The Outcomes of Workably Competitive Markets For Pipeline Services

Robert Willig

September 10, 2018

I. Qualifications

I.A. Compliance

1. I have read, understood and complied with the Expert Evidence Practice Notes of the Court of Australia, including the Harmonised Expert Witness Code of Conduct, as sent to me by Gilbert + Tobin, and I agree to be bound by it.

I.B. Professional Background

2. My name is Robert D. Willig. I am Professor of Economics and Public Affairs Emeritus at Princeton University where I held a joint appointment in the Economics Department and at the Woodrow Wilson School of Public and International Affairs from 1978 until 2016. Previously, I was a Supervisor in the Economics Research Department of Bell Laboratories. My teaching and research have specialized in the fields of industrial organization, government- business relations, and social welfare theory. I continue to teach the graduate course at Princeton "Legal and Regulatory Policy Towards Markets" as Lecturer with the Rank of Professor. I served as Deputy Assistant Attorney General for Economics in the Antitrust Division of the United States Department of Justice from 1989 to 1991, and in that capacity served as the Division's Chief Economist.

3. I have authored some 80 articles in the economics literature, and am the author of *Welfare Analysis of Policies Affecting Prices and Products* and *Contestable Markets and the Theory of Industry Structure* (with W. Baumol and J. Panzar). I was a co-editor of *The Handbook of Industrial Organization*, which summarized the state of economic thinking on the structure of industries and the nature of competition among firms, and served on the editorial boards of the *American Economic Review*, the *Journal of Industrial Economics* and the *MIT Press Series on*

Regulation. I am an elected Fellow of the Econometric Society and was an associate of The Center for International Studies.

4. I have developed and applied research and expertise on market structure, competitive conduct, contractual relations, optimal pricing, intellectual property rights, antitrust policy and government regulation of business. I have been a consultant on those subjects to governments, to international organizations like the World Bank and OECD, and to international firms in many sectors of the economy, including telecommunications, transportation, health care, pharmaceuticals, aeronautics, automobiles, information technology, chemicals, mining, energy, consumer products and financial markets. I have appeared as an expert witness in the United States before Congress, federal and state courts, federal administrative agencies, and state public utility commissions and in Australia before the Australian Competition Tribunal. <<I have also submitted expert reports to the Australian Tax Office, Australian National Competition Council, Federal Court of Australia (two cases)>> I am a Senior Consultant for and co-founder of the international economic consulting firm Compass Lexecon,

5. I have been involved throughout my career in the theoretical design, practical improvement and implementation details of government regulation of telecommunications, railroad freight, electricity, ports, and pipelines. This work has been a source of inspiration and application for my research, teaching and consulting.

My full academic curriculum vitae is attached as Exhibit 1.

II. Background and Assignment

II.A. Background

6. The background of the matter, as described in the letter of instruction from Gilbert + Tobin, attached as Exhibit 2, is the following:

"On 1 August 2017, amendments to the National Gas Law (NGL) and National Gas Rules (NGR) to introduce a new arbitration framework for 'non-scheme pipelines' took effect. Non-scheme pipelines include certain transmission pipelines owned by APA that are not covered pipelines. As these pipelines are not covered, the tariffs that APA may charge for use of these pipelines (and hence the revenues that it may earn) are not subject to regulation. The tariffs and other terms and conditions of access for these pipelines have been (until now) subject to commercial negotiation between APA and its customers.

Under the new arbitration framework, if a prospective user or user cannot agree with APA about one or more aspects of access to a pipeline service after a request for access has been made in accordance with the NGR, the prospective user or user, or APA, may notify the scheme administrator that an access dispute exists. If the scheme administrator receives notification of an access dispute, the dispute must be referred to arbitration.

The objective of the new Part 23 of the NGR, which forms part of the new access framework for non-scheme pipelines, is as follows:

> "The objective of this Part is to facilitate access to pipeline services on non-scheme pipelines on reasonable terms, which, for the purposes of this Part, is taken to mean at prices and on other terms and conditions that, so far as practical, reflect the outcomes of a workably competitive market."

When making a determination in respect of an access dispute, the arbitrator must take into account the principle that access to pipeline services must be on 'reasonable terms', as defined in the objective."

II.B. Assignment

7. I have been instructed by Gilbert + Tobin, on behalf of APA, to prepare a report to address the following questions:

"1 What are the key economic features of a workably competitive market, and how do these compare to models of perfect competition?

2 What economic outcomes (in terms of price, service differentiation, etc.) may be expected in a workably competitive market?

3 What principles should be applied in assessing whether prices for pipeline services reflect, in a (sic) so far as reasonably practical, the outcome of a workably competitive market?"

III. Summary of Conclusions

i. In a workably competitive market, a firm has active and/or potential rivals whose actual or responsive conduct constrains or disciplines the firm to perform with economic efficiency.

ii. Governmental intervention over market power concerns is unnecessary and likely counterproductive in workably competitive markets.

iii. Governmental intervention over market power concerns in a market that is not workably competitive would conduce to economic efficiency if and only if it were effectively guided by outcomes that would be expected if the market were workably competitive.

iv. Workably competitive markets can take on a variety of forms with various economic features and outcomes that depend on the character and production technology of the products offered by the firms in the market. Disastrous industry performance can result from regulatory intervention that is based on a form of workable competition that is inconsistent with the character of the market's products and technology.

v. The three distinct benchmark forms of workably competitive markets considered are perfect competition, differentiated product oligopoly, and perfectly contestable markets where potential entrants without entry barriers can compete for the market, and are able to divert business from any incumbents.

vi. The model of perfect competition can validly be applied only to markets where homogeneous products are sold by firms with few scale economies, because the model generates outcomes with a single uniform market price charged to all customers by numerous firms that equate their marginal and average costs to that price. A market with pervasive scale economics cannot be consistent with perfect competition because efficiency there calls for one rather than many suppliers of each product and because marginal cost pricing cannot cover total cost.

vii. Workable competition in a contestable market is driven by the threat that entrants would divert business from the incumbent(s) if the current prices and other terms made that profitable. Such workable competition is consistent with pervasive scale and scope economies and the resulting natural monopoly. Under these circumstances, economic efficiency generally requires

differential demand-based pricing (formally termed Ramsey Pricing, but not implemented formulaically), and avoidance of pricing according to fully allocated costs or other accounting conventions that neglect consideration of demand and the value of the service to the customer. Economic efficiency also requires contractual deals between the supplier and sizable customers with individualized terms of service, pricing and volume discounts. Workable competition in a contestable market is consistent with these market outcomes.

viii. Workable competition in a contestable market requires that market outcomes pass the stand-alone cost test, whereby an incumbent's prices must generate revenues that are at or below "stand-alone costs" for the outputs sold to any group of the incumbent's customers. The stand-alone costs are defined to be the current long-run efficient costs of producing a particular collection of outputs, and just those outputs without any others.

ix. I proceed to apply these principles to gas pipeline services, on the basis of a number of their fundamental economic features. First, workable competition based on the model of perfectly competitive markets cannot be validly applied to gas pipeline services due to their pervasive economies of scale and scope, and their heterogeneity.

x. There may be some relevant markets for gas pipeline services with active rivalry from services offered by another pipeline from a different gas field, with trucking delivery of alternative fuels for electric generation, or even with electric power from another generation source. Such a relevant market may be assessed to be workably competitive if the alternatives to the pipeline's services do significantly discipline and constrain the pipeline's prices. If so, then the policy conclusion should be that the unregulated outcomes of the market forces and the negotiations between the pipeline and its customers reflect the outcomes of a workably competitive market, with the implication that regulatory intervention would be unwarranted.

xi. The model of workable competition in contestable markets is generally applicable as a benchmark for relevant markets for gas pipeline transportation services where there is no active rivalry, or where there is some active rivalry that is assessed to be too weak to constitute workable competition. If a gas pipeline market without actual workable competition were to be the subject of intervention under the standard of the outcomes of workable competition, that intervention should not draw inferences of the exercise of monopoly power from, nor interfere with, the practices of differential demand-based pricing and customer contracting that includes individualized terms of service, pricing and volume discounts. This conclusion follows from the showing that these features of real gas pipeline markets are entirely consistent with and even a necessary consequence of workable competition.

xii. Regulatory intervention into gas pipeline services without actual workable competition should rely on the conclusion that in outcomes of workable competition, prices would generate revenues no greater than stand-alone costs. The analysis of a customer's issue services likely is most effectively conducted together with a group of other services that might include others with the same receipt and delivery points as those of the issue services, or the group could also include other services with different geography that would nevertheless share efficiently in the utilization of some common facilities such as overlapping stretches of pipeline and the associated compression capacity. Then the total costs of a new entrant to supply that entire

group of services would be assessed and compared with the revenues derived from the current prices of the entire analyzed group of gas pipeline services. If and only if these revenues are no greater than the stand-alone costs are the group's prices consistent with the outcomes of workable competition. This is the test that provides customers with the protections of the applicable workable competition in markets where its actual absence makes them vulnerable to the exercise of monopoly power.

