Economic Measurement and the Authorisation Process:
the expanding place of quantitative analysis

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CONTENTS

Introduction

There is a recent trend in North America toward an increase in the amount and sophistication of quantitative evidence introduced in antitrust cases, particularly in the analysis of unilateral market power in horizontal mergers. Perhaps the best example of this trend is the recent *Staples* case. Not only was there a considerable amount of quantitative analysis presented to the court in *Staples*, but it has been argued that the results of this work also had a significant impact on the court's ultimate decision. Specifically, it has been argued that the Judge relied on a particular piece of quantitative evidence – a point estimate of 0.57 on a variable representing Staples' costs derived from a regression designed to explain the company's pricing behaviour – in coming to a decision in the case.[1] Antitrust experts will likely debate the merits of the *Staples* decision for several years, and it will probably never be known what factors tipped the balance in the mind of the trier of fact in this specific instance. But there has clearly been a significant change in the kind (and volume) of evidence that is being considered by courts in antitrust matters.

That this growth in quantification should occur in North America where, as Berry (1996)[2] argues, an efficiencies defense has not commonly been accepted under U.S. antitrust law, is suggestive that it will occur, or be occurring in other jurisdictions. If, as in New Zealand, mergers and trade practices are authorised on the grounds of economic efficiency there will be at least as much opportunity for quantification as under a narrower criterion. Indeed, quantified evidence is utilised by the Commerce Commission as a matter of course[3]: a recent example being the application by TransAlta Corporation of Canada that sought authorisation to purchase Contact Energy New Zealand Ltd., where modelling was used to quantify detriments. Quantification normally entails both statistical (econometric) analysis and modelling.
The expansion in quantification reflects the recent rapid electronic advances that have led to huge increases in the availability of data and in the cost-effectiveness of computing power. These advances have led to progress in techniques for analysing these data. Advances in the realism of economic modelling have been just as important. Taken jointly, these advances suggest that there will be an expansion in the amount of quantitification that will be utilised in authorisations.

The paper takes the efficiency objective of the authorisation process under the *Commerce Act 1986* as given. This objective makes competition law completely consistent with thrust of New Zealand public policy since the early 1980s. This has entailed the separation of efficiency and equity in policies and functions of government departments.[4] Equity is treated through tax, social welfare, and access to health and education. The provision of goods and services is left to markets that are, in most instances, encouraged to be efficient by means of open entry, few tariffs, an absence of industry-specific special treatments and the implementation of the *Act.* Consequently, there is no reason to adopt any special framework for measuring benefits and detriments for the public benefit test over those that would apply in the

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[1] See Jonathan Baker, Director, Bureau of Economics, FTC, "Econometric Analysis in *FTC v. Staples*" July, 1997 http://www.ftc.gov/speeches/other/bany.htm.

[2] Mark Berry, "Efficiencies and Horizontal Mergers: In Search of Defense", *San Diego Law Review*, 33(2), 1996.

[3] See Michael Pickford, *The Evaluation of Public Benefit andn Detriment Under the Commerce Act*, Commerce Commission Occasional Paper, 7, 1998.

[4] See Silverstone, Brian, Alan Bollard, and Ralph Lattimore, *A Study of Economic Reform*, North-Holland, 1996, and Lewis Evans, Arthur Grimes, and Bryce Wilkinson with David Teece "Economic Reform in New Zealand 1984-94: The Pursuit of Efficiency", *Journal of Economic Literature*, vol. XXXIV, 1856-1902, Dec. 1996.

assessment of any aspect of the provision of any goods and services. Indeed, the ramifications of quantifying the public benefits and detriments of economic efficiency are exactly those of economic welfare assessed by means of cost-benefit analysis[5].

This paper examines the nature and the sources of increased quantification. It argues that the costs of quantification are falling and the information yielded by it is growing so that it is likely that more, rather than less, quantification will be appropriate in the future. This change and increased the sophistication of the economic analyses and quantitative techniques make expertise in these areas an important ingredient of judgements about the evidence and change the nature of debate.

Underlying Forces Shaping the Use of Quantitative Analysis

Before examining the extent to which the increase in the volume of quantitative evidence has had a determinative impact on specific antitrust or authorisation cases, it is informative to consider the underlying factors that have given rise to it.[6] To a degree, the forces behind the change in the intensity with which the competition law agencies and interested parties are using quantitative analysis are the same as those underlying any other production function in the economy. All other things equal, if the cost of acquiring a particular factor of production falls, one would expect those using the factor of production to use it more intensively. Similarly, if other things are held constant, as the marginal productivity (i.e. the increase in output generated by a marginal increase in the amount of the factor employed) of a factor of production rises, one would expect those using the factor of production to use it more intensively. Thus, if the factor of production is "quantitative analysis", production theory would point to two main possible explanations for a pronounced increase in its use in antitrust and authorisation cases: (1) there has been a decline in the "price"; (2) there has been an increase in the "marginal product". It has appeared in the 1990s as a mushrooming demand for economists' services in authorisation and antitrust cases.[7]

Quantification typically requires both statistical (econometric) analysis and modelling. In the case of merger authorisations, the qualitative implications of the market in the context of actual and potential competition should first be explored to extract the critical parameters of interest. This is often a complex process that requires an economic model as a basis for the statistical work and the interpretation of results. These parameters will generally include demand parameters that enable markets to be defined and changes in prices and quantities to be assessed. Estimates of them may come from study of the industries that are the subject of an authorisation or they may be drawn from studies of other relevant markets.[8] Study of the particular

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[5] For a review of cost benefit analysis see Boardman, Antony E., David H. Greenberg, Aidan R. Vining and David L. Weimer, *Cost-Benefit Analysis: Concepts and Practice*, New Jersey, Prentice Hall, 1996.

[6] This discussion of some of the factors that may underly the increased use of quantitative analysis is motivated importantly by: Baker (1997) posted at: http://www.ftc.gov/speeches/other/stspch.htm.

[7] See Michael J. Mandell, "Going for the Gold: Economists as Expert Witnesses", *The Journal of Economic Perspectives*, 13(2), 1999, 113-120.

[8] Relevant quantitative figures may emerge from a range of studies that have been published in the economics literature. Where, for example, the productive efficiency differences between monopoly and competition, or between co-operative and corporate structures are involved in authorisations the broader literature of economics may provide robust estimates, or estimates that simply cannot be obtained by study of the industries under consideration, perhaps because the counterfactual may not exist.

industry is usually important for defining markets and measuring any price effects that are relevant to efficiency considerations. Computer simulated economic models may also be used directly to estimate, or quantify, the outcome of strategic interactions between industry players. The same general comments apply to authorisations of trade practices.

There has been a sharp drop in the "price" of acquiring quantitative evidence. Three primary reasons can be noted:

1. **An increase in the computerization of commercial transactions in the course of ordinary business.** In the early 1980s, information on cost, price, quantity consumed and other commercial variables normally had to be performed as a separate step from completing actual market transactions (using relatively cumbersome computer resources by today's standards, or non-electronically readable/non-digital techniques such as paper reports). Today, the completion of most supermarket transactions, airline (and some other travel) reservations, telecommunications calls or credit card/Automated Teller Machine ("ATM") transactions automatically provide a digital record of the transaction at an incremental cost close to zero. This has vastly increased the volume of data available for analysis in a wide range of antitrust cases.
2. **The computational power available to econometricians and economists has dramatically increased.** In the early 1980s, personal computers were not widely available, and the computer resources that were available were, by today's standards, extremely cumbersome. Indeed, though increasingly uncommon, punch-cards were still used in some universities, and performing routine calculations necessary to provide even the most basic quantitative estimations such as inverting a matrix, or performing basic tests (e.g. a Durbin-Watson statistic) was time consuming. Today these, and much more complex tests and calculations can be performed with the simple push of a button.
3. **There have been advances in econometric methods.** Certainly in the 1950s and 1960s, estimation problems such as simultaneity and omitted variables were challenges, both theoretically and in regard to available data. Today, more basic approaches such as two-stage least square regressions are well-known, and more advanced methods such as the "almost ideal" demand system and the logit model are available.

The above factors have a potential impact on a wide variety of authorisation and antitrust cases (e.g. mergers, vertical restraints, horizontal restraints) as well as in numerous jurisdictions. For New Zealand the size and narrowness of the geographic distribution of its domestic markets may limit data, but this is just one manifestation of this country's market size. These factors are also present quite independently of the legal threshold used, be it a substantial lessening of competition or another test such as strengthening a dominant position. Finally, all of the above are equally relevant to dynamic and static analysis, and for both market power and efficiency investigations.

