

Sub-Regressions: A Rigorous Test For Antitrust Class Cert.

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The recent report and recommendation from the New York federal magistrate judge in *In Re Air Cargo Shipping Services Antitrust Litigation*^[1] draws attention to a particular type of statistical testing that is often used in the economic analysis of class certification. The magistrate judge referred to this testing — which constitutes sensitivity analysis in economics — as “sub-regressions.”^[2] Generally speaking, the objective of such testing is to determine whether the purported effects derived from estimating a given regression model hold for different subgroups in the underlying data. This type of statistical testing is prevalent in economics research more generally and also in the economic analysis of class certification issues.

The Third Circuit’s decision in *In Re Hydrogen Peroxide Antitrust Litigation*^[3] emphasized the importance of “rigorous analysis” into the facts of the case and the expert methodology in the class certification stage. In line with that decision, several courts have relied upon the type of statistical testing discussed here — “sub-regressions” — in order to determine whether a proposed class should be certified.

In *In Re Plastics Additives Antitrust Litigation*, for example, the court relied on “sub-regressions” from the defendants’ expert and ruled that “unrefuted evidence shows that some class members suffered impact while others did not.”^[4] Accordingly, the court ruled that plaintiffs could not rely on their expert’s regression model to “demonstrate impact on a basis common to the class” and denied class certification.^[5]

Similarly, the defendants’ expert in *In Re Graphics Processing Units Antitrust Litigation* conducted tests to determine whether the purported classwide effects derived by the plaintiffs’ expert held for different subsets of customers in the proposed class.^[6] The court certified a rather limited class in this case.^[7]

More recently, such testing of the plaintiffs’ expert’s regression model was conducted in *In Re Optical Disk Drive Antitrust Litigation*, where class certification was denied.^[8] Meanwhile, the magistrate judge in *Air Cargo* was not swayed by such testing and stated that it was “of rather limited probative value.”^[9] Plaintiffs in *Air Cargo* also seek to exclude testimony from the defendants’ experts on their “sub-regressions” on the grounds that such testing does not follow “the scientific method.”^[10]



Laila Haider

The purpose of this article is to describe the relevance of the particular statistical approach in the class certification phase. Though it is a legal question whether the results of such testing are probative in any given case, it is critical to not junk a scientific and valid statistical approach that may be crucial for the economic analysis of class certification.

The Economics of Class Certification and the Use of Regression Analysis

An analysis of class certification asks whether the type of economic analysis that would be required to (1) prove injury and (2) quantify damages is inherently individualized. In an antitrust case, a customer (or a member of a proposed class) has suffered injury if the alleged anti-competitive conduct resulted in that customer paying higher prices than he or she otherwise would. Damages indicate the extent of the injury.

If proof of antitrust injury (or impact) for an individual member of the proposed class requires an analysis of factors that are specific to that class member, then class certification is not appropriate. On the other hand, if proof of antitrust injury requires the same or common evidence for all members of the proposed class, then class certification may be appropriate. This is often referred to as an assessment of common impact.

In practice, this assessment requires economists to address two questions: (1) Were all or virtually all members of the proposed class impacted (or injured) by the alleged conduct? (2) And if so, can impact for a proposed class member be demonstrated using common proof? Meanwhile, the inquiry into damages requires the determination of whether a formulaic method exists for the calculation of damages for the proposed class, i.e., a method that relies on class-wide evidence and not evidence that is unique or individual to each proposed class member.

Regression analysis is a statistical methodology that is frequently put forward for the assessment of impact and also as a means to calculate damages resulting from the anti-competitive conduct at issue. Regression analysis, under certain conditions, can identify and measure the effect of one economic factor on another. In the context of a price-fixing case, regression analysis may be used to determine whether a customer (or customers) paid a supra-competitive price due to the alleged collusive conduct and also to determine the extent to which the price was elevated by the conduct at issue.

On the other hand, regression analysis can yield an unreliable and misleading result if the regression model used is based upon invalid assumptions. Thus, when plaintiffs put forward a regression model in an antitrust class action, an important question at the class certification stage is whether the proposed regression model is based on valid assumptions such that it can reliably be used for the assessment of impact or the calculation of damages for members of the proposed class.