IV. Workably Competitive Markets

IV.A. General Principles

8. Workably competitive markets can take on a variety of forms with various economic features and outcomes that depend on the character of the products and services offered by the firms in the market. An appropriate generalization is that in a workably competitive market, a firm has active and/or potential rivals whose actual or responsive conduct constrains or disciplines the firm to perform with economic efficiency. The resulting economic efficiency includes the dimensions of pricing, quantities and qualities of the outputs the firm supplies, operational productivity, and capital investments for replacement and progressivity. The constraint or discipline that the firm experiences in a workably competitive market arises from the prospect of loss of business to rivals. If the firm does not price attractively enough, or produce enough output to the tastes and needs of its customers, or keep its costs down or sufficiently maintain and advance its abilities and infrastructure, then its rivals will be motivated and able to divert its sales to their own benefit. This prospect of lost business provides direct motivation to the firm that faces workable competition to conduct its business efficiently.

9. It is a general principle that workably competitive markets result in economic outcomes that are favorable for economic efficiency, for social welfare as indicated by real social income, and for the associated public interest. This principle does not apply to such "externalities" (effects that are external to market transactions) as environmental impacts of firms' activities, to needs for consumer protection from unsafe or fraudulent products or to issues of workplace safety. But the

principle does imply that governmental intervention over market power concerns is unnecessary and likely counterproductive (inasmuch as it influences outcomes) in workably competitive markets.

10. A corollary general principle is that government intervention that is motivated by market power concerns in a market that is not workably competitive would conduce to economic efficiency if and only if it were effectively guided by outcomes that would be expected if the market were workably competitive. In such a market, all elements of firms' unregulated conduct cannot be counted on to contribute to economic efficiency, although some elements may do so, and government intervention that succeeds in moving firms' conduct towards the outcomes of workable competition could improve the overall performance of the market for social welfare. Thus, there is strong logical support from economic theory for the policy prescription that regulatory intervention to alleviate market power concerns should attempt to mimic the results of workable competition.

11. Along with this principle comes an even stronger policy warning: It is crucial for economic efficiency and for financial sustainability that regulatory intervention be guided by the results that would follow from the kind of workable competition suited to the character of the market's products and services. Workable competition has markedly different elements and traits in markets with different kinds of outputs produced with technologies having different characteristics and aimed at different sorts of consumer demands. Economic logic and experience (see Section IV.F below for the example of the U.S. Railroad industry) show that disastrous industry performance can result from regulatory intervention that is based on a form of workable competition that is inconsistent with the character of the market's products.

12. I now proceed to delineate and discuss three distinct prominent forms of workable competition that apply to markets with corresponding distinguishing characteristics of the markets' products. First I discuss "perfectly competitive" markets; second, oligopolies with competition among firms that sell differentiated products that are substitutes for one another; and, third, perfectly contestable markets where potential entrants can compete for the market, and are able to divert business from any incumbents.

IV.B. Perfectly Competitive Markets

IV.B1. The Economic Features of Perfectly Competitive Markets

13. In a perfectly competitive market there are many firms that all produce the same homogeneous good or service.[1] The efficient technology of production of the market's product or service does not confer a cost advantage on relatively large scales of output. Accordingly, satisfaction of consumers' total demand for the industry's output is consistent with many independent firms each supplying a relatively small share of the total market output.

14. For this to be the case, the production technology may have constant returns to scale, which means that the average costs of production per unit of output do not rise or fall as the volume of firm output varies. The applicable average costs of production cover the total economic costs of the firm, inclusive of capital costs, and on a long-term or long-run basis. With constant returns to scale, the "marginal cost" of production (the additional cost of producing one additional unit or the cost saving from producing one fewer unit) is equal to the average cost of production at every level of the volume of firm output.

15. More descriptively than constant returns to scale, the production technology may exhibit the text-book "U-shaped" average cost curve, whereby average costs are relatively high and

[1] Every basic economic textbook covers the subject of perfectly competitive markets with much the same definitions of their elements.

decreasing over small levels of output, until output reaches "minimum efficient scale" at the bottom of the "U" where average costs are minimized, and then average costs rise as the scale of production increases from there. Marginal cost is less than average cost over the region of levels of output where average costs are falling with greater output, i.e. where there are "economies of scale" or "increasing returns to scale." Obversely, marginal cost is greater than average cost where average costs rise with greater output, i.e. where there are "decreasing returns to scale." And, at the bottom of the "U" where average cost is minimized, scale economies are exhausted and marginal cost is equal to average cost. In a perfectly competitive market where there are U-shaped average costs, as per the classic text-book treatment, each firm operates at the scale of production that minimizes the firm's total average cost at the bottom of the U, and this scale of production is a small fraction of total industry demand so that the market is populated by many such firms.[2]

16. In a perfectly competitive market, populated by many firms selling homogeneous products, each firm perceives that it is a sufficiently small portion of the total market that the amount of its sales cannot influence the market price, so that each firm is a "price-taker." The firm perceives that if it charged a price higher than the market price it would be unable to effect any sales, since its possible customers would all buy instead from competitors offering sales at the market price. The firm perceives that it can make any level of sales it chooses to at the market price, so there is no reason for it to attempt to elevate its sales by lowering its price below the market price.

IV.B2. Economic Outcomes in Perfectly Competitive Markets

17. A price-taking firm maximizes its profits by producing the level of output that brings its marginal costs into equality with the market price. The firm is motivated to do so since it would make more money by producing more if the cost of additional output (its marginal cost) were

[2] Firms in a competitive equilibrium do not need to have identical assets and technologies, but the single market price, over which each firm has no influence, is what they all charge in the equilibrium and consequently their resulting levels of equilibrium marginal costs are all equal.

below the price it could obtain from its additional sales; and it would make more money by cutting back output if the resulting cost savings (again its marginal cost) were greater than the price it were obtaining from those sales. Thus it is a hall-mark of a perfectly competitive market that its firms equate their marginal costs to the level of the same market-wide price.

18. The striking implications of these features of a perfectly competitive market are that the market is unconcentrated, and each firm's homogeneous output is sold at a common single price that is equal to the firm's marginal cost and also equal to the firm's average cost (at the bottom of the firm's U-shaped average cost curve or at any output where there are constant returns to scale). Price equal to total average cost implies that the firm's total revenue (price times total sales) is equal to the firm's long-run total cost (average cost times total output, which is the same as total sales), so that the firm financially just breaks even. This is financially sustainable, since the long-run average cost of the firm includes all its costs, most prominently including its costs of capital, evaluated at the competitive market rate-of-return on capital.

IV.B3. The Scope of Applicability of the Perfectly Competitive Market Model

19. A perfectly competitive market is an idealized economic model that is not imagined to perfectly correspond to any real market, but instead to characterize principal implications of those real markets whose fundamental characteristics reasonably match those of the market model. The perfectly competitive market model can thus be a useful guidepost for assessing the performance of a market producing a homogeneous product with only a moderate degree of concentration and a correspondingly moderate number of firms, rather than the complete absence of concentration that is characteristic of the model. According to the U.S. Department of Justice and Federal Trade Commission Horizontal Merger Guidelines, a market is considered "unconcentrated" if its measured concentration index is smaller than that reflective of 6 equally sized firms, and

considered "highly concentrated" only if its measured concentration index is larger than that reflective of 4 equally sized firms.[3] The characterization of "unconcentrated" is considered to be a sufficiently powerful policy indicator that horizontal mergers leaving a market unconcentrated only rarely (if ever) raise competitive concerns. Similarly, mergers that leave markets only "moderately concentrated" (less than "highly concentrated" but not "unconcentrated") require extensive analysis before any conclusion of actionable competitive concerns can be reached.[4]

20. It is evident from the description of the model of a perfectly competitive market that the model cannot apply to a real market where the products are not homogeneous and where the conditions of production are inconsistent with even a moderately large number of firms and a moderately low level of market concentration. For products or services whose production has pervasive economies of scale, the efficient and sustainable market structure will include only one active supplier. Such a firm has average costs that keep on declining as its output increases, and its marginal costs are always less than its average costs. As a result, the lesson of perfect competition that price should equal marginal cost cannot apply because such pricing would be guaranteed to bring in total revenues below total costs, making the firm financially unsustainable. Under these conditions too, since there cannot efficiently be more than one active supplier for each good or service, the firms cannot be price-takers because adjustments to their prices would be alterations in the market prices that would affect the quantities of market demands. In contrast, under perfect competition, no one firm can influence the market price, and that is why the firms have no individual discretion in their pricing and are impelled to price to all customers at marginal cost.

[3] 2010 U.S. Department of Justice and Federal Trade Commission Horizontal Merger Guidelines, Section 5.3, p. 19, makes use of the Herfindahl-Hirschman Index (HHI) for these assessments of the degree of concentration, and this index translates into the effective number of equally-sized independent suppliers, N, via the arithmetic relationship N=10,000/HHI.

[4] Ibid

21. The perfectly competitive market model also does not apply to markets where the products and services are not homogeneous, and are thus differentiated from one another in their characteristics that matter to customers. In such markets there is no one market price because the heterogeneous products or services generally have different conditions of supply and demand. There is also no one applicable marginal cost and no one applicable average cost. Thus it would be an invalid and economically injurious mistake to transplant to a differentiated product market the lesson that in a perfectly competitive market there is a single price that is equal to marginal and average costs.

