

# The Antitrust Review of the Americas

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**2010**

Published by Global Competition Review  
in association with  
Cornerstone Research

**GCR**

GLOBAL COMPETITION REVIEW

# Empirical Approaches in Assessing Class Certification in Direct Purchaser Price-Fixing Cases

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In direct purchaser price-fixing cases,<sup>1</sup> two key issues considered by economic experts at the class certification stage are whether there is common proof of impact to direct purchasers and whether damages are subject to common proof.<sup>2</sup> The question of whether there is common proof of impact depends on whether common evidence can be used to show that the alleged agreement to fix prices increased prices above the competitive level for all direct purchasers.<sup>3</sup> The question of whether damages are subject to common proof requires showing that a common methodology can be used to estimate class-wide damages.<sup>4</sup>

In this paper, we describe some of the empirical approaches commonly used to analyse these class certification issues. We explain some of the key assumptions behind these approaches and why a misapplication of these approaches could lead to erroneous inferences. These approaches and assumptions were considered during the class certification stage in many high-profile antitrust cases and have been the subject of several recent articles.<sup>5,6</sup>

## Empirical approaches used to assess common impact

Three empirical approaches that have been used to analyse common impact are visual inspection of prices, price correlations and price regressions.<sup>7</sup> As discussed below, these approaches have been used to analyse whether the transaction prices paid by direct purchasers were commonly affected by the alleged agreement to fix prices. It is critical that one understands the underlying assumptions when applying these approaches in settings where there are a variety of products with different prices and there are diverse purchasers. Prices can vary not only across products but also across purchasers. In addition, changes in prices over time can be different for different purchasers.

In such settings, the question of whether the alleged agreement to fix prices increased prices for all direct purchasers generally requires a rigorous economic analysis of the market(s) under consideration. Specifically, such an analysis requires assessing how the transaction prices paid by direct purchasers are determined and whether the transaction prices would be affected by the alleged agreement to fix prices. If such an analysis can be conducted on a class-wide basis using common facts and a common methodology, then class certification may be appropriate. However, if such an analysis cannot be conducted without an individualised inquiry, then class certification may not be appropriate.

### Visual inspection of prices

In some cases, experts have relied on graphs of price series and a visual inspection of these prices to argue that there is a ‘price structure’ such that these price series are related to each other and that change in one price would result in changes in all other prices.<sup>8</sup> They claim that this is evidence that an alleged agreement to fix prices would raise prices paid by all purchasers. However, this approach has been referred to as ‘junk science’ that ‘would not survive the peer review process of any credible economics journal.’<sup>9</sup> Moreover, this approach does not shed any light on the important economic link-

ages between prices. Importantly, it cannot address the key question of how the prices that the direct purchasers paid would be affected by the alleged agreement to fix prices.

### Correlation analysis

The use of ‘correlations’ has been cited in several recent antitrust class certification opinions.<sup>10</sup> In these cases, experts used correlations to argue that prices have co-movements over time and from this they allege that there would be a common impact. A correlation coefficient is a statistical measure of the strength and direction of a linear relationship between two price series.<sup>11</sup> The correlation coefficient can vary between -1 and +1. A relationship is positive if the two prices move in the same direction while a relationship is negative if the two prices move in opposite directions. A value of 1 indicates that the relationship between the two prices is perfectly linear. A value of 0 indicates that there is no linear relationship between the two prices.

It is well understood that correlations do not imply causality. The fact that two price series are correlated does not explain what economic forces caused changes in each series, and whether and how such changes may be related to each other.<sup>12</sup> Importantly, it does not tell us whether the alleged price-fixing agreement would affect prices in a manner similar to the economic forces that might have caused changes in each series. Recall that for an analysis of pricing to be relevant for class certification, it needs to show that the alleged agreement to fix prices would result in higher prices for all direct purchasers within the class.

Consider the example of prices of airline tickets and train tickets for long-distance travel. These two price series may be positively correlated because of a common input – fuel. An increase in the price of fuel would likely increase the prices of both airline tickets and train tickets. However, this does not imply that a conspiracy to increase the prices of either or both would cause a similar correlation, or that a conspiracy to increase air fares would have a significant effect on the price of long-distance train tickets. Ultimately, correlation coefficients must be interpreted through the lens of economic theory and industry factors.

In addition, there are issues regarding the interpretation of correlation coefficients. One issue is whether a correlation coefficient is economically significant. The most commonly used statistical test is whether the correlation coefficient is statistically significantly different from a given value. This value could be -1 or 1 or it could be any value in between -1 and 1. However, there is no rule as to the level of correlation that is ‘high enough’ to be economically significant.<sup>13</sup> A correlation of 0.6 could be found to be statistically significantly different from zero, but this does not necessarily imply that such a correlation reflects a relationship that is economically material.