In addition to the factors that have reduced the "price" of quantitative analysis, there have been some substantial changes to the "production function", that is, the method by which inputs (e.g., quantitative analysis) are turned into output (e.g. the perceived probability of achieving a favourable outcome). These changes increase the "marginal product", again holding all other things constant, of the input:

4. **The focus of antitrust analysis in North America.** In the U.S. in the 1970s and early 1980s, there would have been considerable debate on basic legal/institutional questions such as the relevance of an estimate of (unilateral) market power (however thoroughly shown) to an antitrust case or advocacy matter. Today, with the publication of the 1984 and 1992 U.S. *Horizontal Merger Guidelines* and the Canadian *Merger Enforcement*

Guidelines, econometric evidence on the extent of relevant markets and market power has clear implications for competition policy results.

An important exception to the significant advance in the degree of focus of antitrust analysis (in particular, mergers) is continuing controversy in both Canada and the U.S. on the relevance of efficiency considerations. As is well-known, in contrast to Australia[9] and New Zealand, the U.S. employs a price standard in horizontal merger analysis that limits the scope to introduce evidence on efficiency effects. In Canada, while in principle there is more scope to introduce efficiency evidence in merger cases, considerable uncertainty remains in practical application (see Sanderson (1998) at http://www.ftc.gov/opp/global/sandersn.htm). Salop (1998) argues that the controversy in the U.S. has worked against the quantification of efficiency gains in merger analysis (at http://www.ftc.gov/opp/global/saloptst.htm).

A second important exception relates to quantifying coordinated effects[10]. While the 1992 U.S. *Horizontal Merger Guidelines* provide a detailed analytical model for assessing whether a merger is likely to substantially lessen competition through coordinated effects, there is little in the way of clear quantifiable criteria. There is a paucity of examples of coordinated effects cases where quantitative methods were successful in influencing the outcome.

5. **Advances in the Economic Theory of Market Structure and Horizontal Mergers.** The work of Salant, Switzer and Reynolds (1983)[11], and numerous subsequent contributions (for example, Willig (1991)[12]) has focused the analytical debate in a way that allows the effects of various quantitative estimates to be translated directly into policy implications. An example of how directly quantitative evidence can generate policy relevant outcomes is provided by the merger simulation model on the Internet at http://mss.math.vanderbilt.edu/cgibin/MSSAgent/~pscrooke/MSS/linearmerger.def. On this Internet site, the webpage demonstrates how price and output (unilateral) effects of a hypothetical horizontal merger can be easily simulated using certain assumptions that have been considered extensively in the theoretical literature.

   The same point can be made for the authorisation of trade practices. Understanding of the efficiency effects of trade practices has also advanced a lot, and in ways that are directly relevant to competition policy and authorisation decisions.[13]

The factors listed here influencing the marginal product of quantification are equally relevant to those jurisdictions (e.g. North America) employing a substantial lessening of competition test and those with a strengthening of a dominant position. They may be more applicable to static analysis of effects on market power and consumer prices than dynamic analysis that encompasses consideration of potential efficiencies over time in addition to market power.

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[9] See *Merger Guidelines: a guide to the Commission's administration of the merger provisions (ss50, 50A) of the Trade Practices Act*, Australian Competition and Consumer Commission.

[10] The term "co-ordinated effects" refers to conduct/trade practice that causes a market outcome that is different from that of a standard oligopoly (Cournot) outcome.

[11] Salant, Steven W., Switzer, Sheldon and Robert J. Reynolds, "Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium", *Quarterly Journal of Economics* Vol. 98, May 1983.

[12] Robert D. Willig,"Merger Analysis, Industrial Organization Theory, and Merger Guidelines" *Brookings Papers: Microeconomics 1991*, pp. 281-312.

[13] See p.6 of Roberts, Gary L., and Steven C. Salop, "Efficiencies in Dynamic Merger Analysis: A Summary" World Competition Law and Economics Review, 5, 1996, 5-17.

The analysis above of the effects of changes in the "price" and "perceived marginal product" are purely positive (i.e. not normative).[14] This may or may not maximize social welfare – i.e. the value of generating the "right" judgment with a higher probability, net of resource costs of collecting the evidence. A normative assessment is more complex. On the one hand, the changes in the private "price" are probably well aligned with the social cost. Changes in the marginal product, however, are potentially less well aligned with social incentives.[15]

Recent Cases

Over the past decade or so in North America, there has been a large volume of cases, in various areas of antitrust, that have used quantitative analysis to some degree. But the most dramatic change in the level of sophistication appears to have been in regard to cases involving the assessment of unilateral effects of horizontal mergers. These cases have been the subject of considerable recent discussion and debate by antitrust economists and practitioners in speeches and papers.

The discussion which follows draws heavily on the summary of these cases provided in Csorgo and Sanderson (1998).[16] For references to these and other cases, see the Annual Reports to Congress on Hart/Scott/Rodino, which for recent years can be found at: for 1998 http://www.ftc.gov/bc/hsr/98annrpt/hsr98annual.htm, and in the case of the year 1997, the link is http://www.ftc.gov/bc/hsr/97annrpt/ann972.htm, and in the case of the year 1996 the relevant link is http://www.ftc.gov/bc/hsr/96anrpt.htm.

1.1. U.S. Experience

Complete econometric modeling and simulations have been primarily undertaken in respect of mergers among branded-products firms. Both the Antitrust Division and the Federal Trade Commission have used these techniques. In addition, there is active use of these techniques by defendants, and also in private antitrust suits. Drs. Hausman and Leonard report using the "almost ideal" demand system and Hausman-Leonard-Zona merger simulation techniques in a number of consumer goods industries, such as beer, shaving cream, deodorants, ready-to-eat cereal, frozen breakfast products, cigarettes, cat food, soft drinks, facial tissue, bath tissue, baby wipes, and contact lens cleaners.[17]

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[14] Furthermore, we are commenting on "perceived" marginal product. In principle, especially where the reasons for judgments are often not as transparent as they might otherwise be, the agencies and interested parties may be investing in inputs that do not ultimately have as large an effect as initially anticipated. However, these agents are assumed to be well-informed and, as noted below, there have been numerous cases, and thus one would expect that the willingness of parties to invest in quantitative analysis indicates that it has a real effect on the private probability of winning.

[15] All other things equal and including the input choices of the opposition, it may be that both sides choose, in equilibrium, to increase their investment in quantitative analysis by an equal amount, and thus that the observed probability of either side winning, given these increased investments, is unchanged. But even then, the investment may lead to a large increase in private profit on the margin, given the level of investment by the other side.

[16] Lilla Csorgo and Margaret Sanderson, "Differentiated Products Mergers: Recent Experience in Canada and the U.S." Mimeo., Paper Presented at the Competition Law Section Meetings of the Canadian Bar Association, Ottawa, Ontario, September 24-25, 1998."

[17] See Jerry A. Hausman, Gregory K. Leonard and J. Douglas Zona "Competitive Analysis with Differentiated Products" 34 *Annales d'Economie et de Statistique* 159 (1994) and Jerry A. Hausman and

In the case of the Antitrust Division, Dr. Gregory Werden is an obvious and influential force behind simulations undertaken in cases related to bread, tissue, cosmetics, frozen sea food and ski resorts.[18] Three of these cases resulted in consent decrees.[19] In the first four of these cases, detailed scanner data on prices and quantities of the merging firms' brands and those of other competitors were used to estimate cross-price elasticities and own-price elasticities of demand. From this information, and other available information on pre-merger profit margins, the effects of the mergers on prices were simulated.

In the cases which were not challenged[20] the empirical evidence demonstrated that good substitutes existed for the products of the merging parties, and hence price increases post-merger would not likely be profitable, given the resulting lost business to these alternative products. In the case of Van de Kamp's acquisition of Mrs. Paul's, IRI[21] weekly data on 64 cities and regions for all "prepared fish products" by brand and for "prepackaged raw frozen seafood" over 108 weeks was analysed. The data were used to estimate individual firm demand and market demand. The results demonstrated that products outside frozen prepared seafoods were as good a substitute for the products of the merging parties as they were to each other. The data also revealed that consumers were highly sensitive to price increases. Together with the other evidence gathered in the course of the investigation, the Department of Justice decided not to bring a case.