IV.C. Oligopoly Market of Differentiated Products

IV.C1. Economic Features of Differentiated Product Oligopolies

22. I now proceed to move on from perfectly competitive markets to discuss the second of the three distinct prominent forms of workable competition. In an oligopoly market of differentiated products (or services), each firm produces outputs that are different from those produced by the other firms. The differentiated products or services sold in the relevant market are somewhat substitutable for one another in their uses by customers, and different customers are apt to place heterogeneous values on the various available products or services. Here, each firm sets the different market prices for its unique products and is apt to experience increasing returns to scale in the production of each of them. Each firm recognizes that it will gain and lose volume of sales as its choices of prices are lower or higher, since consumers find the rival firms' offerings to be somewhat, but not perfectly, substitutable. A firm is motivated to choose its prices to maximize its profit by balancing the higher margins that price increases would bring against the lower levels of sales that earn those margins as the firm's sales are repressed by the higher prices.

IV.C2. Economic Outcomes in Differentiated Product Oligopolies

23. In a differentiated product oligopoly, workable competition arises from the potential diversion of each firm's sales to another firm's substitutable differentiated products, in response to relatively higher prices. The more active rivals with more closely substitutable products there are in the market, the more downward pressure there will be on each firm's prices. In a fully competitive differentiated product oligopoly, entry and exit of firms with their own distinct products continues to occur until the resulting equilibrium yields zero economic profits for the diverse incumbent firms.[5] In this market condition, each firm's total revenues are equal to its total long-run costs. But it is not the case that prices are equated to marginal costs for two reasons. First, the firms are not price-takers so that their incentives are to price above applicable marginal costs. Second, the firms must price above their marginal costs in order to cover their total costs inasmuch as they experience scale economies in the production of their unique products.[6] Moreover, it cannot be said that each price is equal to average cost inasmuch as the firm produces more than one unique product from common facilities so that the average cost of just one of the firm's products is not meaningfully defined.

24. The hallmarks of a workably competitive differentiated product oligopoly, then, are at least several rivalrous firms selling unique but significantly substitutable products, perhaps with different production technologies and costs, in a market into which entry by new firms offering their own unique products is feasible in reaction to significant profit opportunities. The result is

[5] The explicit study of this market form was originated in the book *Monopolistic Competition*, 1932, by E.H. Chamberlin, and it is a textbook standard today.

[6] It is a matter of economic theory that under the condition of scale economies or increasing returns to scale, pricing at marginal costs will not earn revenues sufficient to cover total costs of production. See J. Panzar and R. Willig, "Economies of Scale in Multi-Output Production," *Quarterly Journal of Economics*, V. 91, No. 3, August 1977, pp. 481-494.

differentiated prices constrained by the potential for business loss from substitution to the other active firms' products, and total revenues that do not significantly exceed total long-run costs.[7]

IV.C3. The Scope of Applicability of the Differentiated Product Oligopoly Model

25. In both the perfectly competitive market model and the model of differentiated product oligopoly, the force of the workable competition to a firm arises from the loss of business it would experience to another active firm if it were to price too high. Each of these two different models of workably competitive markets thus requires that there can be more than one active firm in a real market to which the model would be applied. As such, both the perfectly competitive model and the model of differentiated product oligopoly cannot validly be applied as benchmarks for workable competition in real markets where the technology renders inefficient and impractical active production by more than one firm. In contrast, the perfectly contestable market model can apply to real markets where natural monopoly conditions rule out more than one active supplier. Here, workable competition arises from the influence of potential entrants who can compete for the market, and are able through their entry to divert business from any incumbents.

IV.D. Perfectly Contestable Markets

IV.D1. The Economic Features of Perfectly Contestable Markets

26. Perfectly contestable markets constitute the model for workable competition that is most generally applicable to real natural monopoly markets.[8] In a perfectly contestable market, firms not

[7] There can be situations where there is a differentiated-product oligopoly that includes one or more firms with specially valuable assets, such as patent-protected product technologies or brand equity from prior investments in design and marketing. Such firms may appear to be earning revenues above costs, and that margin may be a competitive return on the investments that created their specially valuable assets, or a yet larger return that reflects a particularly positive outcome of prior risky investments.

[8] For the most complete original treatment, see *Contestable Markets and the Theory of Industry Structure*, 1982, W.J. Baumol, J.C. Panzar and R. Willig; and for discussion of the role of contestable markets as a benchmark for regulation, see Baumol, William J. and Robert D. Willig, "Contestability: Developments

already active are capable of entering into the production and sale of any quantities of any of the market's products or services by making use of the generally available technology and inputs, and thus incurring efficient economic total costs of that production. Such potential entrants evaluate the profitability of their entry into the market by comparing these costs with their potential revenues from diverting sales of the incumbent firm or firms at prices just below those charged to the incumbent customers.

27. The potential entrants into a perfectly contestable market are assumed to face no entry barriers, and this is the primary reason why contestability is a benchmark model of workable competition rather than a generally accurate description of real markets. Real entry barriers can arise from legal constraints (including exclusive governmental franchises), from scarcity of necessary inputs (including rights-of-way or other elements of geography), or from dynamic strategic concerns. The strategic entry barriers may be caused by a confluence of significant sunk costs and scale economies. In these circumstances, an entrant would have to irreversibly commit its capital expenditures to the market (i.e. "sink its costs"), and scale economies would require cost effective entry to constitute a substantial enough portion of the market's supply to significantly depress market prices. Then, a potential entrant would have to recognize that to recoup its costs it would have to plan to remain active in the market over time, since its capital costs are sunk, and that it would face lower prices as a consequence of its substantial size. Accordingly, such a view of its future difficulties and risks would be a barrier to entry otherwise stimulated by any immediate profit potential of incumbent's high prices.

28. There are two useful logical articulations of perfect contestability's assumption of no entry barriers. One is an assumption that potential entrants would face no need to sink costs. Then,

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since the Book," *Oxford Economic Papers*, New Series, Vol. 38, *Supplement: Strategic Behaviour and Industrial Competition* (Nov., 1986), pp. 9-36.

entrants could "hit and run" by diverting business from an incumbent if its prices made that profitable, and then depart from the market without penalty of stranded costs if and when conditions made that more profitable than remaining.[9] In that situation, irrespective of scale economies, the force of workable competition would derive from potential entrants who would react to incumbents' terms of business and divert their sales to customers if the prices made that attractive.

29. Another articulation of perfect contestability's assumption of no entry barriers is that there is ex ante "competition for the market."[10] In this model, the incumbent and potential entrants bid for the business that is conducted in the market on an ex ante basis, as if no costs are yet sunk by any supplier. The incumbent cannot win all or a portion of the business if an entrant would find it profitable to serve it instead at even slightly lower prices than those bid by the incumbent. In this fashion, the current prices of the incumbent are tested for their profitability to the theoretical ex ante opportunities of entrants to divert the associated business.

30. In markets where barriers prevent potential entrants from providing workable competition, and where there is no active discipline from ex ante competition for the market, contestability can still be the guidepost for regulation or for the decisions of an arbitrator. If a gas pipeline market without actual workable competition were to be the subject of intervention under the standard of the outcomes of workable competition, then contestability is the appropriate form of workable

[9] There are some real markets where contestability applies because the needed capital and other inputs are mobile and not sunk into their immediate application. Trucking is one example, since the necessary vehicles and personnel can be readily redeployed elsewhere if market conditions change. While commercial aircraft are similarly redeployable, airport facilities may be scarce, may be legally constrained or may require substantial sunk costs. Factory space and infrastructure, and programmable robots may be fungible among uses, and thus not sources of sunk costs, while specialized machinery without resale opportunities can require sunk costs.

[10] This concept originated with Harold Demsetz, and is sometimes termed "Demsetz competition."

competition to set that standard.[11] Under these circumstances, the regulator or arbitrator should apply the principles behind and information about the character of outcomes in contestable markets in assessing market conduct. The most general articulation is that actual market conduct is not consistent with the outcomes from workably competitive contestable markets if an entrant facing no entry barriers could profitably undercut incumbent prices and divert the business. Conversely, if incumbent business could not be profitably diverted with lower prices by an entrant facing no entry barriers, then the incumbent prices are consistent with workable competition. Far more details about the guidepost for workable competition derived from contestability emerge from the discussion below about the characteristics of the outcomes of contestable markets. These details are spelled out for gas pipeline markets in Section V.

IV.D2. Economic Outcomes in Perfectly Contestable Markets

IV.D2(i). A Single Price at Average Cost For A Single Product Sold To Many Small Customers

30. Perfectly contestable markets are a generalization of perfectly competitive markets since an unconcentrated market of homogeneous-product firms that sell at prices equal to their average and marginal costs would not attract entry, even in the absence of any entry barriers. The simplest case of a perfectly contestable market that is not perfectly competitive is where there is a single producer of a good with pervasive increasing returns to scale that markets with a single price to many small customers. This technology has the natural monopoly characteristic, since total production costs of the market are minimized with only a single firm doing all of the production. If the firm's market price were greater than its average cost, then an entrant facing no entry barriers could divert much or all of the firm's business by offering the product at a lower price that were

[11] This conclusion follows from the characteristics of natural gas pipeline services and production technology, as discussed below in Section V.A.

still at or just above its average cost. Thus, there, workable competition in this contestable market would constrain the incumbent to charge a market price equal to the firm's average cost at the level of output that cleared the market.