Another issue is that a correlation can only measure a linear relationship between a pair of price series. If there are multiple products and a variety of purchasers, as is the case in many proposed classes, there could be many price series for which correlations will have to be calculated and they may take on many different values.

Without any benchmarks as to what level of correlation is economically significant, it may be difficult to make an inference about how transaction prices are related and how they would be affected by the alleged agreement to fix prices.<sup>14</sup>

Some economic experts attempt to aggregate or combine price series or average them together to make claims about the ‘average’ correlation across a variety of prices paid by diverse purchasers. Because not all prices exactly follow the trend of the ‘average’ price, this aggregation or pooling of data precludes one from determining ways in which individual price series are related and how the alleged price-fixing agreement would affect different prices. Furthermore, this approach can lead to incorrect inferences about how the prices are correlated.<sup>15</sup>

The correlations between two aggregated price series could be high even if the correlations between individual price series that make up the aggregated price series are low.<sup>16</sup> For example, consider the correlation between airlines’ average economy and average first-class fares, with averages taken over all routes. Suppose that at the route level, the demand for economy tickets is unrelated to demand for first-class tickets so that the economy and first-class fares for a particular airline have only a small correlation. However, suppose that some airlines have better overall service than others, so that their average economy fares and average first-class fares are higher. This would result in a positive correlation between average economy fares and average first-class fares, even though the economy and first-class fares for a particular airline have a small correlation.

In contrast, the correlations between two aggregated price series could be low even if the correlations between individual price series are high. Continuing the airline example, suppose each airline prices economy and first-class seats higher on its high-demand routes. In this case, the economy and first-class fares for a particular airline will be highly correlated. Further, suppose that all airlines follow a similar methodology in pricing their economy fares but there is variation across airlines in how they price their first-class fares. Assume all airlines will have average economy fares that are nearly identical and that any variation in economy fares between airlines is unrelated to first-class fares. In this example, the correlation between average economy fares and average first-class fares will be small, even though the economy and first-class fares are highly correlated for any particular airline.

### Regression analysis

Another empirical approach that has been used to analyse common impact is regression analysis.<sup>17</sup> Regression analysis is a widely accepted technique for measuring the relationship between multiple variables.<sup>18</sup> Specifically, multiple regression analysis measures the effect of two or more ‘explanatory’ variables on a ‘dependent’ variable or the variable to be explained, such as prices.

In general, a regression model used to analyse class certification issues might treat prices as the dependent variable and include as explanatory variables the relevant competitive supply and demand factors along with a ‘conspiracy’ variable that measures the difference between average prices in the class period and average prices outside the class period.

### *Regression estimates and common impact*

One should exercise caution when relying on regression estimates to assess common impact. If one does not allow the effect of the ‘conspiracy’ variable to differ across different purchasers, the effect of the ‘conspiracy’ variable in the regression model described above should be interpreted as the average amount of price inflation that

remains after controlling for all other variables in the regression model. Even if this average effect is statistically significant, it does not imply that all individuals within the class were impacted.<sup>19</sup> It only shows that, on average, the putative class period was associated with higher prices.

For example, suppose that the alleged agreement to fix prices resulted in half of the proposed class being harmed by \$10 and the other half not being harmed. In this case, the model might estimate a statistically significant (average) impact of \$5 even though half of the proposed class was not harmed. In such a case, estimating an average impact due to the alleged agreement to fix prices cannot address the question of whether all purchasers were impacted, which is the threshold issue for determining common impact. Absent a rigorous economic rationale for why all members of the proposed class would be harmed, one may not be able to make any inference about common impact.<sup>20</sup>

To properly specify a regression to assess common impact may require individual level information. Specifically, for regression analysis to be relevant to the issue of common impact may require estimating a regression model that controls for all relevant supply and demand factors at a disaggregated level. It may even require estimating a separate regression model for each individual purchaser. But doing so may not be possible due to data limitations.<sup>21</sup> Further, data limitations may reduce the accuracy of the regression estimates. In some cases, the necessary data may only be available through an individualised inquiry.<sup>22</sup>

### *Using regressions to explain variation in prices*

In some cases, plaintiffs have argued that common impact can be shown if the variation in prices can be explained by a regression model.<sup>23</sup> However, this is only strictly true if all variation in prices can be explained, a criteria that is generally impossible to meet.<sup>24</sup> It is an open question as to how much of the price variation needs to be explained by the regression model for establishing common impact. The R-squared statistic reports how much of the variation in price is explained by variation in the variables in the model.<sup>25</sup> However, there is no standard for how high this statistic needs to be for establishing common impact.<sup>26</sup>

The ability of the model to explain variation in prices is not the same as the ability of the model to explain variation in the impact of the alleged agreement on different members of the proposed class. As discussed earlier, it may be useful to have separate conspiracy variables for each group or a separate conspiracy variable for each individual purchaser or even a separate regression for each individual purchaser. This may allow one to determine which class members were impacted and which ones were not impacted. However, as discussed earlier, data for such a disaggregated analysis may not be available without an individualised inquiry.