Similarly, in the case of L'Oreal's acquisition of Maybelline, the Department of Justice chose not to challenge the transaction. Again, very detailed data were used to calculate own and cross-price elasticities. Nielsen ScanTrak data from mass-market outlets over 156 weeks for the entire U.S., for eight individual metropolitan areas, and for each brand and by outlet were analysed. The results indicated the merger would result in small price increases, if any at all. Furthermore, small differences in methodology mattered as to whether a price increase was predicted. When considered in the context of other information, particularly in relation to the prospect of entry or brand repositioning, the Department of Justice decided not to pursue the case.

Interstate Bakeries/Continental Baking Company

In contrast, the acquisition of Continental Baking Company by Interstate Bakeries Corporation resulted in the Department of Justice seeking divestitures of certain white bread brands and plants in five regional markets (Chicago, Milwaukee area, Central Illinois, Los Angeles area, and San Diego area). Continental is the largest

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Gregory K. Leonard "Economic Analysis of Differentiated Products Mergers Using Real World Data", *George Mason Law Review*, 5:3 (1997) 321.

[18] Werden has been instrumental in advancing use of the logit simulation model within the Department of Justice. See Gregory J. Werden and Luke M. Froeb "The Effects of Mergers in Differentiated Products Industries: Structural Merger Policy and the Logit Model" *Journal of Law, Economics and Organization* 10 (1994) 407.

[19] *United States v. Interstate Bakeries Corp.*, 1996-1 Trade Case. (CCH) ¶71,271 (N.D.Ill. 1996) (consent decree); *United States v. Kimberly-Clark Corp.*, 1996-1 Trade Case. (CCH) ¶71,405 (N.D.Tex. 1996) (consent decree); and, *United States v. Vail Resorts, Inc.* No. 97-B-10 (D. Colo. January 27, 1997) (consent decree).

[20] See Constance K. Robinson, "Quantifying Unilateral Effects in Investigations and Cases", *George Mason Law Review*, vol. 53, 1997 at 387. Van de Kamp was acquiring the assets of Mrs. Paul's in the frozen seafood case. In the cosmetics case, L'Oreal was acquiring Maybelline.

[21] IRI is a competitor in North America to AC Neilsen that collects and supplies data, particularly scanner data from retail outlets.

baker of fresh bread in the U.S. and the maker of the Wonder and Home Pride brands. Interstate is the third largest baker, producing brands such as Weber's, Mrs. Karl's, Butternut and Sunbeam. Economists within the Antitrust Division used IRI weekly data on the quantity sold and average price for each premium fresh bread product, along with data on eight variety bread groups to estimate the competition between different brands of premium white bread sold by the two parties. They found that consumers had a strong preference for white pan bread over other varieties and for premium white bread over private label white breads. In particular, the brands of Wonder and Butternut were very close competitors relative to other brands of white pan bread. Markets were found to be local because the firms could price discriminate and arbitrage was not possible.[22] Using certain assumptions about demand, simulations predicted price increases between 5% and 15% for Continental's and Interstate's premium white pan breads in the Los Angeles and Chicago areas. Entry was felt to be unlikely given the cost of establishing a premium brand.

Kimberly-Clark/Scott Paper

In the second challenged case, Kimberly-Clark's acquisition of Scott Paper Company was found to substantially lessen competition in the markets for baby wipes and facial tissues. Econometric analysis was focused on determining the extent of competition between the parties' brands in these two markets.[23] In the case of facial tissue, Kimberly-Clark has the leading brand, Kleenex, with a 48.5% market share. The second leading brand belongs to Proctor & Gamble, controlling 30% of the market. Scott's brand was considerably smaller, having a 7% share, but the empirical analysis revealed that the share figure understated Scott's competitive significance. The Scottie's brand was found to impose a significant constraint on Kleenex's prices. With entry found to be difficult, divestitures were required. For baby wipes, Scott and Kimberly-Clark were the two leading brands with almost 60% of the market post-merger. They were each other's primary competitor and the most significant constraint of each brand's prices. The next largest brand would have been seven times smaller than the merged entity.

While also an issue at the early stage of the Kimberly-Clark/Scott investigation, econometric analysis related to the market for bath tissue revealed that the parties were unlikely to be able to unilaterally raise price post-merger in this product. Bath tissue is worth noting to demonstrate the considerably different price projections which may be revealed when using different simulation techniques. Drs. Hausman and Leonard, who were retained by Kimberly-Clark, report price estimates ranging from a low of 2.4% to a high of 24.4% depending upon the technique employed.[24] Using the almost ideal demand system model, and a fully estimated system of own and cross-price elasticities Hausman and Leonard report a price increase in Kleenex's brand of bath tissue, before accounting for projected efficiencies, of only 2.4%. In an effort to demonstrate the fallibility of Professor Carl Shapiro's Diversion Ratio simulation technique when it is based on market share data,[25] they calculate

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[22] See Constance K. Robinson, "Quantifying Unilateral Effects in Investigations and Cases", *George Mason Law Review*, vol. 53, 1997 at 392.

[23] Kimberly-Clark produced the Huggies brand of baby wipes and the Kleenex brand of facial tissue, while Scott produced the Baby Fresh and Wash-a-Bye Baby brand of baby wipes and the Scotties brand of facial tissue.

[24] See Hausman and Leonard, *George Mason Law Review, supra* note 7, at 341-342.

[25] The Diversion Ratio is the fraction of the sales lost by Brand A, due to a Brand A price increase, that would be captured by Brand B. It is described in Carl Shapiro "Mergers with Differentiated Products" *Antitrust*, Spring 1996. Shapiro provides a variant on the Diversion Ratio based on cross-price and

post-merger price predictions of 24.4% for Kleenex using Shapiro's assumptions; namely, that the two products have the same own-price elasticities, cross-price elasticities, unit sales and price-cost markups. Without declaring whether the Hausman and Leonard estimate is the correct one, it is clear from this demonstration that the assumptions necessary to compute the simple price projections with market share as a proxy for the diversion ratio can lead to invalid projections. Indeed, the fact that the Department of Justice did not require any divestitures in bath tissue also reveals that their more detailed estimations did not project price increases anywhere close to 24%.

Vail Resorts/Ralston

The other case challenged by the Department of Justice where simulations were important relates to ski resorts.[26] Here the market of concern was that related to day or overnight skiers on Colorado Front Range resorts. There is a considerable difference in marketing, promotion and pricing to day skiers compared to destination skiers, which led to the more narrowly defined market. The geographic market for day or overnight skiers is limited to within a two and one-half hour travel time from their home. Vail and Ralston were found to compete directly for this set of skiers, and together would have controlled 38% of the skier days in the Colorado Front Range market post-merger. Like consumer branded goods, ski resorts are a differentiated product, given differences in terrain and amenities. Unlike the cases noted above, the simulations undertaken in this case did not rely on detailed scanner data as an input to calculating own and cross-price elasticities. Instead, the Antitrust Division used existing surveys of Front Range skiers in Colorado to estimate how many customers are likely to switch between Vail and Ralston resorts. Margin information was derived from the parties' accounting and marketing documents. A likely range of own and cross-price elasticities was derived from the survey information, the existing literature about the market for ski resorts, and market data on past price changes. Together with cost and demand information, Antitrust Division economists estimated post-merger prices would rise by 4% on average with higher price increases at the merging firms' resorts. This translated into an average lift ticket price increase of (US)$1.00 for Front Range customers. The remedy required divestiture of Ralston's rights, titles and interests in the Arapahoe Basin resort in Summit County, Colorado, one of the smaller resorts acquired.

The Federal Trade Commission (FTC) has also been making use of simulations in merger review. With the arrival of Jonathan Baker as the Director of Economics, it is perhaps not surprising that residual demand estimation has been used regularly at the FTC in simulating the price effects of mergers.[27] However, this technique is only appropriate in cases where the market may be characterized as one of a dominant firm and fringe rivals. Most of the cases noted here would not fall neatly into this characterization.

The most renowned of the FTC's quantitative analysis merger cases is that which was conducted in the case of Staples proposed acquisition of Office Depot. But before turning to this example, it is also worthwhile noting that the FTC has challenged cases related to the auction variant of the differentiated product merger

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own-price elasticities that is instead related to the firms' market shares pre-merger. The case has a number of extremely limiting assumptions.

[26] See the Competitive Impact Statement filed in this case.

