁶ took place in order to stress-test the opinions and evidence of all the experts.

Was the cartel successful in raising prices?

As with any cartel damages claim, an important aspect of the assessment of the LCD claims was to determine the cartel overcharge—the amount by which the cartel raised the prices of LCDs.⁷ However, this assessment is far from straightforward in the LCD industry, for the following reasons.

Unlike markets such as those for commodities where cartelisation is likely to be easier, the particular features of the LCD industry meant that it was not an obvious candidate for effective cartelisation. The

Figure 1 Damages claims and settlements following the LCD cartel



Source: Oxera, based on publicly available information.

industry was characterised by many differentiated products; the differentiation parameters included end-application (eg, whether it concerned televisions or computers), size, resolution and other technical aspects. Furthermore, different suppliers were active in supplying different sets of products at different points of time. Such diversity of products and suppliers might, at least on the face of it, make effective price coordination challenging.

The LCD industry is characterised by technological progress through repeated innovation and learning-by-doing. In particular, technological advances in the manufacturing process typically imply less waste and faster production, leading to lower costs and prices. The cost of production within the lifecycle of a specific product also falls owing to economies of scale in production. The general trend of these supply-side factors, in the absence of a cartel, is to push LCD prices down over time. This, in turn, creates challenges in delineating the reduction in price that is due to the cartel breakdown from that which occurred due to the nature of the industry.

The demand for LCDs, and therefore their price, is driven by the demand conditions in the downstream markets for LCD applications. Indeed, the demand for LCD products, and consequently for TFT-LCDs, saw significant growth during the cartel period, with the demand for LCDs for use in notebooks and mobile phones increasing significantly from around 2002, and demand for computer monitors and televisions growing from around 2004. This growth in demand was due to increased demand both for existing products (eg, through a rise in mobile subscriptions) and for new products. In addition to the usual upward pressure on price resulting from increased demand for a product, the shift in demand to new products affected the price of the old products—the price tends to be high in a product's early life and then, as new waves of technology appear, it declines to ensure that the product continues to be attractive to consumers.

Ideally, an analysis of the cartel overcharge in this industry needs to isolate the effect of the cartel from the effect of other factors, such as those described above, provided that such data is available.

Methods used by the experts

The economic experts used a wide variety of methods to assess the effect of the cartel, including qualitative and quantitative analysis of the documentary evidence of cartel communications; assessment of the cartel's incentives to increase prices and its ability to do so; simple analyses of industry trends; profitability analysis using the defendants' data; and time-series and panel data econometrics using the claimants' data.

While these methods were not always used in a mutually exclusive way, the focus and the importance attached to each method differed between experts. For example, some experts focused on a qualitative analysis of industry features, while others analysed industry trends and average prices and margins. Some experts also used sophisticated econometric models to estimate the cartel overcharge. Where econometric models were used, the precise specification varied, as did the overcharge estimate.⁸ This variation in overcharge estimates underscores the need for careful consideration of the analytical method used to quantify the overcharge.

Static versus dynamic models of prices

The quantitative methods used in this case ranged from a simple analysis of price trends and profitability analysis to econometric methods that modelled the price evolution and its relationship with other influencing factors. For example, some experts conducted a simple analysis of the trend in prices during and after the cartel to argue that the cartel had minimal impact, on the basis that LCD prices did not demonstrate a sharp drop when the cartel is understood to have ended in 2006.

However, in any event, LCD prices typically demonstrate a downward trend during the lifecycle of a product, and prices are affected by a variety of factors. For example, the price of a particular LCD product in one period depends on demand and supply conditions of the product in that period, as well as prices in previous periods (for example, due to evolution of costs and economies of scale within the lifecycle of a product). As noted by the expert acting for the US DoJ in relation to its case against AUO, a simple analysis of price trends does not account for these other factors that influence LCD prices.⁹

An econometric analysis, on the other hand, can control for other influencing factors. In undertaking such an analysis, it is important to carefully consider the choice of specific model. For example, one can use static econometric models such as cross-sectional regressions, which account for the relationship between prices and other factors such as costs, demand and the presence or absence of the cartel, but do not account for any intertemporal dynamics. For example, such a model was used by the US DoJ in its case against AUO in order to estimate the cartel overcharge while controlling for other factors such as cost of production, prices of alternatives such as plasma panels, and demand for televisions.¹⁰

In the case of LCDs, however, such static models may not be appropriate to adequately isolate the effect of

the cartel in this industry. This is because static models fail to capture the inherently dynamic nature of the supply and demand conditions in the LCD market and the fact that the price in one period was likely to have a strong influence on the prices in the following periods because of the way prices were determined. In such situations, it is necessary to ascertain the nature of price formation and incorporate this dynamic into the analysis. This can be done, for example, by using dynamic econometric models, which can take into account the effect of other factors such as contemporaneous demand as well as the effect of past prices. Indeed, the importance of controlling for dynamic effects in this case was recognised by a number of experts, on both the claimant and the defendant sides.