### **Empirical approaches for estimating damages**

At the class certification stage, the plaintiffs are required to offer common methodologies that would reliably estimate class-wide damages. Empirical approaches typically proposed range from simple comparisons of actual prices with prices from a benchmark market (or time period) to complicated econometric models of demand and supply.<sup>27</sup> It is true that these methodologies exist and have been used in a variety of settings in the academic literature. However, before a court can endorse them, there is a need to understand whether the underlying assumptions in these methodologies conform to the realities of the markets at issue and whether sufficient data are available, or are likely to be available, to reliably estimate these models. In

other words, it is not enough to say that a given model or methodology exists, but rather the model must be tied to the features of the markets at issue and the available data.

In general, the objective of damage estimation in a price-fixing case is to quantify the effect of the alleged price-fixing agreement on the transaction prices,<sup>28</sup> while holding constant all the relevant demand and supply factors. It is important to control for all relevant supply and demand factors because higher prices may be the result of expanded demand, contracted supply, or both. For example, the price of corn would increase if more of it started being used for bio-fuel (expanded demand), or if a drought were to hit the Midwest (contracted supply).

Because the alleged price-fixing agreement would only operate on the supply side of the market, estimates of the average effect of the alleged agreement should distinguish the average effect of the alleged agreement from the average effects of other relevant supply and demand factors.

#### Simple differences in means approach

One approach that has been used to estimate damages is to compare prices in the market at issue to a benchmark.<sup>29</sup> This benchmark could be another market or another time period in the same market. An expert may be able to argue that a comparison to a benchmark market is reasonable because the two markets are similar in all respects except for the alleged price-fixing agreement. The expert could then calculate damages as the difference in prices between the two markets during the class period. Similarly, the expert may argue that it is reasonable to compare prices during the class period to prices in a benchmark time period, for example the time before or after the class period, because the class period and benchmark time period are similar in all respects except for the alleged agreement to fix prices.

If the market at issue and the benchmark are not similar in all respects except for the alleged agreement to fix prices then one needs to control for all the relevant supply and demand factors that could explain some of the variation in prices. A simple differences-in-means approach fails to do that. Also, a simple differences-in-means approach does not account for differences among the class members, and so can only calculate an average, not an individual, impact. In order to control for these and other effects, economic experts often turn to regression-based approaches.

#### Regression-based approaches

##### *Reduced form regression models*

Economists frequently use regression analysis to control for demand and supply factors. A price regression may be used to explain the relationship between prices and various demand and supply factors. For example, an expert may consider the effect of the cost of a production input such as the price of jet fuel on the transaction price for airline tickets, while controlling for relevant supply and demand factors. Such a regression is sometimes known as a reduced form regression, because it reduces the underlying relationships (that is, demand and supply relationships) into a single price equation. An economic expert may calculate damages as the amount of price inflation captured by a variable that spans the duration of the class period (a ‘conspiracy’ variable),<sup>30</sup> while controlling for all relevant competitive supply and demand factors. As discussed earlier, the effect of the ‘conspiracy’ variable may be interpreted as the average amount of price inflation that remains after controlling for all other variables in the regression model.

Reduced form regressions are usually an improvement over the simple benchmark approach because they control for additional

factors. But they can be misinterpreted. A reduced form regression measures the price inflation as the increase in prices that cannot be explained by the variables included in the model. This estimate can be misleading if the model omits factors that are important in determining prices in the market. For example, an important cost could have increased during the class period and, if this cost variable was not included in the model, the effect of this cost increase on price could be misinterpreted as price inflation due to the alleged conspiracy to fix prices. An expert must use economic theory and industry experience to make sure that all relevant factors are included. As mentioned earlier, sometimes reliable data on some of these relevant factors are not available; this may prevent an estimation of damages using a common methodology.