IV.D2(ii). Demand-Based Differential Prices to Sizable Customers of Natural Monopoly

31. Now, consider the case where the incumbent with pervasive increasing returns to scale markets its output on a delivered basis to some heterogeneous sizable customers. Then it is economically efficient and a conventional business practice for the supplier to contract individually with its sizable customers with individual heterogeneous deals. The contracts are apt to charge differential prices to different customers in reaction to the heterogeneous values that they experience from the product or service. Customers with relatively low values, but values that still exceed the supplier's marginal costs of production, are beneficially served at relatively low prices between their values and the marginal costs of serving them. They receive positive net value from their purchases equal to the difference between their value of consumption and the price they pay, and the supplier receives a contribution to its profitability equal to the difference between that price and its marginal cost. Prices to sizable customers who experience greater value from their consumption of the product or service are apt efficiently to provide relatively greater margins above marginal costs to the supplier.

32. There is compelling basic economic logic for demand-based differential pricing to heterogeneous sizable customers of a firm with prevalent increasing returns to scale. Due to the scale economies, prices all equal to marginal costs do not generate revenues sufficient to cover total cost. Setting all prices at equal percentages above marginal costs, while perhaps superficially equitable and attractive, is a policy error with significant loss of overall economic efficiency and social real income. Customer demands with value greater than marginal cost but less than the

needed average markup above marginal cost are excluded by such average-markup pricing. This in and of itself represents an inefficient loss of social real income (social welfare) since the lost utilization of the product would have been beneficial to the customer by more than its marginal cost of supply. Further, the loss of this demand means less sales volume and thus a higher average markup above marginal cost is needed to cover total cost from the remaining volume of sales whose customers must pay more. Moreover, the consequent higher prices likely exclude more customer demands with values that exceed marginal costs but that are not sufficient to bear the higher prices, causing additional loss of social welfare and additional loss of volume with yet further negative consequences. In sharp contrast, setting prices with relatively small markups above marginal costs to customers with relatively low value demands allows those demands to be met with net benefits to social welfare and with positive contributions to total costs that allow other customers to pay less towards the recovery of total costs than they would have to if that volume were not gainfully transacted. Customers with relatively high value demands must be charged prices with relatively high markups above marginal costs in order to complete the recovery of the total cost of supply.

33. The standard formulation in the economic literature of this principle is called Ramsey Pricing, under which each customer's percentage margin above marginal cost is inversely proportional to that customer's price elasticity of demand.[12] The price elasticity of demand measures the degree of the customer's demand's sensitivity to the product's price, which in turn is an inverse indicator of the value of the product to the customer. Thus, a customer with a relatively low level of price elasticity of demand exhibits demand that is relatively insensitive to price,

[12] For a concise treatment and appropriate historical bibliography see R. Braeutigam, "Optimal Policies for Natural Monopolies," Chapter 23, *Handbook of Industrial Organization*, *V 2*, 1989, R. Schmalensee and R. Willig (eds.).

correspondingly experiences a relatively high value of consumption of the product, and consequently has a Ramsey price with a relatively high percentage markup above the marginal cost of its supply. As a matter of formal economic theory, Ramsey Prices are economically efficient as they maximize consumer and social real income subject to the stipulation that the prices generate revenues sufficient to cover the total costs of production, under the condition of increasing returns to scale that make marginal cost pricing financial insufficient. It is important to recognize that while the formal treatment of Ramsey Pricing is illuminating economic theory, it is not usually treated as the source of quantitative formulas to set actual market prices. Precise estimates of the needed elasticities of demand are rarely available, and they are apt to change in the market faster than they can be reliably reestimated. Instead, in real markets, suppliers exercise market judgment, learn from experience, negotiate with customers, try out pilot experiments and generally grope their way through decentralized decision-making to determine prices based on both costs and values of service. The crucial learning for policy is not to attempt to force quantified application of Ramsey Pricing formulae, but to understand that the differential pricing based on demand and value along with cost is a vital element of economic efficiency and reflection of workable competition where scale economies are significant.

34. Differential pricing is not inconsistent with the workable competition provided by perfectly contestable markets in which the technology of supply is characterized by pervasive economies of scale. Like the incumbent supplier, any potential entrant's economics is shaped by the increasing returns to scale that make relatively large volume of sales necessary for the realization of efficient levels of cost. A potential entrant would not necessarily find it profitable to offer sales to only those customers paying relatively higher margins to the incumbent because the entrant's average cost would be higher than the incumbent's without the added volume from the customers paying

relatively lower margins. I shall return below to the subject of the limits on differential pricing created by workable competition from the model of contestable markets. Here, I note that the "weak invisible hand theorem" proves that Ramsey Pricing is consistent with perfectly contestable markets under some technical conditions that are sufficient to assure that the market production has pervasive economies of scale and scope and has natural monopoly characteristics.[13]

IV.D2(iii). Individual Deals Including Volume Discounts to Sizable Customers of Natural Monopoly

35. It is economically efficient and a conventional business practice for an incumbent with pervasive increasing returns to scale to contract individually with its sizable customers with individual heterogeneous deals. As discussed above, it can be expected, consistent with applicable workable competition and economic efficiency, that the prices reflected in these individual deals will be differential and demand-based. It can also be expected that the individual contracts will include heterogeneous other terms that respond to any particular needs of the customers, including, for example, assurances of deliveries' timeliness, reliability, and adaptability to the customer's dynamic circumstances.

36. In addition, it can be expected that the individual deals will include individuated volume discounts whose quantity break points and degrees of discount will be heterogeneous.

As a matter of economic logic and formal theory, mutually beneficial volume discounts are always a feasible addition to level pricing that is above marginal costs.[14] To see this, imagine as a simple example that without a volume discount the customer's price is $10/unit, the marginal cost of production is $7/unit, and the customer's demand is 9000 units. Then the supplier could offer the

[13] See W. Baumol, E. Bailey and R. Willig, "Weak Invisible Hand Theorems on the Sustainability of Multi-product Natural Monopoly," *American Economic Review*, V. 67, No. 3, June 1977, pp. 350-365.
[14] See, R. Willig, "Pareto Superior Nonlinear Outlay Schedules," *Bell Journal of Economics*, Vol. 9, No. 1, Spring 1978, pp. 56-69.

volume discount deal under which the first 9000 units carry the price of $10/unit and any additional units are available at the price of just $8/ unit. The customer may be stimulated to purchase more than 9000 units under this deal, to the customer's benefit, while the additional volume earns additional contribution to the supplier's profits with the still positive markup of $1 above marginal cost.

37. Thus it is plain that a volume discount deal exists that is mutually beneficial, and it should also be noted that the details of such a volume discount are individual to the customer – since the effective volume break points and the depth of the discounts depend on the customer's level of demand and on the customer's price elasticity of demand. Such individuated volume discounts are not only consistent with workable competition in contestable markets, but they are also necessary reactions to the forces of that workable competition. An incumbent who did not make heterogeneous deals with its heterogeneous sizable customers, including individuated terms and volume discounts, would find its business diverted by entrants who would make those mutually beneficial deals in a perfectly contestable market.

IV.D2(iv). Prices That Generate Revenues No Greater Than Stand-Alone Costs

38. In a perfectly contestable market, in order to be sustainable (i.e. to avoid stimulating a competitive entrant's diversion of the business), an incumbent's prices must generate revenues that are at or below "stand-alone costs" for any collection of the incumbent's outputs.[15] The stand-alone costs are defined to be the current long-run efficient costs of producing a particular collection of outputs, and just those outputs without any others. In a perfectly contestable market, if incumbent's prices were to generate revenues from a collection of outputs that exceed those

[15] For the definition and background bibliography for "stand-alone" costs, see R. Willig, "Multiproduct Technology and Market Structure," *American Economic Review*, Vol. 69, No. 2, May 1979, pp. 346-351. For the proposition about contestable markets, see *Contestable Markets and the Theory of Industry Structure*, 1982, W.J. Baumol, J.C. Panzar and R. Willig.

outputs' stand-alone costs, an entrant would divert from the incumbent the sales of those outputs, and do so profitably. This is so, for example, for a collection of outputs that represent the sales of any particular service, or that constitute the sales of output to any particular customer, or that is formed from the combination of a group of services, or that is the aggregation of sales to many individual customers. This is a clear consequence of the nature of contestable markets, since potential entrants have the capability of entering the markets with no entry barriers in order to sell any quantities of the markets' goods to whatever consumers want them, so long as there is demand for them, and so long as the entrant can cover its (stand-alone) costs with revenues from the prices it charges that do not exceed those of the incumbent firms. Conceptually, whether or not the potential entrant would be attracted to divert incumbents' business is a question set in the long run, for example where any extant contractual obligations would no longer be binding constraints.