[27] See Jonathan B. Baker and Timothy F. Bresnahan "Estimating the Residual Demand Curve Facing a Single Firm" *International Journal of Industrial Organization* 6 (1988) 283.

scenario discussed in the 1992 Merger Guidelines. This case is considered before Staples.

Rite-Aid/Revco

The stylized model used in the auction variant requires several assumptions: indivisible goods; capacity constraints so that buyers are forced to purchase from multiple sellers; and, "all or nothing" offers on the part of sellers. In such a setting, a merged firm may have an incentive to raise price post-merger knowing that if a buyer chooses not to purchase the merged firm's expanded capacity the buyer must turn to a less desirable (i.e. higher cost) alternative seller. Under such a scenario, even small increases in concentration can generate considerable price increases. The FTC challenged the merger of Rite-Aid and Revco, the two largest retail pharmacy chains in the United States using this theory, claiming that the merger would raise price to managed care providers offering pharmacy benefits.

When providing pharmacy benefits to employers, managed care providers face a trade-off between having a large network of participating pharmacies, which allows for convenience or a smaller network which may provide for better pricing. Typically, employers resolve this conflict in favour of convenience. As a result, managed care providers prefer to have at least 60% of the pharmacies in a given town participate in the plan and to have these well distributed throughout the town's neighbourhoods. Given this, managed care providers favour larger pharmacy chains over smaller chains over independent pharmacies. Managed care providers typically hold an auction seeking bids from pharmacies to participate in the plan's network. The ability to negotiate a low price turns on the alternatives available to the managed care provider. In this case, the FTC was concerned that the combined Rite-Aid/Revco could make "all or nothing" offers to managed care providers to participate in their networks. Without the participation of Rite-Aid/Revco, a managed care provider would be required to turn to less desirable alternatives – i.e. a larger percentage of smaller chains and independent pharmacies. As a result, the merged entity would be in a position to unilaterally raise price to the detriment of managed care providers and ultimately consumers.

Staples/Office Depot

We will now turn to discussion of the proposed merger between Staples and Office Depot. Had this merger proceeded it would have combined two of the three office superstore chains operating in the United States. Fundamental to the case was the extent to which other suppliers (e.g. warehouse clubs) competed with office superstores. Baker reports that Staples' internal documents showed that prices were lower in markets where there were two office superstores as compared to only one, and that competition from other retailers was not relevant to the prices set by office superstores.[28] In blocking the transaction, the court found that office superstore chains are the primary competitive constraint on each other's pricing.

The case is significant in that it is the first time the government has presented simulation analysis in the courts. Both sides of the case undertook extensive econometric studies of pricing, margins, revenues and the extent to which cost

[28] See Jonathan Baker, "Econometric Analysis in *FTC v. Staples*", Prepared Remarks before the American Bar Association's Antitrust Section, Economics Committee, July 31, 1997 [Revised March 31, 1998].

savings had historically been passed through to consumers. There was an incredible volume of data – weekly price and quantity data on individual stock-keeping units (SKUs) and a price index for 400 Staples stores for more than 40 cities over an 18 month period, resulting in hundreds of thousands of observations. Interestingly, the decision of the court, while finding in the FTC's favour, and granting the preliminary injunction, does not refer directly to the econometric analyses. Depending upon which side of the case one is on, this has been interpreted as the court's "hidden opinion" supports the government's use of econometric evidence[29] versus econometric studies cancel each other out and courts will always turn to the documents.[30]

On the government side, two econometric studies were presented: (i) a systematic empirical study of Staples' pricing practices across time and cities; and, (ii) an econometric study of the rate at which Staples had historically passed through cost savings to consumers through lower prices. The parties also presented several studies: (i) an alternative empirical study of Staples' pricing practices over time; and, (ii) an econometric study of the determinants of Staples' gross price-cost margins and the effect on Staples' revenues of nearby store openings by possible rivals.

The FTC's econometric study used reduced-form price equations to describe Staples' pricing practices in 400 stores across 40+ cities for 18 months. Monthly aggregates of prices were examined and related to market structure and concentration. In particular, the effect of nearby Office Depot stores on Staples' pricing practices was analysed. The FTC also simulated the merger's impact on pricing under two different scenarios: (i) treating the merger as closing all Office Depot stores; and, (ii) treating the merger as converting Office Depot stores to Staples outlets. The results of the FTC analysis supported the internal documentation – namely, that Staples' prices were substantially lower where Staples competed with Office Depot. The simulation results predicted the merger would raise the price of a selected group of office supplies seven per cent on average, and double this for an index of "price sensitive" items.

The parties' econometricians were sharply critical of the FTC empirical work, on a number of grounds. For instance, the FTC argued that comparison of one geographic location with two office superstores to a different geographic location with one office superstore could provide a reliable estimate of the effect that a second office superstore has on pricing. This comparison does not hold constant any other economic factors that differ across the two geographic locations.[31] To correct for this, the parties' econometricians undertook a different analysis. They estimated the effect of adding a second office superstore chain to an area with only one office superstore using the historical record of previous entry. In response to this criticism, the FTC argued that the "fixed-effects" analysis undertaken by the parties had its problems as well; namely, that the analysis tends to exaggerate any "errors-in-variables" bias, which can bias the price estimates downward. For example, if the parties misidentified the opening date for the second office superstore, or weighted nearby and distant office superstores improperly, this would lead to inappropriate price estimates. Claiming to correct for these deficiencies, the FTC's simulations

[29] Jonathan Baker, "Econometric Analysis in *FTC v. Staples*", Prepared Remarks before the American Bar Association's Antitrust Section, Economics Committee, July 31, 1997.

[30] See Jerry Hausman and Gregory Leonard, "Documents versus Econometrics in *Staples*", *mimeo*, available at www.antitrust.org.

[31] The FTC recognizes this. Nonetheless, having compared prices across stores and prices across time, the FTC concluded that the cross-section analysis dominated the time-series in its explanatory power of pricing.

suggested price increases post-merger of 7-9%, while the parties' simulations suggested increases of only 1%.

Unfortunately, the court's opinion provides little guidance to either antitrust economists or litigators on what is the best approach. The parties' experts view this as a canceling out of the econometric studies, and a return by the court to an examination of the documents. From a reading of various "post-Staples" articles, it is clear that both sides viewed the process as in need of some reform. Interestingly, both the FTC and the parties' economists make calls for an improved and fuller exchange between the two sides of the data, assumptions, methodology and econometric analysis undertaken. Both sides also call for a narrowing of the issues to be decided, and accuse the other side (explicitly[32] and implicitly[33]) of an obfuscation strategy. Finally, the case provides further confirmation that econometric analyses will be more persuasive when key modeling choices are consistent not only with economic theory but also with the documentary and other evidence available about the market, and tested against plausible alternatives.[34]

1.2. Canadian Experience

Economists within the Canadian Competition Bureau have estimated cross-elasticities, diversion ratios, and the price effects of a merger in a bidding model in a number of cases. Here, we will describe the experience in four cases.

Kimberly-Clark/Scott Paper

The factual setting of the merger between Kimberly-Clark and Scott Paper was generally similar in Canada to that in the U.S. (discussed above). Like the U.S. the competition analysis focused on the extent to which the merging parties' brands of baby wipes, facial tissue and bath tissue competed against each other compared to their rivals' brands, especially private-label brands. In addition, both Scott and Kimberly-Clark were large producers of industrial wipes in Canada, which are used in various manufacturing processes. In the end, three products were found to present significant competition problems: baby wipes, facial tissue and commercial wipes. In the case of baby wipes, Scott and Kimberly-Clark were the only significant branded products available, with remaining competition coming from private labels. Similarly, in facial tissue the parties were the two largest players, with Proctor & Gamble a distant third followed by private labels.

As noted above, the primary issue for the retail products was the extent to which private labels disciplined branded products. Third party contacts indicated that the private labels were not close enough substitutes for the parties' brands to prevent

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[32] See Hausman and Leonard, See Jerry Hausman and Gregory Leonard, "Documents versus Econometrics in *Staples*", *mimeo*, available at www.antitrust.org.

[33] See Jonathan Baker, "Econometric Analysis in *FTC v. Staples*", Prepared Remarks before the American Bar Association's Antitrust Section, Economics Committee, July 31, 1997. Baker notes that ". . . *criticism of an econometric or simulation methodology should be treated with skepticism absent a demonstration that a reasonable alternative leads to a substantially different result, where such an analysis is possible*. In situations where the effect of the questioned methodology cannot be determined quantitatively, the party criticizing the other side's analysis should explain both why the other side's approach is inappropriate and why it is plausible that the difference between the inappropriate and preferred approaches is substantial."