Forecast approach versus dummy variable approach

The economic debates surrounding this case also illustrate the trade-offs between the two basic econometric methods for estimating overcharges: the forecast approach and the dummy variable approach.

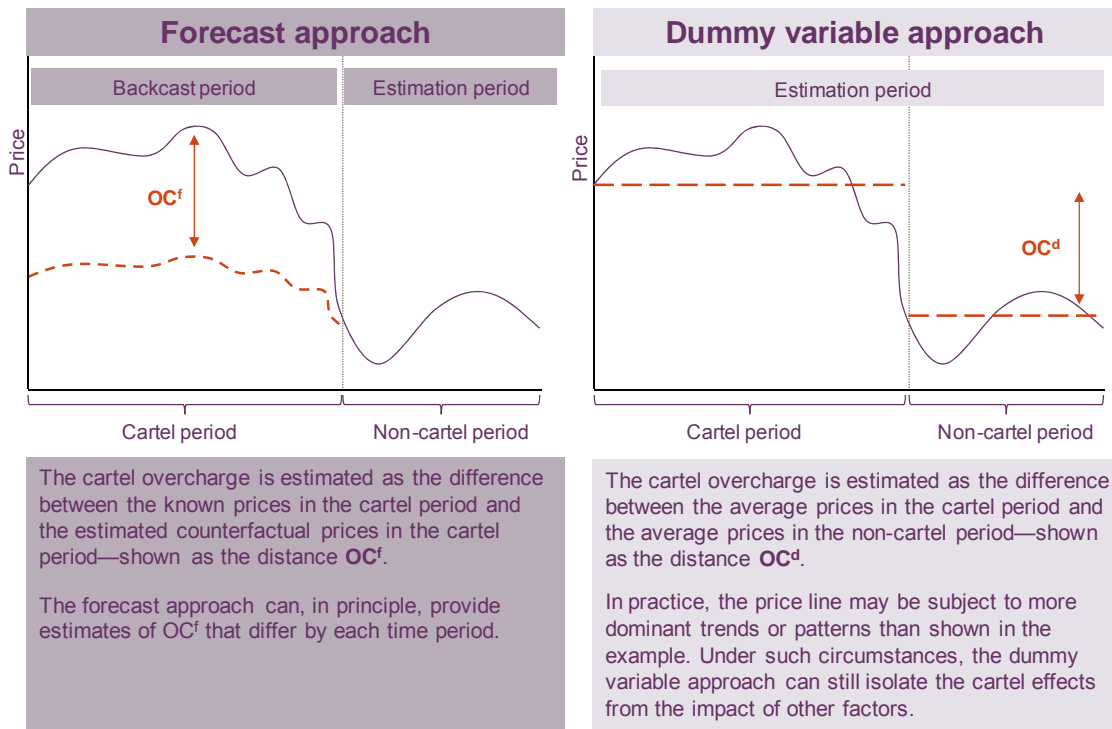
The forecast approach uses data from the non-cartel period to estimate the relationship between prices and other factors, which is then used to forecast (or backcast) the prices that would have prevailed during the cartel period but for the cartel

(the 'counterfactual' prices). The difference between actual cartel prices and the counterfactual prices in each period yields the cartel overcharge for that period. The dummy variable approach, on the other hand, uses data from both the non-cartel and cartel periods to estimate the relationship between price and factors that affect price, including a variable that indicates the presence or absence of the cartel (the 'cartel dummy'). Figure 2 below illustrates each approach.

In the LCD case, different economic experts adopted different approaches. While the two approaches broadly coincide in theory, there are a number of reasons why one method may be more suitable than the other, given the specific circumstances.

For example, the dummy variable approach may be preferable to the forecast approach when there is a possibility that the economic relationships being modelled have undergone significant changes across the non-cartel and cartel periods. This is because the dummy variable model uses data from both the cartel and the non-cartel periods and therefore allows one to conduct statistical tests of whether the underlying relationship has changed. Additionally, if the assumption of a stable relationship passes the test, the dummy variable model is likely to yield more precise estimates as it uses more data from both periods relative to the forecast approach. This is particularly the case when the non-cartel period—on which the

Figure 2 Forecast approach and dummy variable approach to determining the cartel overcharge



Source: Oxera.

forecast model is based—is not long enough. This is because, if the non-cartel data is not sufficient or is of poor quality, the relationship between price and economic factors estimated by the forecast model, and thereby the predictions of the counterfactual price and overcharge, may not be reliable.