Air Cargo and the Plaintiffs' Proposed Methodology

In *Air Cargo*, a putative class of persons and entities that purchased airfreight shipping services directly from defendant airlines for shipments both to and from the United States alleged that the defendants participated in a price-fixing scheme. Specifically, plaintiffs alleged that the defendant airlines fixed "fuel and security surcharges that were applied to thousands of routes flown worldwide," which they claim resulted in reduced competition and customers paying allegedly supra-competitive prices.[11]

The federal magistrate judge recommended certification of the proposed class on the basis that the requirements of Rule 23(a) and Rule 23(b)(3) were satisfied. According to the magistrate judge, the

“plaintiffs’ voluminous record evidence” and testimony from plaintiffs’ experts “provides a more-than-sufficient basis for the court to find that the question of impact may be resolved by predominately common proof.”[12] Moreover, he stated that “the issue of damages is also substantially amenable to common proof, and will not require ‘labyrinthine individual calculations.’”[13]

In *Air Cargo*, the plaintiffs’ expert proposed two regression models for the assessment of classwide impact — one regression model for cargo inbound to the United States and a second regression model for cargo outbound from the United States.[14] Each regression model estimated the difference, on average, in airfreight prices paid by customers between the alleged “conspiracy period” and a benchmark period — the period after the alleged conspiracy had ended — after purportedly accounting for supply and demand factors that influenced airfreight prices paid by customers.

The regression models were estimated by pooling together sales transactions across the defendant airlines — specifically, 30 million sales transactions across 25 defendant airlines.[25] Using the two regression models, the plaintiffs’ expert concluded that the proposed class “as a whole” paid airfreight prices that were, on average, 5.4-7.5 percent higher during the alleged conspiracy period depending on whether the shipments were inbound to the United States or outbound from the United States.[16] In response, defendants’ experts conducted tests to determine whether the alleged conspiracy had this same effect for subsets of proposed class members based on, for example, the carrier utilized and different origin-destination route pairings. This testing of the applicability of the 5.4 – 7.5 percent average overcharge for various subgroups of customers is the analysis that the magistrate judge referred to as “sub-regressions.”

According to the defendants’ experts, this testing of the plaintiffs’ expert’s regression models revealed that a substantial portion of the proposed class did not suffer overcharges and therefore, the methodology put forward by plaintiffs could not be used to show that all or virtually all members of the proposed class were impacted by the alleged conduct.

Discussion

In order to analyze the relevance of such testing, it is crucial to understand the assumptions embedded in regression models like the ones proposed by plaintiffs’ expert in the *Air Cargo* case. Because the supply and demand factors in such regression models are estimated by pooling together sales transactions across all customers, the approach assumes that the supply and demand factors had the same or uniform effect (i.e., resulting in the same change in prices paid) across all customers. This is a testable assumption and may or may not be valid depending upon the facts of a given case.

By way of an illustrative example, snow accumulation at origin or destination airports may capture seasonal variation in the cost of cargo transportation. Moreover, snow accumulation likely has a larger impact on transportation costs at airports where snowfall is infrequent, (e.g., Hartsfield-Jackson Atlanta Airport) than at airports where snowfall is more frequent (e.g., Minneapolis-Saint Paul International Airport). As a result, pooling sales transactions across these two airports to estimate an average effect of snow accumulation on price of cargo transportation would be misleading as it would mask the differential effects on transportation costs at the different airports.

Similarly, because a single average overcharge is estimated by pooling together sales transactions across all customers, the approach assumes that the estimated overcharge was the same or uniform across all customers, i.e., the conduct at issue resulted in the same overcharge for each customer. This too is a testable assumption and may or may not be valid depending upon the facts of a given case.

For example, the plaintiffs' expert's analysis in *Air Cargo* suggested that relative to the benchmark period, prices paid for airfreight by all customers were on average 5.4-7.5 percent higher during the alleged conspiracy period. Because such regression models — by design — estimate a single average effect across all customers, they do not allow for the possibility that some customers may not have responded in the same manner to the alleged conduct. As a result, such an approach masks the underlying variation in responses of different customers to the alleged conduct.

Put another way, a finding of a positive overcharge, on average, across all proposed class members cannot be taken as proof that all the underlying individual overcharges are also positive. This is crucial because such a regression approach assumes away the very issue that is at the heart of the inquiry in the class certification phase, i.e., whether all or virtually all members of the proposed class were impacted by the alleged conduct. Several antitrust practitioners have highlighted this critical issue^[17] and a number of courts have recognized it (see, for example, *In Re Photochromic Lenses Antitrust Litigation* and *In Re Wholesale Grocery Products Antitrust Litigation*).^[18]

A scientific approach requires that the economic researcher conduct statistical tests to determine whether it is appropriate to assume that (1) each of the supply and demand factors had the same or uniform effect across all members of the proposed class, and (2) the overcharge variable had the same or uniform effect across all members of the proposed class. There are well-accepted statistical tests that can be utilized to test the validity of these assumptions.^[19]

This type of inquiry is equivalent to testing whether it is appropriate to pool together sales transaction data across all customers in order to estimate the effects of the supply and demand factors and the effect (if any) of the alleged conduct. If the requisite empirical testing shows that economic conditions varied or had different effects across different members of the proposed class, then the pooled regression approach is rejected by the data. Similarly, if the requisite empirical testing shows that the estimated overcharge varied such that some members of the proposed class were able to avoid impact from the alleged conduct, then it undermines the proposed methodology and the flawed presumption of class-wide impact.