[34] Baker makes this observation, as another key lesson, *Id*.

post-merger price increases. Consistent with this, an external economist working with a non-merging party presented econometric evidence to demonstrate that, in facial tissue and baby wipes, the merger would combine the two closest brand substitutes, and hence was likely to lead to a significant rise in prices. Using scanner data of weekly purchases of the various brands over an 18 month period, the expert estimated own-price and cross-price elasticities. Rather than undertaking full merger simulations, the expert presented numerical examples to demonstrate the profitability of possible price increases post-merger.

Within the Bureau, the internal economist attempted to replicate the analysis using the raw data provided by the expert. A number of problems arose in this context, not least of which was the inability to predict the pre-merger pricing behaviour of the parties given the estimated own and cross-price elasticities. In the end, various other events superceded the economic analysis and no further internal econometric work was undertaken. Instead, reliance continued to be placed on the traditional documentary and market contact evidence. In the end, Scott decided not to pursue the merger in Canada and the Scott Canada operation was sold to Kruger along with the brand names, with the exception of the baby wipe business which was divested in both Canada and the United States to Proctor & Gamble.

Archer Daniels Midland/Maple Leaf Mills

As a result of its acquisition of Maple Leaf Mills' wheat flour mills in Calgary, Port Colborne and Montreal, Archer Daniels Midland ("ADM") was required to divest one mill in Montreal through a consent order. The order also required certain supply obligations by ADM to the eventual purchaser of the divested mill. The remedy was aimed at resolving the substantial lessening of competition in the supply of bulk hard wheat flour in Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland ("Quebec/Atlantic Canada") which would likely arise from the merger. In the Director's view if the transaction were permitted to proceed as structured, ADM would likely be able to significantly raise prices for hard wheat flour in Quebec/Atlantic Canada and consumers in these locations would likely pay more for bread and other related bakery products. In Ontario, the Director concluded that the U.S. Milling Company in Buffalo would be a significant competitive presence in the foreseeable future. The Competition Bureau also did not find that the merger would substantially lessen or prevent competition in Western Canada in part due to planned or actual expansion by other flour mills in this market.

To reach the above conclusions, a tremendous amount of economic work was undertaken by all sides to clearly delineate the relevant geographic market. At issue was whether U.S.-based mills are cost-competitive with Canadian flour mills and, hence, if the parties attempted a price increase post-merger, entry of American flour would make this ultimately unprofitable, so that it was unlikely that a price increase would be pursued. In addition to this work, however, the Bureau's external expert also estimated the likely price effects of the merger using a bidding model. While flour is not a highly differentiated product, the flour mills are geographically dispersed and hence the parties are spatially differentiated, along the lines discussed in the U.S. Merger Guidelines variant model. The bidding model used was relatively simple in that it assumed one-period Cournot competition amongst independent, non-cooperative firms with equal access to information. In the bidding context, this translates into firms using Nash bidding strategies based on knowledge of their own costs and their expectations of their rivals' costs. The model was run with the pre-

merger number of players to predict price levels, and then rerun with the merger removing one player for various geographic locations – i.e., a hypothetical buyer in Vancouver, Calgary, Toronto, Montreal and Halifax, respectively.

In the case at hand, the Bureau had reasonably good information on firms' costs. In addition, the technology employed in the flour milling industry is well established and hence there is relatively little variation between firms. While any one firm's expectations of another rival's costs could not be known with certainty, it was assumed that these were based on predicted shipping costs given the relative homogeneity amongst firms' variable cost structures. In such a setting, the predicted price increases are highly dependent upon the number of players bidding. Typically it is only when the number of firms approach small numbers, such as three, that one finds any significant change in price levels.

The model was reasonably good at predicting pre-merger price levels, and supported the other findings of the case in that the highest predicted price increases post-merger would occur in the Quebec/Atlantic Canada market. While generally supportive of the other evidence and economic analysis undertaken, the results of the bidding models were not presented to the parties for a number of reasons. First, there was skepticism that a bidding model was appropriate at all, given that prices are typically negotiated between purchaser and supplier, rather than having a purchaser's requirements put out to tender. Large purchasers did, however, seek the best price from a variety of suppliers. Second, the model assumes that firms do not learn from each other over time, such that they adjust their bidding strategy. Finally, there was considerable discussion over the accuracy of estimated shipping costs, which were where the vast majority of economic estimation time and effort was focused. To engage further discussion over the results of the bidding models was felt to divert debate from the narrowly defined issue of relevance.

Guinness/Grand Metropolitan

Prior to the recent analysis of bank mergers, the most extensive internal econometric analysis undertaken occurred when examining the merger between Guinness plc and Grand Metropolitan plc. Both companies manufacture a wide variety of distilled spirits, where multiple brands are aimed at different consumer tastes. The merger was examined in several jurisdictions, including Europe and the United States. Two types of distilled spirits were at issue in Canada: gin and scotch.

Unlike many cases that the Bureau is faced with, there was an extraordinary amount of high quality data on prices and quantities sold, in part due to the provincial regulatory environment in Canada. The data was comprised of bi-weekly price and sales information, broken down by province, on hundreds of brands (in excess of 500), by stock-keeping unit (SKU) over three years. The sheer quantity of data meant that a great deal of preliminary work was undertaken before any analysis could be attempted.

The first task was to order the products in some fashion. Depending upon the grouping (i.e. denominator) chosen one could go from no competitive concerns (no single brand had a market share in excess of 5%) to a virtual monopoly. This is the classic problem of market definition – if a market is defined to be high-end fountain pens then a merger involving Mont Blanc and Schaeffer may be problematic for

antitrust authorities, unlike a situation where the market is defined to be writing instruments and there are ample alternatives available post-merger. What is often not discussed in the literature on simulations is that large data-sets of the type dealt with here and typically provided with scanner data necessarily entail some form of product groupings in order to be tractable. Neither the parties nor the competition authority have the resources or time available to compute cross-elasticities of demand on 500+ brands.

To begin, data on special orders and products sold infrequently was deleted from the sample. Then the remaining data was aggregated into groups or categories. It was initially assumed that gin was distinct from scotch for several reasons. First, internal corporate documentation and industry practices supported product markets no broader than internationally recognized spirit categories – i.e., gin, vodka, whiskey, rum, tequila. Second, absolute price differences and price correlations between spirit categories supported product boundaries along spirit categories. Finally, previous econometric work in the literature supported a division between "white" spirits versus "brown" or aged spirits, such that gin and scotch would not be in the same product market.

In Canada, one of the effects of a regulatory environment which set minimum prices in various provinces was that little price differential existed between imported or "London Dry Gin" and other types of gin. As a result, the data on gin sales in Canda were treated as a single group. Within this category, the parties owned the Bombay Sapphire, Gordon's and Gibley's brands, with Beefeater providing strong competition along with Seagram and other rivals.

In contrast, the scotch market in Canada appeared to be divided into three categories: single malts and long-aged blends (i.e. high-quality); blends typically aged three years (i.e. medium-quality); and, blends which are unsupported by advertising (i.e. low-quality). A graph of the data revealed clustering of brands around three proximate price-points which was consistent with corporate documentation and market contacts. Having made this assumption, the parties were found to compete only in the medium-quality scotch category where their individual brands would represent in the order of 60% of the market post-merger followed by Allied's Ballantines brand, and several smaller brands.[35]

Next, a decision was needed on whether to undertake a full time-series, cross-section analysis using dummy variables for each of the provinces (this approach would allow greater degrees of freedom, but would necessarily reduce the total amount of time-series data to smallest available among the provinces) or alternatively, to do individual time-series analysis for each province. The rationale for the latter approach is that some provinces, notably Quebec, demonstrated distinct differences in taste and pricing from others. In light of the time pressure, it was decided to run time-series analysis on individual provinces and to focus initially on the largest provinces.

The analysis then assumed two-stage budgeting, where it is assumed that any individual's purchases among the three quality categories will be affected by the average price in any single category. Thus, it is assumed that if the price of J&B scotch increased post-merger, consumers would substitute to other brands within the

[35] The parties owned the Johnny Walker Red, J&B, and Dewar's labels in the medium-quality category. While each party owned other brands in the high-quality and low-quality categories, they did not have overlapping brands in these categories.

medium-quality category, but that the effect on other high-quality and low-quality brands would be the same as if the price increase had occurred in any other medium-quality scotch.