An appropriate and robust forecast model, on the other hand, is useful in providing separate overcharge estimates for each period within the cartel period. While estimating possible variations in overcharge within the cartel period is possible with a dummy variable approach, this may pose technical problems with the estimation. The forecast model may also be a suitable choice if there is strong evidence that other factors (such as actual costs of production during the cartel) have been affected by the cartel, because the forecast model uses data only from the non-cartel period.

Although both approaches can be modified to address some of these issues, the debates around their merits and drawbacks in the LCD case highlight that, in

certain situations, it might be prudent to apply both approaches and to conduct appropriate statistical tests in order to determine the more reliable method.¹¹

Concluding remarks

The LCD investigation is no doubt an important case from both a legal and an economics perspective. From the point of view of public enforcement, it reaffirms the effectiveness of leniency programmes as a tool for prosecuting cartels and illustrates the effective use of a criminalisation regime. From a private enforcement perspective, the large number of damages claims and subsequent success of the settlements on a global scale serve to reinforce the importance of private actions in compensating victims and deterring future cartels. Furthermore, from an economics perspective, the extensive economic analyses, and subsequent discussions between experts, highlight the importance of carefully considering the methodological aspects and suitability of each method when assessing the impact of cartels in complex markets such as that for LCDs.

¹ For example, see press coverage of the claims by Dell and AT&T: Reuters (2010), 'Dell Sues 5 Asia Tech Firms, alleging LCD Cartel', March 15th; Bloomberg (2009), 'AT&T Sues LCD Manufacturers Over Price-Fixing Claims (Update1)', October 21st. Oxera advised Nokia in relation to its claim.

² While the Commission's finding focused on large LCD panels for computers, televisions and notebooks (Commission Decision of 8.12.2010 relating to a Proceeding under Article 101 Treaty on the Functioning of the European Union and Article 53 of the Agreement on the European Economic Area (COMP/39.309 – LCD – Liquid Crystal Displays)), the US Court allowed the claims for small LCDs used in mobile phones based on documentary evidence of cartel communications. See, for example, the judgment in AT&T's case against the cartel: The United States District Court for the Northern District of California (2012), 'Order denying Defendants' Motion for Summary Judgment regarding Mobile Phone Displays', Case Nos. C 09-4997 SI, C 10-4572 SI, C 11-0058 SI, C 10-0117 SI, C 09-5840 SI and C 10-4945 SI, December 4th.

³ This includes around \$890m in fines by 2011 following guilty pleas by several companies, and \$500m following litigation with AUO that concluded in 2012. See Department of Justice (2012), 'AU Optronics Corporation Executive convicted for Role in LCD Price-Fixing Conspiracy', press release, December 18th.

⁴ European Commission (2010), 'Commission Fines Six LCD Panel Producers €648 million for Price Fixing Cartel', press release, December 8th.

⁵ For example, China's National Development and Reform Commission fined the cartel members \$56.7m on January 4th 2013. See Global Competition Review (2013), 'China hits LCD Cartel with Record Fine', January 4th.

⁶ A deposition is a process in the USA whereby parties' experts are cross-examined on the opinions expressed in their written reports.

⁷ Whether the overcharge was passed on by the claimants to their customers (pass-on analysis) is another key aspect of the assessment of such claims. However, for direct purchasers this element was less relevant, as US law does not allow the 'pass-on defence', and hence the claimants do not need to demonstrate that they did not pass on the overcharge.

⁸ For example, in the trial involving Toshiba and the direct purchaser class, the overcharge estimates ranged from less than 1% to 18%. See the expert declaration of Dr Robert Hall, acting on behalf of AUO in its litigation with the DoJ: Hall, R. (2012), 'AUO- and AUOA-Specific Estimates of Consumer Harm', August 10th, para 8.

⁹ United States District Court Northern District of California (2012), 'Declaration of Dr. Keith Leffler regarding AUO's US Volume of Commerce for Sentencing Hearing', Exhibit B, para 38–39.

¹⁰ Ibid., Exhibit B, para 39–50.

¹¹ Another interesting development in this case was that the court allowed claims that were based on inferred value of commerce. For example, see the summary judgment of Judge Illston in the District Court for the Northern District of California: The United States District Court for the Northern District of California (2012), 'Order Granting in Part Defendants' Joint Motion for partial Summary Judgment as to (1) Claims based on Inferred Invoices; and (2) State Law Claims', Case No. C 09-5609 SI, August 31st.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Leonardo Mautino: tel +44 (0) 1865 253 000 or email l_mautino@oxera.com

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