39. As a simple illustrative example, consider an incumbent whose services to customers A and B make use of common facilities with long-run recurring costs of 10, specialized facilities used only to serve A with recurring cost of 6 and specialized facilities used only to serve B with recurring cost of 9. The stand-alone cost of service to A is 16 (10+6) because the common facilities would be needed for that production even in the absence of service to B, along with the specialized facilities that are employed only to serve A.[16] Similarly, the stand-alone cost of service to B is 19 (10+9) because the common facilities would be needed for that production even in the absence of service to A, along with the specialized facilities that are employed only to serve B. The total recurring cost is 25 (10+6+9), which is significantly less than the sum of the stand-alone costs

[16] Of course, those common costs might be efficiently reduced if they were to serve only A without B, and this would somewhat complicate the example without changing its lessons.

of A and B. This is a reflection of the firm's "economies of scope," that means that joint production of the services is more efficient than the total cost of producing them all separately.[17]

40. Continuing with the example, suppose the incumbent charged prices that generated revenues of 18 from the services provided to A and 7 from the services provided to B. These prices could not hold sustainably in a contestable market since an entrant could produce service to A for its stand-alone cost of 16 and divert that business from the incumbent who was charging 18 for it.[18] Alternatively, suppose the incumbent charged prices that generated revenues of 14 from the services provided to A and 16 from the services provided to B. Then these levels of revenues are below the stand-alone costs of 16 for just A and the stand-alone costs of 19 for just B, so that in contestable markets an entrant would not be able to profitably divert the incumbent's business of just A nor that of just B. However, an entrant would be motivated to divert the business of both A and B since the incumbent's revenues from that collection of output are 30 (14+16) while the stand-alone costs for the services of A and B together are just 25.

41. This same example provides an illustration of the benefits of demand-based pricing (as per Ramsey Pricing), the economic dangers of pricing based on fully allocated costs, irrespective of customers' demands, and the connections to stand-alone cost limits on pricing. Suppose the value of the services to A is a flow of benefits of 9 and the flow of benefits to B is 18. Since the incremental costs of service to A are 6 and the incremental costs of service to B are 9[19], it might seem under some accounting principles that the equitable prices to A and B would raise revenues

[17] J. Panzar and R. Willig, "Economies of Scope," *American Economic Review*, Vol. 72, No. 2, May 1981, pp. 268-272.

[18] Another reflection of this unsustainability is that the revenue from services to B of 7 is less than the incremental cost of 9 of producing those services for B.

[19] These are the costs of the specialized facilities needed only to support the services of one of the customers

of 10 from A and 15 from B. These prices are both the same percentage above incremental costs (67%) that is needed to boost the total of the incremental costs (15=6+9) to the level of the total cost of 25. Another common accounting principle might exercise "fully allocated costs," or "fully distributed costs," by dividing up the common costs of 10 in accordance with relative use, for example equally, to derive revenue targets of 11 (6+1/2 of 10) and 14 (9+1/2 of 10) for A and B respectively.[20] The pricing methods based on seemingly equitable accounting principles that neglect customers' individual values of service lead to dramatic economic harms for this market. Customer A does not experience sufficient value from its services to warrant paying the revenues of either 10 or 11 derived from the accounting principles. Then, with customer A out of the market, and making no contribution to the needed costs, customer B with the much higher level of value of service of 18 must face its own stand-alone cost of 19, which exceeds its willingness-to-pay. The result is no service at all, and an incumbent impelled to price this way will soon be out of business. In sharp contrast, Ramsey prices generating revenues of 8 from A and 17 from B are socially optimal here, because they leave both customers with benefits from their services that are greater than their payments, and they cover the total costs of service effected jointly with the available economies of scope. This is an illustration of how demand-based pricing, or more formal Ramsey Prices, maximize the use of the common facilities and the net benefits to consumers, while still providing financial sustainability to the efficient enterprise doing the production. And, here, the optimal prices for social welfare are fully consistent with the workable competition provided by perfectly contestable markets. The revenues from the optimal prices do not exceed the stand-alone costs of A, of B and of A and B taken together.

[20] See R. Braeutigam, op. cit., for explanation of the general economic harms of such methods for pricing the outputs of a firm with pervasive economies of scale.

42. The workable competition provided by the model of perfectly contestable markets protects customers against the exercise of monopoly power through the application of the stand-alone cost test. The stand-alone cost test imposes the same constraints, discipline and ceilings on customers' prices that the market would impose if the incumbent supplier were subject to robust competition from potential entrants with efficient technology and inputs and facing no barriers to entry. In contestable markets, no customer or group of customers would agree to pay more to a supplier for their products or services than it would cost to produce them efficiently in the long run on their own, or than it would cost a competitor to implement their supply. Under the protection of the stand-alone cost test, a customer can limit the revenues it is asked to pay to the level of the stand-alone costs of the services it is provided.

43. Where the production of the services a customer employs is implemented more efficiently in combination with the services purchased by a group of other customers, then the more protective form of the stand-alone cost test might aggregate those services and compare the total payments of the entire group of customers with the stand-alone costs of the totality of the services purchased by the group. Equivalently, the revenue paid by a particular customer is to be compared with the customer's net stand-alone cost: the stand-alone cost of production of the group's products or services, less the total revenues paid at contemporaneous prices by the other customers in the group. If the revenues paid by the total group exceed the stand-alone cost of the production of the group's total services, or if a particular customer pays revenue in excess of its net stand-alone cost, then the prices do not reflect the outcomes of a workably competitive market. Thus, employed in this way, the stand-alone cost test affords customers the same protection that workable competition would provide.

IV.D2(v). Stand-Alone Costs Are Long-Run Economic Costs

44. Stand-alone costs must be viewed from the long-run perspective and must include all economic costs, under the assumption of no entry barriers. This follows since they represent the costs that a new entrant into the relevant market would bear, with no preset rigidities and with the ability to choose the current best available technology and the most efficient inputs. The capital expenditures that the entry plan requires must be seen as engendering capital costs, including competitive rates of return on capital investment that are comparable to those earned by firms outside the industry that experience equivalent levels of risk. Recognition that these costs must be expected to be covered by revenues if there is to be entry is necessary for the entrant to compete successfully in competitive capital markets for the financing it needs initially and over its life span. It is economically efficient that the workable competition of contestable markets constrains incumbents' prices with levels of forward-looking long-run economic costs rather than any backward-looking historic costs or accounting conventions that may have their appropriate uses but that do not play a role in shaping the outcomes of workable competition. It is essential to recognize that if the model of workable competition fails to take into account all the relevant risks and variances in the market's flow of revenues and consequent coverage of costs, then there will be insufficient returns to capital that will suppress the ability of the supplier to grow, to innovate, to maintain and replace its facilities as needed, and to continue to provide service to its customers with beneficial quality.

IV.E. Recap of the Principles of Workable Competition

44. Three market models have been considered above as alternative settings for the operations and interpretation of workable competition. According to the homogeneous product perfectly competitive model, the market is unconcentrated with few scale economies, there is a single uniform price charged to all customers, and firms' pricing is disciplined by the prospect that all

business would be diverted by other active market participants if price were set above the market price. Each firm sets its output to equate its marginal cost to its price, which also equals the firm's average cost. In dramatic contrast is the model of a perfectly contestable market inhabited by a single active natural monopoly firm with pervasive economies of scale and scope. Its prices are disciplined by the prospect of loss of business to efficient potential entrants facing no entry barriers who would divert the incumbent's sales if their revenues exceed stand-alone costs. The in-between case is a workably competitive oligopoly of firms that sell somewhat substitutable differentiated products and that compete each others' prices down to their respective levels of average costs.

45. In applying the standard of workable competition to a real market, it is crucial to assess which of the three market models, with their different mechanisms of competition and different implications, is most fitting. One glaring error to avoid is attempting to apply the model of workable competition from perfectly competitive markets to a real incumbent that has pervasive economies of scale and scope. This mistaken application would attempt to impose on the incumbent's prices a homogeneous cost-based standard, thereby precluding economically beneficial differential demand-based prices and volume discounts. The mistaken application would attempt to equate a service's single price to some measure of cost (without accurate specification or even recognition of the differences among marginal costs, average costs and fully allocated costs), and thereby lose the accuracy of the concept of stand-alone costs that reflect which collection of outputs are being tested for excessive prices. And this mistaken application might find economically beneficial individual heterogeneous deals with customers to be inefficient or even abusive or corrupt. The results of this mistake could be economically disastrous in contrast to the appropriate application here of the concept of workable competition derived from contestable markets.