One of the assumptions key to making this work tractable is the division of brands into various categories. This can be highly contentious and it is possible to get different results depending upon the groupings chosen. In order to check the appropriateness of the chosen categories, price correlations amongst all scotch brands was undertaken and used as a check to ensure that the division of brands into the three categories was justifiable.

The Bureau economist replicated some econometric results submitted by outside consultants and undertook independent analysis based on the AIDS model.[36] Three-stage ordinary-least-squares regression analysis on the individual brands within the medium-quality scotch category was completed, using a weighted price indicia of the combined high and low-quality groups of scotch as the instrumental variable. Market shares are actually regressed on shares and transformed into pairwise cross-price elasticities following certain formulas found in the economics literature.

Ideally one would use these own- and cross-price elasticities in a simulation similar to that described above. However, in the interests of proceeding expeditiously, one might also be interested in what the ordinal ranking of substitutes is for any single brand. From this information one can calculate diversion ratios from raising the price of one of the parties' brands. This requires forcing some form of oligopoly structure on the model in order to transform the elasticities into a price effect. If one uses raw elasticities then one is assuming that the other firms are passive in their reaction to any single firm's attempts at raising price. In this case, the elasticities were weighted by market share. Thus, notwithstanding a high cross-elasticity, if the second product has a very low market share, then one gets a low diversion ratio. Sensitivity analysis should be undertaken at this stage to test whether the group categorization has been appropriate.

The econometric conclusions were consistent with the other available evidence from internal documents and field contacts; namely, that the parties faced significant competition from Ballantines in scotch and from Beefeater in gin. Notwithstanding the Canadian result, the transaction was altered worldwide, stemming from an FTC consent order which required the parties to divest the Dewar's and Bombay Sapphire brands on a worldwide basis. These were ultimately purchased by Bacardi. In the United States, the strength of the various brands was different from that in Canada, and the merger was one of merger to near monopoly in gin and medium-quality scotch (referred to in the U.S. as "premium" scotch).

Bank Mega-Mergers

On January 23, 1998, Royal Bank of Canada and Bank of Montreal announced their intention to merge. This was followed in April, 1998 with the announcement that Canadian Imperial Bank of Commerce (CIBC) and Toronto-Dominion Bank (TD Bank) would also merge. With only six national banks in Canada, the proposed mergers of four of the players would clearly qualify as "bank mega-mergers". All four

[36] Angus S. Deaton and John Muellbauer, "An Almost Ideal Demand System" *American Economic Review* 1980 and Richard D. Green and Julian M. Alston, "Elasticities in AIDS models: A Clarification and Extention", *American Journal of Agricultural Economics*, August 1991.

institutions had significant retail branch networks and derived considerable revenue from investment banking, retail brokerage, credit card services and insurance.

On December 14, 1998 the Canadian Minister of Finance announced that he would not allow the bank mega-mergers to proceed because they were not "in the best interests of Canadians. The mergers would lead to an unacceptable concentration of economic power in the hands of fewer, very large banks. They would result in a significant reduction of competition. And they would reduce the government's policy flexibility to address potential future prudential concerns."[37] The Minister's decision was based upon his own department's analysis along with independent reports received from the Superintendent of Financial Institutions on prudential issues, and from the Director of Investigation and Research, Competition Bureau on competition effects.

One component of the Competition Bureau's assessment was an econometric study used to determine the product and geographic markets. The merging parties also employed econometrics.[38] Little information has been publicly released concerning the Bureau's analysis. However, counsel for the Canadian Imperial Bank of Commerce ("CIBC") has indicated that their econometric analysis used a very detailed data base proprietary to the merging parties, and specifically allowed for a more expeditious identification of problematic products and geographic locations. In turn, this allowed the client, counsel and economic experts to focus on detailed analysis of a more limited number of markets.

One of the transactions considered in the contect of the bank mega-mergers involved two Canadian banks – CIBC and Toronto Dominion (TD). In the examination of this transaction, econometric analysis was used to determine the extent to which competition within the particular product and geographic markets had an economic and statistically significant impact on price behaviour. This work enabled the analyst to closely examine the relationship between local measures of competition and pricing for particular products and services in particular regions. It also provided insights into the extent to which geographic markets are localized for particular products or services. Similar to U.S. studies undertaken, the results of the Canadian work indicated that while higher concentration ratios are associated with lower interest rates on deposits and higher interest rates on loans the estimated effects of concentration are relatively small in size.[39] Counsel also indicated that econometric evidence would have been useful in determining which divestitures would have been viable remedies, had negotiations with the Bureau been pursued.[40]

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[37] Statement by the Honourable Paul Martin Minister of Finance on the bank merger proposals.

[38] Lawson A. W. Hunter, Q.C. briefly discussed the econometric analysis undertaken by Charles River Associates, Toronto in respect of the CIBC/TD transaction at a presentation of the American Bar Association, Financial Markets Group on February 24, 1999 in New York.

[39] Lawson Hunter relayed this result at the February 24th presentation (Id.). The U.S. studies that have found similar results include Allen Berger and Timothy Hannan (1997) "Using Measures of Firm Efficiency to Distinguish among Alternative Explanations of the Structure-Performance Relationship" *Managerial Finance* 12, pp. 6-31; Timothy Hannan (1991) "Bank Commercial Loan Markets and the Role of Market Structure: Evidence from Surveys of Commercial Lending" *Journal of Banking and Finance* pp. 133-49; Allen Berger and Timothy Hannan (1989) "The Price-Concentration Relationship in Banking" *Review of Economics and Statistics*, May, pp. 291-99; and Paul Calem and Gerald Carlino (1991) "The Concentration/Conduct Relationship in Bank Deposit Markets" *Review of Economics and Statistics*, May pp. 268-76.

[40] Lawson Hunter, February 24th presentation, *Id.*.

1.3. Quantitative Analysis by Means of Modelling: A New Zealand Case

A recent clearance investigation by the Commerce Commission had as input quantitative information derived from a model.[41] It illustrates the benefits and detriments of the approach, and of its application. TransAlta Corporation of Canada clearance to purchase Contact Energy Limited from the Crown. The application involved assessing competition in the gas, retail electricity and wholesale electricity generation markets. The "Dublin" model was used to investigate the implications of the merger in the physical spot market for wholesale electricity, and the analysis of this market is the only aspect of the application that is considered.[42]

The generators' market shares are variously reported as[43]

	PHB[44]	TransAlta 1998[45]	TransAlta 1998 Less Comalco
Mighty River Power	13%	10%	11%
Genesis Power	19%	7%	8%
Meridian Energy	27%	36%	27%
Contact Energy	29%	27%	31%
TransAlta	6%	12%	13%
Trustpower		3%	4%
Other	6%	5%	6%

The figures that exclude the Comalco energy are relevant because this energy is subject to a long term contract and is outside the New Zealand Electricity Market (NZEM) wholesale spot market. Thus wholesale price discovery will be largely independent of this energy.[46]

The proposed merger, at least in the wholesale market, meets the Commerce Commission's first safe harbours (40% market share of the merged entity) unless the Comalco contract is removed. It certainly meets the second Commission threshold of 60% plus at least 15% for the next largest firm. Based on their data, PHB report increases in the Herfindahl-Hirschman (HH) index[47] for the merger of

624 based on TransAlta data, and

440 based on the Dublin model's outcome market shares

that PHB suggest indicates that the merger should be of concern.[48] Based on the U.S. Department of Justice quidelines that use this index PHB (sec. 2.1.10) consider that because the index is above 1800 whether or not there is a merger there are potential market power concerns. Note that if market shares were all equal the HH index would reach its minimum value for this number of firms of approximately 1500. The quantitative impact of the potential merger on the prices and quantities of the spot market was evaluated by means of a game theory model of the operation of the

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[41] Commerce Commission Decision 340 (12 February 1990): Determination pursuant to the Commerce Act 1986 in the matter of an application for clearance of a business acquisition involving TransAlta Corporation of Canada and Contact Energy Limited. The application was authorised.

[42] The Dublin model was developed by the Electricity Corporation of New Zealand. It was applied by Putnam Hayes & Bartlett – Asia Pacific Ltd. (PHB) for the Ministry of Commerce.