Even if the economic expert is able to control for all the relevant variables, there may be limits to what a reduced form regression can do. When the variables in a reduced form price equation clearly capture only a demand shift (for example, greater popularity of airline travel) or a supply shift (cost of fuel), one can be confident that they are capturing the effects of demand or supply on price. However, the ‘conspiracy’ variable is used to capture variation not accounted for by both competitive supply and demand factors so it has no such interpretation. By design, it captures changes in prices not captured by other variables in the regression model. To interpret it as capturing only price changes that result from a change in supply behaviour attributable to a price-fixing conspiracy, one needs to separate its demand and supply components. To isolate these effects, one may need to rely on structural regression models, which are described below.

##### *Structural regression models*

Structural regression models attempt to explicitly explain prices as a result of interaction between demand and supply factors. Typically, such models include both an equation explaining demand behaviour and an equation explaining supply behaviour. The distinction between demand and supply in a structural model allows economists to explicitly estimate a supply equation while simultaneously taking into account how factors in a demand equation affect the supply behaviour.

By using a structural model, one could, in theory, estimate the quantitative effect of alleged price-fixing with the proper economic interpretation of the ‘conspiracy’ variable in the supply equation. There are many structural regression models that may be employed, each with its advantages and disadvantages.<sup>31</sup> The data requirements for estimating a structural regression model can be high. As discussed earlier, reliable data on some of the relevant variables may not be available; this could prevent the estimation of damages using a common methodology.

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There are critical assumptions that underlie empirical approaches commonly used to analyse class certification issues in direct purchaser price-fixing cases. In real-world markets with differentiated or heterogeneous products and disparate prices, a misapplication of these approaches may lead to erroneous inferences about whether there is common proof of impact and whether class-wide damages can be estimated using a common methodology.

**Notes**

- 1 The discussion of impact in this paper focuses on rule-of-reason types of cases.
- 2 See William H Page, 'Introduction: Reexamining the Standards for Certification of Antitrust Class Actions,' *Antitrust*, Summer 2007, at p53; and Robert H Klonoff, 'Antitrust Class Actions: Chaos in the Courts,' 11 *Stan JL Bus & Fin* 1, 2005.
- 3 See ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp183–91.
- 4 See ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp191–94.
- 5 For example, see *In re Graphics Processing Units Antitrust Litig*, 527 F Supp 2d 1011 (ND Cal 2007).
- 6 Michelle M Burtis and Darwin V Neher, 'Correlation and Regression Analysis in Antitrust Class Certification,' Working Paper; Richard Schmalensee, 'Economic Analysis of Class Certification,' *Global Competition Policy*, June, Release 2, 2008; John M Majoras, 'Opening the Curtain: Why Economics Is Taking Center Stage in Class Certification Battles in Antitrust Cases,' *Global Competition Policy*, June, Release 2, 2008; John H Johnson and Gregory K Leonard, 'Economics and the Rigorous Analysis of Class Certification in Antitrust Cases,' *J Comp Law & Econ*, 2007 Vol 3(3), pp341–56.
- 7 See, for example, *In re Pressure Sensitive Labelstock Antitrust Litig*, MDL Docket No. 1556, Document 335 (MD Pa 2007); *In re Graphics Processing Units Antitrust Litig*, 527 F Supp 2d 1011 (N.D. Cal 2007); and *Weisfeld v Sun Chem Corp*, 210 FRD 136, 143-44 (DNJ 2002), *aff'd* (3d Cir 2004).
- 8 John H Johnson and Gregory K Leonard, 'In the Eye of the Beholder: Price Structure as Junk Science in Antitrust Certification Proceedings,' *Antitrust*, Summer 2008, pp108-12, at p111; John C Beyer, *The Role of Economics in Class Certification and Class-Wide Impact*, in *Litigating Conspiracy* (Stephen GA Pitel ed, 2006).
- 9 See John H Johnson and Gregory K Leonard, 'In the Eye of the Beholder: Price Structure as Junk Science in Antitrust Certification Proceedings,' *Antitrust*, Summer 2008, pp108-112, at pp108, 111.
- 10 See, for example, *In re Graphics Processing Units Antitrust Litig*, 527 F Supp 2d 1011 (ND Cal 2007).
- 11 For a more detailed description of correlations, see David H Kaye and David A Freedman, 'Reference Guide on Statistics,' *Reference Manual On Scientific Evidence*, 2nd ed, 2000, at pp135–9.
- 12 See, for example, ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp5–6.
- 13 See, for example, ABA Section of Antitrust Law, *Indirect Purchaser Litigation Handbook*, 2007, at pp172-73.
- 14 Michelle M Burtis and Darwin V Neher, 'Correlation and Regression Analysis in Antitrust Class Certification,' Working Paper.
- 15 See, for example, ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at p220; Michelle M Burtis and Darwin V Neher, 'Correlation and Regression Analysis in Antitrust Class Certification,' Working Paper.
- 16 See, for example, Humberto Barreto and Frank M Howland, *Introductory Economics: Using Monte Carlo Simulation with Microsoft Excel*, 2006, at pp44–5; Michelle M Burtis and Darwin V Neher, 'Correlation and Regression Analysis in Antitrust Class Certification,' Working Paper; ABA Section of Antitrust Law, *Indirect Purchaser Litigation Handbook*, 2007, at pp. 171–72.
- 17 For example, see *In re Flat Glass Antitrust Litig*, 191 FRD.472, 486 (WD Pa 1999).
- 18 See, for example, Daniel I. Rubinfeld, 'Reference Guide on Multiple Regression,' *Reference Manual On Scientific Evidence*, 2nd ed. 2000, pp179–227.
- 19 Richard Schmalensee, 'Economic Analysis of Class Certification,' *Global Competition Policy*, June, Release 2, 2008; John M Majoras, 'Opening the Curtain: Why Economics Is Taking Center Stage in Class Certification Battles in Antitrust Cases,' *Global Competition Policy*, June, Release 2, 2008.
- 20 John H Johnson and Gregory K Leonard, 'Economics and the Rigorous Analysis of Class Certification in Antitrust Cases,' *J Comp Law & Econ*, 2007 Vol 3(3), pp341–56.
- 21 ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at p223.
- 22 John H Johnson and Gregory K. Leonard, 'Economics and the Rigorous Analysis of Class Certification in Antitrust Cases,' *J Comp Law & Econ*, 2007 Vol 3(3), pp341–56.
- 23 See ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp220–224.
- 24 Richard Schmalensee, 'Economic Analysis of Class Certification,' *Global Competition Policy*, June, Release 2, 2008, at p. 4: 'Regression analysis is normally about averages, but no regression fits perfectly so that there are always deviations from the estimated regression function.'
- 25 See, for example, Peter Kennedy, *A Guide to Econometrics*, Sixth Edition, Blackwell Publishing, 2008, at pp13–4.
- 26 See, for example, ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp408–9. For a discussion on ways the R-squared statistic can be misinterpreted, see Michelle M Burtis