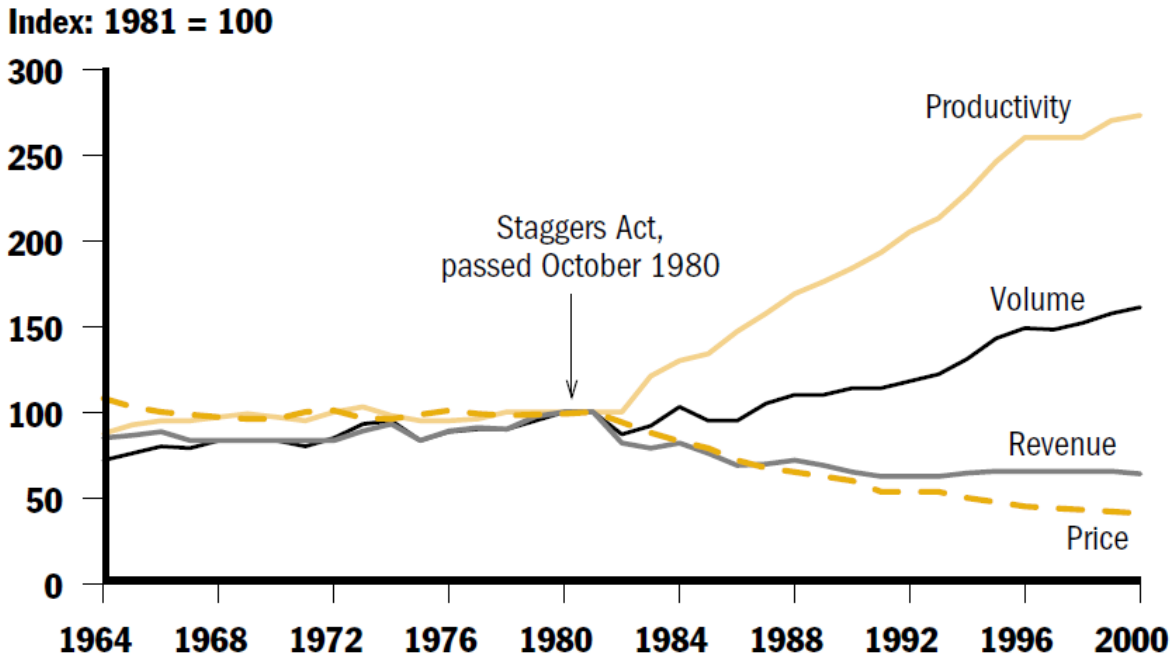
IV.F. Movement to the Fitting Standard of Regulation Saved the U.S. Freight Railroad Industry

46. The history of the U.S. freight railroad industry provides a generally recognized example of a disastrously mistaken form of regulation whose replacement led to a dramatic industry turn-around. The complexity of that turn-around is concisely summarized by the data on the large U.S. freight railroads displayed in the below figure drawn from the literature.[21] The figure shows that shortly after 1980, productivity began a new period of steep elevation, average prices began a long period of decline, revenues declined by far less than price and costs, and volume of service began an increasing trend. It was at this time that the Staggers Act was passed by Congress laying out the principles for revolutionizing the regulation of freight railroad services by the Interstate Commerce Commission (ICC) and later by its successor agency, the Surface Transportation Board (STB). Such dramatic change was plainly necessary since during the 1970's the Penn Central and many other railroads fell into bankruptcy, and more than 70 percent of the nation's rail freight moved on railroads that were not financially viable.[22] While observers

[21] This version of the display is from Ioannis Kessides, *Reforming Infrastructure: Privatization, Regulation and Competition*, a World Bank Policy Research Report, published by the World Bank and Oxford University Press, 2004, pp.193-194. Similar depictions and data can be found in Robert Gallamore and John R. Meyer, *American Railroads: Decline and Renaissance in the Twentieth Century*, Harvard University Press, 2014, p. 424; Robert Gallamore, "Regulation and Innovation: Lessons from the American Railroad Industry," in *Essays in Transportation Economics and Policy*, Jose Gomez-Ibanez, William Tye, and Clifford Winston (eds.), Brookings Institution Press, 1999, p. 496; and Surface Transportation Board, "Rail Rates Continue Multi-Year Decline," February 1998.

[22] Robert Willig and William Baumol, "Using Competition As a Guide," *Regulation: AEI Journal on Government and Society*, 1987, No. 1, p. 31. Theodore Keeler, *Railroads, Freight, and Public Policy*, The Brookings Institution, 1983.

Figure 4.3 Performance of Class I U.S. Railroads, 1964–2000



identify diverse causes of the financial distress of the industry, dysfunctional regulation is high on the list.[23] Pre-Staggers there was minimum price regulation of intra and inter-modal rivalrous rail freight services, with price floors justified by forms of fully-allocated costs, that repressed traffic volume the railroads could have otherwise gainfully attracted with more competitive pricing than was permitted. There was also maximum rate regulation via fully-allocated costs that prevented coverage of economic capital costs and that stifled incentives to attract more traffic since added volume would diminish the fully-allocated-cost rate caps on high demand business.[24] Rate increases in response to inflation generally had to be across-the-board rather than selectively dependent on heterogeneous customer demands and market conditions. Pre-Staggers,

[23] See, for example, Gallamore and John R. Meyer, op. cit., pp. 150-157. Also John Mayo and David Sappington, "Regulation in a 'Deregulated' Industry: Railroads in the Post-Staggers Era," *Review of Industrial Organization* (2016) 49, pp. 203-205, and the references therein.

[24] Fully-allocated (unit) costs were calculated by adding to directly attributed unit costs the totality of common costs divided by total volume of traffic. Thus, increases in total traffic would diminish the fully-allocated costs assigned to particular movements and thereby lower the regulatory rate caps on those movements.

individualized contracts between rail carriers and customers were illegal due to the "discrimination" they could implement. Innovation was severely stultified by these restraints since quality improvements could not necessarily earn higher prices, improvements in scale economies could not necessarily be coupled with the needed volume-increasing price breaks, and improved responsiveness to individual customers' needs could not be compensatory without contractual implementation.[25]

47. All of these elements of dysfunctional regulation were eliminated by the Staggers Act. In rule-makings mandated by the Act, the ICC moved to accord much new commercial freedom to the railroads while still offering protections against monopoly pricing for "captive shippers." Under the rubric of "Constrained Market Pricing," the ICC adopted the contestable markets concept of workable competition for transportation markets in which the incumbent railroad was "dominant," and relied on stand-alone costs (SAC) for the ceiling on freight rates. The ICC clearly articulated this philosophy in an early court filing:

"A rate level calculated by the SAC methodology represents the theoretical maximum rate that a railroad could levy on shippers without substantial diversion of traffic to a hypothetical competing service. It is, in other words, a simulated competitive price. (The competing service could be a shipper providing service for itself or a third party competing with the incumbent railroad for traffic. In either case, the SAC represents the minimum cost of an alternative to the service provided by the incumbent railroad.) The theory behind SAC is best explained by the concept of 'contestable markets.' This recently developed economic theory augments the classical economic model of 'pure competition' with a model which focuses on the entry and exit from an industry as a measure of economic efficiency. The theory of contestable markets is more general than that of 'pure competition' because it does not require a large number of firms. In fact, even a monopoly can be contestable. The underlying premise is that a monopolist or oligopolist will behave efficiently and competitively where there is a threat of losing some or all of its markets to a new entrant. In other words, contestable markets have competitive characteristics which preclude monopoly pricing."[26]

[25] For example, see Willig and Baumol, op. cit. pp. 30-32; Mayo and Sappington, op. cit. p. 205; Theodore Keeler, op. cit. pp. 28, 77; and Robert Gallamore, op. cit.

[26] Coal Rate Guidelines, Nationwide, 1 I.C.C.2d 520, 528 (1985), aff'd sub nom. Consolidated Rail Corp. v. United States, 812 F.2d 1444 (3d Cir. 1987).

The data depicted in the figure above are indicative of the resulting dramatic turn-around in the industry. Financial viability is no longer a general concern, innovation and the investment needed for progressivity and efficiency has been forthcoming, pricing levels and dynamics have been heterogeneous and in accord with demand and underlying costs, while most traffic moves under individual contracts.[27]

V. Principles For Assessing Whether Pipeline Service Prices Reflect Outcomes of a Workably Competitive Market

48. To address the question of what principles should be applied in assessing whether prices for pipeline services reflect, in so far as reasonably practical, the outcome of a workably competitive market, it is necessary to first assess which market model of workable competition is the best match for the pipeline market at issue. Toward this end, I proceed here to summarize a number of pertinent basic features of gas pipeline service markets that will help to focus the analysis that follows.

V.A. Basic Features of Gas Pipeline Service Markets

49. (a) Gas transmission pipelines provide multiple differentiated services with different pairs of receipt/delivery points, different degrees of reliability (e.g. firm service versus interruptible service), and different temperatures and pressures at which the gas is delivered.[28]

(b) Most of pipelines' gas transmission business is arranged under long term contracts that are negotiated bilaterally with heterogeneous prices, other terms and conditions, and service arrangements applying to different large end-users and to retailers.[29]

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[27] Nevertheless, policy disputes over regulation have continued before the STB and Congress, and there has been some ineffective backward regulatory motion towards partial endorsements of fully allocated costs to streamline calculations. See Mayo and Sappington, op. cit.

[28] See Productivity Commission 2004, Review of the Gas Access Regime, Report no. 31, Canberra, pp. 6, 53.

[29] Productivity Commission, op. cit., pp. 26, 29, 32-33.