[43] The current names of the generators are reported here.

[44] Based on capacity in early 1999.

[45] These data include the introduction of Contact Energy's Otahuhu plant.

[46] It is not entirely independent because NZEM provides reserve in the event Manapouri cannot deliver the energy contracted for.

[47] See Carlton, Dennis W. and Jeffrey M. Perloff , *Modern Industrial Organisation,* Harper Collins, 1994, p.344.

[48] This index is the sum of market shares expressed in percent (See Carlton, Dennis and Jeffrey Perloff *Modern Industrial Organisation* Harper-Collins, 2nd. ed., 1994, p.334). PHB (sec.2.1.10) do indicate that market power indices should be interpreted with care as they may not predict industry performance well.

spot market, the New Zealand Electricity Market.[49] It was calibrated so that its inputs captured in a simple way the generators supplying electricity to NZEM.[50] The model incorporates a demand curve for each Island[51] allows generators to have different costs[52], and assumes that the generators compete with each other in the wholesale spot market.[53] The model provides generator production choices for each of 52 weeks, and for peak, shoulder and low levels of demand: in so doing generates a market price and quantity produced for each week for one year and for each demand level. It did not allow for any efficiencies arising from the merger and therefore is an attempt to quantify detriments only.

The model was run with and without the merger of Contact Energy and TransAlta. It concluded that if the two generation sets were to merge output would fall somewhat and wholesale electricity prices would rise by an order of 4-5%. While this "simulation" of a market was, in the New Zealand context, an innovative input to the Commerce Commission's decision, it did not entirely capture the essence of the circumstances. Nevertheless, the approach of quantification by means of a model made assumptions explicit and allowed exploring the effect of changes in them.

The model assumes that generators compete strategically by choosing generation levels in a way that takes account of the best response of other generators who are behaving the same way; economists know it as Cournot competition. Other forms of competition may lead to other outcomes.[54] In particular, if interaction in the market is based on price competition subject to (perhaps short term) capacity constraints pricing occurs closer to cost and there would be a, much smaller price difference resulting from the merger. Game theory and experimental economics both suggest that the nature of the competition changes as numbers of market participants change and this is not captured in the model: co-ordination becomes rapidly more difficult as numbers of market participants increase from very low levels. Outcomes approaching vigorous competition can occur with very low numbers of participants, depending on the circumstances.

The incentive for competition to take place under Cournot strategic behaviour requires checking for consistency. In many circumstances, profits for the merged entity may be lower under Cournot competition than if the merger did not occur[55]:: in which case either a merger would suggest that the players would not make bids according to Cournot behaviour, or the merged firm intended to allow the two generators to compete as separate divisions. In fact, in certain circumstances, if under Cournot competition a merger would be profitable and raise the price, then it will be welfare enhancing.[56]

The simulation does not permit the entry of generation plant in response to higher prices. Entry is explored by PHB by adding a 350MW plant to Genesis Power, and a

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[49] Also, NZIER use a model from Energy Link Limited to estimate price effects of a merger.

[50] Supplying the reserve market was not included. The game is run as a repeated one-shot game with generators having full knowledge of all firms' costs.

[51] The demand curve is for each Island and it is a linear approximation to a constant elasticity demand curve with an inelastic elasticity of –0.35.

[52] Hydro generators' costs are determined by the opportunity cost of storage.

[53] A certain proportion (20%) of the market is locked up by retail customers who will not shift to other suppliers. This is held to represent devices that insulate the generators from the spot price: that is, hedges or long term contracts or vertical integration.

[54] For a discussion of this see http://www.antitrust.org/economics/mergers/simulation.html.

[55] In fact a submission of Hydro Energy Limited states that in the PHB model profits would decline for the merged entity.

[56] See Proposition 5 of Farrell, Joseph, and Carl Shapiro, "Horizontal Mergers: An Equilibrium Analysis", *American Economic Review*, 80, 107-126, 1990.

new entrant, and re-running the model. A similar price differential was found for the merger if Genesis Power expanded capacity, but a much smaller difference occurred with a new entrant: also, the price level declined with entry (PHB sec. 6.1.1). This analysis nowhere approaches the central issue associated with the potential for entry. If pricing under Cournot competition generates excess profits it will draw entry and if entry occurs incumbent profits will fall. Under this scenario generation offers by incumbent generators into NZEM will anticipate entry and attempt to dissuade it by lowering the price attached to offers: these offers will not be in accord with Cournot pricing. In short, the threat of entry strikes at the basis of the simulation model itself: (the threat of) entry implies pricing that is closer to cost with and without the merger. As already mentioned, price competition would almost certainly lead to a much lower price differential resulting from the merger.

The similar outcome associated with the Genesis Power expansion obliquely illustrates that any market power effect stems from numbers of industry players, as opposed to the relative sizes of the plant, at least for the distribution of capacity reported here. To illustrate this, consider the PHB statement (sec. 6.3.2) that the merger of TransAlta's generation capacity with that of Genesis yield's a similar merger-price effect. Interestingly, the change in the Herfindahl-Hirschman index is much less (168) than for the Contact-TransAlta merger (648)[57], confirming that the index is not a good predictor of industry outcomes.

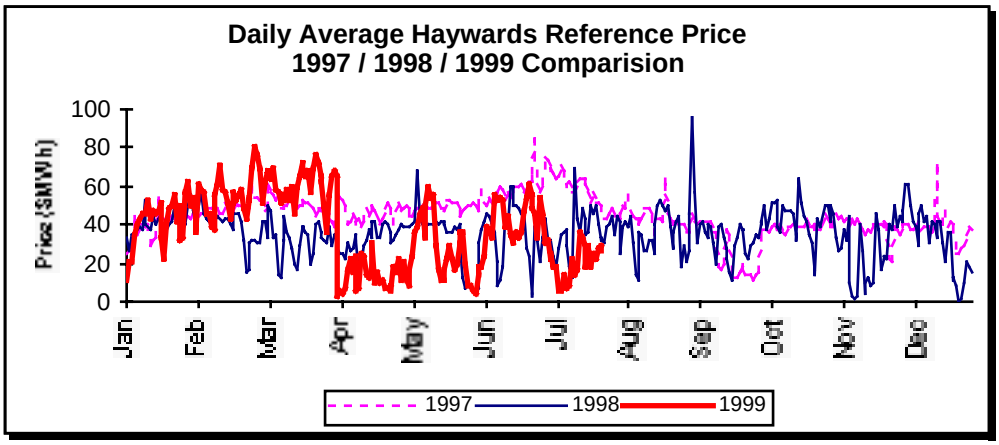
The discussion of this case is concluded by noting the change in the wholesale price of electricity that took place on April 1 with the advent of two additional players in the market. The following figures suggest that the pricing process has changed a lot. A detailed examination would require controlling on factors such as the weather and available capacity, as well as time for the market participants to adjust to the new circumstances. Nevertheless, there is some indication of an increase in volatility and a lower price level in the market with the expansion of the number of players. Private ownership can be expected to bring more vigorous competition as well. The volatility indicates that even with a frequently-measured market such as NZEM, determining whether the average price has changed since 1 April due to the changed industry structure would require econometric analysis.

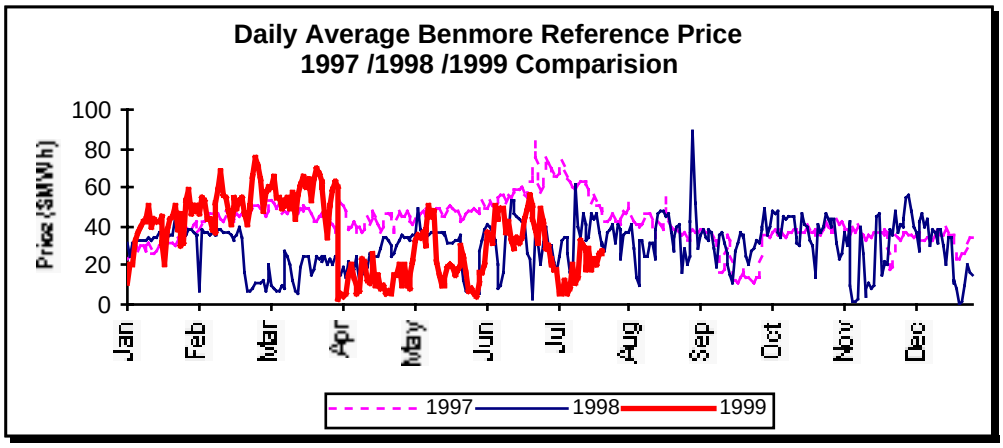
This analysis of the PHB wholesale-market study of the potential Contact/TransAlta merger illustrates that market outcomes are critically affected by the specification of models, including behavioural assumptions. Critics of game theory have argued that a weakness of it is that seemingly minor variations in assumptions can predicate quite different outcomes. It may be that the performance of markets is, in fact, very sensitive to the details of the institutional structure of these markets.[58] If so, then the sensitivity exhibited by models does not vanish because models, or quantification are not used in decision making: rather, lack of modelling and/or quantification may simply imply decisions based on instinct rather than a fuller appreciation of the alternatives. Nevertheless, although modelling and quantification costs are falling, the most detailed, and hence expensive, analysis may not be cost effective.