If the requisite statistical testing rejects the regression approach described here, a direct method to illustrate this critical issue is to estimate the proposed regression model for subsets of proposed class members. By conducting this so-called “sub-regression” or sensitivity analysis, the economic researcher can demonstrate that the assumed average effects do not hold for different members of the proposed class. How these subsets of customers are chosen can be rooted in the facts of the case and the realities of the industry at issue.

For example, if evidence suggests that customers located in a particular geographic region were able to avoid paying supra-competitive prices because they had the ability to turn to competing sources of supply, then pooling sales transactions of customers across the different geographic regions and estimating a single average overcharge would be misleading. Crucially, sensitivity testing or “sub-regressions” conducted at the region level would unveil that a single average effect masks the underlying heterogeneity in customer experiences. Similarly, if evidence suggests that larger customers were able to negotiate bulk discounts such that they could avoid an alleged overcharge, then pooling sales transactions across all customers and estimating a single average overcharge would be misleading. Again, sensitivity testing or “sub-regressions” conducted at the customer level would unveil that a single average effect masks the underlying heterogeneity in customer experiences.

In *Air Cargo*, plaintiffs argued that the defendants' "sub-regression" models were mis-specified as they paired "globally-specified" factors with "specific or local subsets of data." [20] Plaintiffs also argued that the appropriate test of the validity of plaintiffs' expert's regression model is to estimate it "using 'slightly smaller random samples of the data on which a regression model is run.'" [21] The magistrate judge was swayed by this reasoning and stated that the sub-regression models could not be used to prove that some members of the proposed class were not impacted by the alleged conduct. He also ruled that "some degree of intra-class variability is permitted under both the antitrust laws and Rule 23." [22] Notably, however, the magistrate judge did not recommend that defendants' experts' testimony on "sub-regressions" be excluded and asserted that "striking this testimony would be draconian." [23]

Plaintiffs' criticism related to regression mis-specification highlights a fundamental misunderstanding of the purpose of such testing. The sub-regression models can only be mis-specified if the underlying regression model that is subject to testing (here, this would be the regression model put forward by the plaintiffs) is mis-specified. This is because, for one, such testing utilizes the same regression model. Moreover, the local subsets of data are components of the larger data that are pooled together for purposes of estimating the plaintiffs' regression model. To the extent there would be local effects that are unaccounted for in a "sub-regression" model, those local effects would by no means be accounted for in the global version of the model. Instead, it would be the case that those local effects are simply assumed away.

Moreover, the random sampling approach suggested by plaintiffs has limited value in the sensitivity analysis described here. By way of example, if the competitive landscape in a particular geographic area is such that it is unlikely that customers in that location paid supra-competitive prices, this can be tested by conducting a "sub-regression" analysis for the geographic area in question. Analysis of a random sample of the sales transaction data will be uninformative as to whether prices paid by customers in that geographic area were at supra-competitive levels. Accordingly, inference based on a random sample would not be meaningful in this context. Indeed, there is support in the academic literature for choosing non-random sub-samples when testing for the sensitivity of results. For example, an estimation methodology called regression discontinuity design [24] often tests the robustness of results by estimating the same empirical model on specific subsets of the data and then analyzing differences across the results. Crucially, the subsamples are selected based on some feature of the data and are therefore, not random.

Conclusion

A scientific approach to class certification requires rigorous testing of the assumptions underlying a proposed regression model. Empirical inquiry — including a properly implemented sensitivity analysis that is rooted in the facts — is required to determine whether it is appropriate to pool together sales transaction data across all customers to derive a single average overcharge or to derive average effects of supply and demand factors. The answer will vary depending on the facts of the case — in some cases, the average effects may mask diverse individual experiences of proposed class members, and in other cases, they may not.

Moreover, if the requisite empirical inquiry reveals intra-class variability (i.e., variation among proposed class members in terms of whether they were impacted by the alleged conduct), it is a legal question as to whether the variation is such that class certification would be an inappropriate means of adjudicating the controversy. It is important, however, to not junk a scientific and valid statistical approach that may be crucial for that assessment of intra-class variability.