(c) Provision of gas pipeline transportation services requires large sunk (irreversible and nonfungible) investments in pipe, compressors, valves, control systems, metering and other durable facilities. Once these assets are in place, their costs of operation and maintenance borne by the pipeline are not significantly sensitive to volume, in part because the shippers typically provide the compressor fuel needed to transport their gas. These same assets provide the full array of the pipeline's differentiated services to its many customers. In terms of the shorthand language of economics, these assets engender sunk, fixed and common costs.[30]

(d) There are substantial long-run economies of scale and scope in the provision of gas pipeline capacity for transportation services. The average initial investment costs of capacity between a given receipt and delivery point decline significantly as the amount of capacity that is planned increases. There are substantial long-run common costs for the provision of service along routes between pairs of receipt and delivery points that overlap.[31]

(e) In some geographic demand centers, there is competition between different firms' transmission pipelines for transportation of gas to gas retailers and large end-users from different gas fields. The transportation of pipeline-delivered gas to fuel electricity generation may in some areas compete with truck transportation to the generator of alternative fuels such as liquefied natural gas and diesel fuel, or compete with electricity supplied from base load generation via electricity transmission line.[32]

V.B. The Model of Perfect Competition Is Not Applicable

50. It is straightforward to connect these basic characteristics of gas pipeline services to the economic features that distinguish the market models of workable competition from one another.

[30] Productivity Commission, op. cit., pp. 22-23.
[31] Productivity Commission, op. cit., pp. 19-22. There have been several studies of these properties of gas pipeline service technology in the academic economic literature that agree on these conclusions.
[32] Productivity Commission, op. cit., pp. 30, 36, 38-41.

First, the basic characteristics unambiguously rule out the applicability of the model of perfectly competitive markets. Homogeneous products are inconsistent with characteristics (a) and (e). A large population of competing firms with homogeneous products or services is inconsistent with the pervasive long-run economies of scale described in (d). Marginal cost pricing cannot recover total costs of production in either the short run, as described in (c), or in the long run due to the long-run economies of scale described in (d).

V.C. The Model of Differentiated Product Oligopoly May Apply to Some Markets With Active Rivalry

51. The model of workable competition in a differentiated product oligopoly can be consistent with gas pipeline services where they compete with active alternatives as described in (e). In such an actively rivalrous relevant market, the pipeline may be viewed as an oligopolist offering transportation services that are somewhat substitutable with the services offered by another pipeline from a different gas field, with trucking delivery of alternative fuels for electric generation, or even with electric power from another generation source. These are differentiated services and products that, if available, may vary in their substitutability to the pipeline's customers, as well as in the competitiveness of their costs. Such an actively rivalrous relevant market may be assessed to be workably competitive if the active alternatives to the pipeline's services do significantly discipline and constrain the pipeline's prices.

52. One form of this analytic inquiry would be to assess the extent of the loss of the pipeline's business in this market if it were to raise its prices – and thus to size the business vulnerability to the active competition. The two critical factors for this assessment are the degree of the alternative services' substitutability with those of the pipeline from the point of view of the customers' utilization and the satisfaction of the customers' needs, and how close are the all-in costs of the alternatives to the all-in costs to the customers of use of the pipeline's delivered gas, inclusive of

the pipeline's prices for its transportation services. Another conceptual form of the analytic inquiry would be the question of whether the competitive pressures from the alternatives are sufficiently strong to keep the pipeline's revenues from its prices for its transportation services in the relevant market below its services' stand-alone costs.

53. In a gas pipeline's relevant markets with active rivalry, the assessment may be that there is actual workable competition. If so, then the policy conclusion should be that the unregulated outcomes of the market forces and the negotiations between the pipeline and its customers reflect the outcomes of a workably competitive market. Then, regulatory intervention would not be needed to mitigate concerns over monopoly power, and in general the outcomes of the unregulated workably competitive market forces are apt to better serve social welfare than the results of even the best implemented outside intervention.

V.C. The Model of Workable Competition in Contestable Markets Does Apply To Gas Pipeline Services

54. The model of workable competition in contestable markets is generally applicable to relevant markets for gas pipeline transportation services where there is no active rivalry, or where there is some active rivalry that is assessed to be too weak to constitute workable competition. It is not the case that the model of contestability is applicable due to the absence of actual entry barriers in the actual market. In fact, it is likely the case that the relevant market is actually characterized by high barriers to entry. These may arise from the difficulties of arranging for the needed rights-of-way. Even where such difficulties can be overcome, in general, the characteristics summarized in (d) indicate that due to pervasive economics of scale and scope an entrant would have to implement an entry plan with substantial size relative to the extent of the market in order to attain relatively efficient levels of cost. Feature (c) indicates that the entrant would have to commit substantial sunk costs to the market in order to commence efficient operations. As discussed above

in Section IV.D.1, the combination of significant sunk costs and scale economies typically create significant economic entry barriers, and it is a fair presumption that that is the case in a typical relevant market for gas pipeline services.[33] Instead, workable competition in a contestable market can apply because as a benchmark model, rather than as a description of the entry conditions into the actual market, it fully covers the situations described by the basic features of gas pipeline markets.

55. The basic features of gas pipeline markets imply that the typical supplier has natural monopoly technology due its pervasive economies of scale and scope, so that marginal cost pricing is ruled out by its endemic inability to cover total costs. Instead, as described above in section IV.D2(ii), an expected outcome of workable competition under that circumstance is differential value-based pricing to heterogeneous customers, which is entirely consistent with the described features (a) and (b) of gas pipeline markets. Moreover, as described above in section IV.D2(iii), another expected outcome of workable competition where there are sizable heterogeneous customers served by a supplier with pervasive economies of scale is prevalent contracts negotiated between the supplier and its customers with individualized terms of service, pricing and volume discounts. This is also entirely consistent with the described features (a) and (b) of gas pipeline markets.

V.D. Regulatory Intervention Into Gas Pipeline Services Under the Standard of Outcomes of Workable Competition

56. If a gas pipeline market without actual workable competition were to be the subject of intervention under the standard of the outcomes of workable competition, that intervention should not draw inferences of the exercise of monopoly power from, nor interfere with, the practices of

[33] That is not to say that there may be situations where that typical judgment does not apply. For example, if there were an anchor customer for the delivery of gas who were willing to commit to a long-term contract for the service that were of sufficient duration and size, then the strategic risk to the pipeline firm from entry would be much mitigated or eliminated.

differential demand-based pricing and customer contracting that includes individualized terms of service, pricing and volume discounts. This conclusion follows from the above analyses showing that these features of real gas pipeline markets are entirely consistent with and even a necessary consequence of workable competition.

57. Regulatory intervention into gas pipeline services without actual workable competition should rely on the conclusion discussed above in section IV.D2(iv) that in outcomes of workable competition, prices would generate revenues no greater than stand-alone costs. The application of the stand-alone cost test to gas pipeline services would proceed with the concepts described more abstractly in section IV.D2(iv) above. The analyst would identify the prices to be compared to their services' stand-alone costs, and then assess what would be the efficient current costs to a new entrant, including the competitive rate of return on the initial capital investments, of the provision of those services at issue. In the likely case that the needed facilities would also be able to contribute to the handling of the business of other current pipeline customers, the net stand-alone cost test would be applicable. Here, the analyst would consider the group of services, including the services at issue, that would cost effectively be supplied by common facilities as well as by some specialized ones. The group of such services might include others with the same receipt and delivery points as those of the issue services, or the group could also include other services with different geography that would nevertheless share efficiently in the utilization of some common facilities such as overlapping stretches of pipeline and the associated compression capacity. Then the total costs of a new entrant to supply that entire group of services would be assessed. These costs are to be compared with the revenues derived from the current prices of the entire analyzed group of gas pipeline services. With the focus on the particular prices at issue, under the net stand-alone cost test the revenues derived from the issue prices of the gas pipeline services are to be

compared with the total stand-alone costs of the group of pipeline services less the revenues from all the services of the group except those directly at issue. If and only if the revenues from the prices at issue are no greater than the net stand-alone costs are the group's prices consistent with the outcomes of workable competition.[34] Although this description of the stand-alone cost test seems mechanical and removed from the texture of the business, the analysis needed to implement it must consider the important details of the involved business reality in order to identify the relevant revenues and costs. Regardless of the mechanics, this is the test that provides customers with the protections of the applicable workable competition in markets where its actual absence makes them vulnerable to the exercise of monopoly power.

Robert Willig September 10, 2018

[34] This procedure leaves open the follow-on issue of which prices of the group's services should be reduced if some must in order to bring the group's revenues in line with its total stand-alone costs. Here, it can be useful to continue with additional comparisons of revenues with stand-alone costs for subsets of the entire group.

EXHIBIT 1

August 25, 2018

Curriculum Vitae

Name: **Robert D. Willig**

Address: [redacted]

Birth: [redacted]

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Education: Ph.D. Economics, Stanford University, 1973
Dissertation: Welfare Analysis of Policies Affecting Prices and Products.
Advisor: James Rosse

M.S. Operations Research, Stanford University,

1968. A.B. Mathematics, Harvard University, 1967.

Professional Positions:

Lecturer with the rank of Professor, Woodrow Wilson School of Public and International Affairs, 2/2017 – 6/2019.

Professor of Economics and Public Affairs, Emeritus, Princeton University, 7/2016 –

Professor of Economics and Public Affairs, Princeton University, 7/1978 - 6/2016.

Principal External Advisor, Infrastructure Program, Inter-American Development Bank, 6/97-8/98.

Deputy Assistant Attorney General, U.S. Department of Justice, l989-1991.

Supervisor, Economics Research Department, Bell Laboratories, 1977-1978.