[57] Based on the data that include the Otahuhu plant.

[58] It is for this reason that there is such interest in studying the details of electricity pool markets. These markets vary in their detail, and thereby provide an, almost controlled, experiment in relating performance to market design.

Wholesale Electricity Prices





Final Comment

As it becomes possible to quantify price effects with increasing precision, there will be increasing pressure in the U.S. to quantify efficiencies as well. Whether a trade-off analysis (to assess the net effect of price effects and efficiencies) is done informally, or more explicitly as would occur under the Australian *Trade Practices Act*, the Canadian *Competition Act* and the New Zealand *Commerce Act*, a more precise estimate of a price effect puts pressure on for more exact estimates of potential efficiencies that a merger would likely generate in order to achieve better overall decisions. The advances made to date in assessing efficiencies pale, however, compared to the advances made in quantifying the likely scope of market power (judging at least from the publicly available information on recent Canadian and U.S. cases).[59] This is at least in part due, however, to the fact that a price standard is generally used in U.S. merger cases, and difficulties that have been encountered in implementing the explicit efficiency tradeoff in Canada. As the trend toward increased use of quantitative analysis develops, the pressure to quantify efficiency effects may translate into changes in the results of antitrust cases in North America and elsewhere. In the U.S.A. there is some sign that the efficiencies defense will play an increasing role.[60]

The improved understanding of price effects contribute to an appreciation of static efficiency implications, but more analysis is required to encompass dynamic efficiency. Although some account of dynamic efficiency is reflected in studies that incorporate efficiencies, judgements about processes that facilitate dynamic efficiency are required if these longer-term effects are to be taken into account. In this respect, the general evidence provided by economic literature on the performance of institutional market structures may be useful input. For example, quantitative estimates of efficiency differences due to competition may contribute to decisions about authorisations.[61]

As with cost-benefit analysis most generally, quantitative analysis provides information on a logical basis to decision making. It forces specific assumptions to be made apparent and it allows variation in these to be explored. As cases reviewed illustrate, it can change the nature of the debate. Rather than appeal to documentary and market information when quantified results and experts conflict, the debate turns to an, often detailed, evaluation of the bases and credibility of parties' evidence.

Also, in common with cost-benefit analysis, *ex post* evaluation of decisions is extremely difficult, whether or not based on quantified information. Whereas the *ex ante* analysis for authorisation embodies counterfactuals, and assumptions and expectations about the future, *ex post* analysis evaluates outcomes in the context of realisations of factors that are taken as given or at their expected level in the *ex ante* analysis. Some of these *ex post* realisations may affect the outcome of an authorised activity as against its counterfactual, thereby potentially rendering an *ex post* outcome that is detrimental to the authorised activity. Welfare may go up or down

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[59] Even the degree to which some forms of efficiencies (e.g. network effects, changes in business organization such as increased use of hub-and-scope networks) can be quantified is an open question. Just as price effects are inherently more difficult to quantify in some fact situations, one would expect that the ability to quantify efficiencies would depend on a specific fact situation as well.

[60] See Robert Pitofsky, Chairman of the Federal Trade Commission at http://www.ftc.gov/speeches/pitofsky/pitofeff.htm.

[61] Pickford *op cit* makes this same point.

following any particular authorisation, even if on average the authorisation process improves economic efficiency. It is for this reason that it is only possible to assess the authorisation process on the basis of a range of studies that have been carried out in detail. [62]

Advances in electronics and allied industries are transforming markets and organisations. Indeed, the very process of change is affecting competition in ways that are relevant to competition and regulatory policies.[63] These changes also make the future more uncertain. Relationships that have been estimated from data may not hold in the future. Despite increases in the amount and sophistication of quantification, authorisations will continue to require judgement.

However, the nature of debate about conflicting evidence is changing with increased quantification. Rather than treat conflicting quantified evidence as uninformative and simply rely on documentary evidence and market information, an authorisation may turn on the quality of the empirical evidence and any presumptions that affect the empirical approach. Concomitantly, increasingly sophisticated economic and qnantitative analyses will be productive in authorisations.

The recent trend of an increase in the amount and sophistication of quantitative evidence introduced in antitrust cases, or authorisations, appears likely to continue because economic understanding is progressing and the information-based technological change is continuing unabated: these are lowering the real price of quantification.

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[62] Leask (Andrea Leask, Public Benefit Test Evaluations Under The Commerce Act: A Review with the benefit of Hindsight, mimeo, 1999) reports results of an *ex post* survey of facts and opinions of parties involved in 9 New Zealand authorisations. The study amply demonstrates the difficultly of identifying performance under the counterfactual, *ex post*, rendering great difficulty in assessing the effect of an authorisation *per se.*

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[63] See Lewis Evans and Neil Quigley, "Common Elements in the Governance of Deregulated Electricity Markets, Telecommunications Markets and Payments Systems" ,New Zealand Institute for the Study of Competition and Regulation, paper presented to the International Telecommunications Society, Biannual Conference, Stockholm, 1998.

Appendix: Recent Statements by North American Antitrust Agencies

In general, the official statements of antitrust agencies through Guidelines and official statements that we are aware of have been surprising silent on the manner in which they use (and how much they use) quantitative analysis. Several speeches by officials at the U.S. Department of Justice (Antitrust Division) and U.S. Federal Trade Commission have shed some light on the issue. A selective list of some examples are provided below:

U.S. Department of Justice (Antitrust Division)

1. Carl Shapiro, Deputy Assistant Attorney General, "Mergers with Differentiated Products", Nov. 1995 posted at http://www.usdoj.gov/atr/public/speeches/shapiro.spc

2. Charles E. Biggio, Senior Counsel to the Assistant Attorney General, Antitrust Division, "Merger Enforcement at the Antitrust Division, May 1996, which is posted on the Internet at: http://www.usdoj.gov/atr/public/speeches/chibar.htm.

3. Constance K. Robinson Director of Operations Antitrust Division U.S. Department of Justice, "Quantifying Unilateral Effects in Investigations and Cases", October, 1996, http://www.usdoj.gov/atr/public/speeches/robins3.htm.

US Federal Trade Commission

1. Jonathan Baker, Director, Bureau of Economics, FTC, "Product Differentiation through Space and Time: Some Antitrust Issues" (revised version is published in *Antitrust Bulletin*, vol. 42, Spring 1997, pp. 177-196 http://www.ftc.gov/speeches/other/unilat61.htm.

2. George S. Cary, Deputy Director for Mergers, Bureau of Competition, FTC, "Staying Ahead of the Merger Wave", December 1996, http://www.ftc.gov/speeches/other/corp.htm.

3. Jonathan Baker, Diector, Bureau of Economics, FTC, "Unilateral Competitive Effects Theories in Merger Analysis", August, 1996, http://www.ftc.gov/speeches/other/unilat61.htm.

4. Jonathan Baker, Director, Bureau of Economics, FTC, "Contemporary Empirical Merger Analysis", October 1996 (revised Feb 1997) http://www.ftc.gov/speeches/other/gmu5.htm.

5. Jonathan Baker, Director, Bureau of Economics, FTC, "Econometric Analysis in *FTC v. Staples*" July, 1997 http://www.ftc.gov/speeches/other/bany.htm.

6. William J. Baer, Director, Bureau of Competition, FTC, "Report from the Bureau of Competition", April,1998,http://www.ftc.gov/speeches/other/baeraba98.htm

7. William J. Baer, Director, Bureau of Competition, FTC, "New Myths and Old Realities" November, 1997, http://www.ftc.gov/speeches/other/bany.htm.