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For more than twenty-five years, Cornerstone Research has provided high-quality expert testimony and economic and financial analysis to attorneys in all phases of commercial litigation and regulatory proceedings. Our services include identifying relevant issues and developing case strategy, engaging expert witnesses, conducting research and preparing effective testimony.

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Our antitrust experience and expertise span a broad spectrum of issues, including price fixing, horizontal collusion, monopolisation, predation, tying, bundling, exclusionary practices and antitrust issues associated with intellectual property and mergers. We have worked on some of the most prominent antitrust cases in private litigation (including a recent Supreme Court case) and in matters involving the Department of Justice, Federal Trade Commission, Federal Communications Commission, Securities and Exchange Commission and other agencies. Attorneys seek our involvement to address issues of class certification, liability and damages.

- and Darwin V Neher, 'Correlation and Regression Analysis in Antitrust Class Certification,' Working Paper.
- 27 ABA Section of Antitrust Law, *Proving Antitrust Damages: Legal and Econometric Issues*, 1996; ABA Section of Antitrust Law, *Econometrics: Legal, Practical, and Technical Issues*, 2005, at pp167–78.
- 28 As discussed earlier, if the estimated effect of the alleged agreement is an average, the amount by which a particular individual was harmed may be very different from the estimated average.
- 29 For example, it was offered as a method to show common proof of damages in *In re Hydrogen Peroxide Antitrust Litig*, 240 FRD 175 (ED Pa 2007).
- 30 Some economists have raised concerns about using data from the class period to estimate price inflation due to the challenged conduct. For example, see Franklin Fisher's testimony in *In re Corrugated Container Antitrust Litig*, (8 Feb 1983); or Fisher (1980), 'Multiple Regression in Legal Proceedings,' *Columbia Law Review*, 80(4), pp702–36.
- 31 For example, consider the 2SLS model (JRN Stone, 'Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand,' *Economic Journal*, 1954, Vol 64, pp511–27; and Paul Ruud, *Classical Econometric Theory*, New York, NY: Oxford University Press, 2000, pp502–5); the AIDS model (Angus Deaton and John Muellbauer, 'An Almost Ideal Demand System,' *American Economic Review*, Vol 70, No. 3, 1980, pp312–26); and the BLP model (Steven Berry, James Levinsohn, and Ariel Pakes, 'Automobile Prices in Market Equilibrium,' *Econometrica*, Vol 63, No. 4, 1995, pp841–90).



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