—By Laila Haider and Muneeza Alam, Edgeworth Economics LLC

Laila Haider, Ph.D., is a partner and Muneeza Alam, Ph.D., is a principal consultant at Edgeworth Economics in Washington, D.C.

DISCLOSURE: Laila Haider was the consulting expert for defendants in In Re Photochromic Lenses Antitrust Litigation. Edgeworth Economics provided expert testimony in In Re Photochromic Lenses Antitrust Litigation and In Re Wholesale Grocery Products Antitrust Litigation.

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[1] In Re Air Cargo Shipping Services Antitrust Litigation, Master File No. 06-MD-1175 (JG)(VVP), MDL No. 1775, in the US District Court Eastern District of New York.

[2] Ibid, pp. 28-30.

[3] In Re Hydrogen Peroxide Antitrust Litigation, No. 07-1689, in the US Court of Appeals for the Third Circuit.

[4] In Re Plastics Additives Antitrust Litigation, Master Dock No. 03-CV-2038, in the US District Court for the Eastern District of Pennsylvania, p. 40.

[5] Ibid, p. 40.

[6] In Re Graphics Processing Units Antitrust Litigation, No. C 06-07417 WHA, MDL No. 1826, in the US District Court for the Northern District of California, p. 26.

[7] Ibid, p. 1.

[8] In Re Optical Disk Drive Antitrust Litigation, Case No. 3:10-md-2143 RS, in the US District Court for the Northern District of California San Francisco Division (“Optical Disk Drive”).

[9] Air Cargo, p. 98.

[10] Ibid, p. 29.

[11] Ibid, p. 3.

[12] Ibid, p. 98.

[13] Ibid, p. 107.

[14] Ibid, p.18.

[15] Ibid, p. 17.

[16] Ibid, p. 89.

[17] Dickey, Bret M. and Daniel L. Rubinfeld (2011): "Antitrust Class Certification: Towards an Economic Framework," NYU Annual Survey of American Law, 66, 459-485.; Johnson, John H. and Gregory K. Leonard (2007): "Economics and the Rigorous Analysis of Class Certification in Antitrust Cases," Journal of Competition Law and Economics, 3(3), 341-356.; Johnson, John H. and Gregory K. Leonard (2011): "Rigorous Analysis of Class Certification Comes of Age," Antitrust Law Journal, 77(2), 569-586.

[18] The magistrate judge in In Re Photochromic Lens Antitrust Litigation recommended denial of the proposed indirect purchaser class, and rejected the plaintiffs' expert's regression approach that calculated annual average overcharges across customers on the grounds that it was not "a workable methodology for establishing impact." (In Re: Photochromic Lens Antitrust Litigation, MDL Case No.: 8:10-MD-2173-T-27EAJ, in the US District Court Middle District of Florida Tampa Division, p. 11.) Notably also, the district judge denied class certification of the proposed direct purchaser class partly on the grounds that "Direct Purchasers cannot utilize common proof to demonstrate the crucial element of antitrust impact as to each member of the class." (In Re: Photochromic Lens Antitrust Litigation, MDL Docket No. 2173, in the US District Court Middle District of Florida Tampa Division, p. 50.)

Similarly, in In Re Wholesale Grocery Products Antitrust Litigation, the district judge rejected plaintiffs' expert's damages calculation that relied on averages and stated that "That profits may have increased on average, does not mean that monopolist profits were extracted from each class member," and plaintiffs' expert's tests "cannot establish that prices or upcharges or profits actually increased for each class member." (In Re Wholesale Grocery Products Antitrust Litigation, Court File No. 09-MD-2090 ADM/AJB, in the US District Court District of Minnesota, p. 26.)

Similarly, the district judge in Optical Disk Drive rejected the plaintiffs' expert's regression approach that calculated an average overcharge across members of the proposed class and stated that "[w]hatever utility such an approach might have in calculating a damages total, it cannot serve to establish that all (or nearly all) members of the class suffered damage as a result of the defendants' alleged anti-competitive conduct." (Optical Disk Drive, p. 14.)

[19] The required statistical test is called the F-test. For details, see Wooldridge, Jeffrey M., (2009): Introductory Econometrics: A Modern Approach, 4th Edition, pp. 143-148.

[20] Air Cargo, p. 28.

[21] Ibid, p. 30.

[22] Ibid.

[23] Ibid.

[24] See, for example: Black, Sandra E. (1999): "Do Better Schools Matter? Parental Valuation of Elementary Education," Quarterly Journal of Economics, 114(2), 577-599.; Dell, Melissa (2010): "The Persistent Effects of Peru's Mining Mita," Econometrica, 78(6), 1863-1903.