Visiting Lecturer (with rank of Associate Professor), Department of

Economics
and Woodrow Wilson School, Princeton University, 1977-78 (part

time). Economics Research Department, Bell Laboratories, 1973-77.

Lecturer, Economics Department, Stanford University, 1971-73.

Other Professional Activities

ABA Section of Antitrust Law Economics Task Force, 2010-2012

Advisory Committee, Compass Lexecon 2010 -

OECD Advisory Council for Mexican Economic Reform, 2008 - 2009

Senior Consultant, Compass Lexecon, 2008 -

Director, Competition Policy Associates, Inc., 2003-2005

Advisory Bd., Electronic Journal of I.O. and Regulation Abstracts, 1996-2008.

Advisory Board, Journal of Network Industries, 2004-2010.

Visiting Faculty Member (occasional), International Program on Privatization and Regulatory Reform, Harvard Institute for International Development, 1996-2000.

Member, National Research Council Highway Cost Allocation Study
Review Committee, 1995-98.

Member, Defense Science Board Task Force on the Antitrust Aspects of Defense Industry Consolidation, 1993-94.

Editorial Board, Utilities Policy, 1990-2001.

Leif Johanson Lecturer, University of Oslo, November 1988.

Member, New Jersey Governor's Task Force on Market-Based Pricing of Electricity, 1987-89.

Co-editor, Handbook of Industrial Organization, 1984-89.

Associate Editor, Journal of Industrial Economics, 1984-89.

Director, Consultants in Industry Economics, Inc., 1983-89, 1991-94.

Fellow, Econometric Society, 1981-.

Organizing Committee, Carnegie-Mellon-N.S.F. Conference on Regulation, 1985.

Board of Editors, American Economic Review, 1980-83.

Nominating Committee, American Economic Association, 1980-1981.

Research Advisory Committee, American Enterprise Institute, 1980-1986.

Editorial Board, M.I.T. Press Series on Government Regulation of Economic Activity, 1979-93.

Program Committee, 1980 World Congress of the Econometric Society.

Program Committee, Econometric Society, 1979, 1981, 1985.

Organizer, American Economic Association Meetings: 1980, 1982.

American Bar Association Section 7 Clayton Act Committee, 198l.

Principal Investigator, NSF grant SOC79-0327, 1979-80; NSF grant 285-6041, 1980-82; NSF grant SES-8038866, 1983-84, 1985-86.

Aspen Task Force on the Future of the Postal Service, 1978-80.

Organizing Committee of Sixth Annual Telecommunications Policy Research Conference, 1977-78.

Visiting Fellow, University of Warwick, July 1977.

Institute for Mathematical Studies in the Social Sciences, Stanford University, 1975.

Published Articles and Book Chapters:

"The Role of the Circle Principle in Market Definition," (with Bryan Keating and Jonathan Orszag), The Antitrust Source, April 2018, 1-6.

"Economy-wide and Sectoral Impacts on Workers of Brazil's Internet Rollout" (with Mark A. Dutz, Lucas Ferreira Mation, and Stephen D. O'Connell), Forum for Social Economics, 46:2, 160-177, 2017.

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Problems of Regulated Industries, University of Missouri-Columbia Extension Publications, 1980, pp. 379-388.

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"Customer Equity and Local Measured Service," in Perspectives on Local Measured Service, J. Baude, etal. (ed.), 1979, pp. 71-80.

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Books

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Welfare Analysis of Policies Affecting Prices and Products, Garland Press, 1980.

Unpublished Papers and Reports:

"Brief for Amici Curiae J. Gregory Sidak and Robert D. Willig in Support of Respondents," In the Supreme Court of the United States; In the Supreme Court of the United States; State of Ohio, et al., v. American Express Company, et al., On Writ Of Certiorari To The United States Court Of Appeals For The Second Circuit; No. 16-1454; January 23, 2018.

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Invited Conference Presentations:

Portuguese Competition Authority Public Seminar Series
"Ups and Downs of Horizontal and Vertical Mergers" 2017

World Bank Workshop on Digital Technology Adoption, Skills, Productivity and Jobs in Latin America
"Discussion of Models of Firm Heterogeneity" 2016

George Mason Law Review Annual Antitrust Symposium: Antitrust in an Interconnected World
"GUPPI and the Safe Harbor" 2016

Competition Law & Policy Institute of New Zealand Annual Workshop
"Merger Analysis Keynote" 2015

Economic Studies at Brookings: Railroads, Policy and the Economy
"The Industry Perspective" 2015

Georgetown University McDonough School of Business Railroad Economics Symposium
"The Role of Economic Theory in the 'Deregulated' Rail Industry" 2015

Brazilian School of Economics and Finance (FGV EPGE) Seminario
"Public Interest Regulation: Lessons from Railroads" 2015

NYU School of Law Conference on the Fiftieth Anniversary of United States v. Philadelphia National Bank: The Past, Present and Future of Merger Law
"Discussion with Agency Economists" 2013

Brookings Institution Conference on The Economics of the Airline Industry
"Airline Network Effects and Consumer Welfare" 2012

AGEP Public Policy Conference on Pharmaceutical Industry Economics, Regulation and Legal Issues; Law and Economics Center, George Mason University School of Law
"Pharmaceutical Brand-Generic Disputes" 2012

U.S.-EU Alliance Study Peer Review Conferences
"Review of Cooperative Agreements in Transatlantic Airline Markets" 2012
"The Research Agenda Ahead" 2012

Antitrust in the High Tech Sector Conference
"Developments in Merger Enforcement" 2012

Georgetown Center for Business and Public Policy, Conference on the Evolution of Regulation
"Reflections on Regulation" 2011

Antitrust Forum, New York State Bar Association
"Upward Price Pressure, Market Definition and Supply Mobility" 2011

American Bar Association, Antitrust Section, Annual Convention
"The New Merger Guidelines' Analytic Highlights" 2011

OECD and World Bank Conference on Challenges and Policies for Promoting Inclusive Growth
"Inclusive Growth From Competition and Innovation" 2011

Villanova School of Business Executive MBA Conference
"Airline Network Effects, Competition and Consumer Welfare" 2011

NYU School of Law Conference on Critical Directions in Antitrust
"Unilateral Competitive Effects" 2010

Conf. on the State of European Competition Law and Enforcement in a Transatlantic Context
"Recent Developments in Merger Control" 2010

Center on Regulation and Competition, Universidad de Chile Law School
"Economic Regulation and the Limits of Antitrust Law" 2010

Center on Regulation and Competition, Universidad de Chile Law School
"Merger Policy and Guidelines Revision" 2010

Faculty of Economics, Universidad de Chile
"Network Effects in Airlines Markets" 2010

Georgetown Law Global Antitrust Enforcement Symposium
"New US Merger Guidelines" 2010

FTI London Financial Services Conference
"Competition and Regulatory Reform" 2010

NY State Bar Association Annual Antitrust Conference
"New Media Competition Policy" 2009

Antitrust Law Spring Meeting of the ABA
"Antitrust and the Failing Economy Defense" 2009

Georgetown Law Global Antitrust Enforcement Symposium
"Mergers: New Enforcement Attitudes in a Time of Economic Challenge" 2009

Phoenix Center US Telecoms Symposium
"Assessment of Competition in the Wireless Industry" 2009

FTC and DOJ Horizontal Merger Guidelines Workshop
"Direct Evidence is No Magic Bullet" 2009

Northwestern Law Research Symposium: Antitrust Economics and Competition Policy
"Discussion of Antitrust Evaluation of Horizontal Mergers" 2008

Inside Counsel Super-Conference
"Navigating Mixed Signals under Section 2 of the Sherman Act" 2008

Federal Trade Commission Workshop on Unilateral Effects in Mergers
"Best Evidence and Market Definition" 2008

European Policy Forum, Rules for Growth: Telecommunications Regulatory Reform
"What Kind of Regulation For Business Services?" 2007

Japanese Competition Policy Research Center, Symposium on M&A and Competition Policy
"Merger Policy Going Forward With Economics and the Economy" 2007

Federal Trade Commission and Department of Justice Section 2 Hearings
"Section 2 Policy and Economic Analytic Methodologies" 2007

Pennsylvania Bar Institute, Antitrust Law Committee CLE

"The Economics of Resale Price Maintenance and Class Certification" 2007

Pennsylvania Bar Institute, Antitrust Law Committee CLE
"Antitrust Class Certification – An Economist's Perspective" 2007

Fordham Competition Law Institute, International Competition Economics Training Seminar
"Monopolization and Abuse of Dominance" 2007

Canadian Bar Association Annual Fall Conference on Competition Law
"Economic Tools for the Competition Lawyer" 2007

Conference on Managing Litigation and Business Risk in Multi-jurisdiction Antitrust Matters
"Economic Analysis in Multi-jurisdictional Merger Control" 2007

World Bank Conference on Structuring Regulatory Frameworks for Dynamic and Competitive South Eastern European Markets
"The Roles of Government Regulation in a Dynamic Economy" 2006

Department of Justice/Federal Trade Commission Section 2 Hearings
"(Allegedly) Monopolizing Tying Via Product Innovation" 2006

Fordham Competition Law Institute, Competition Law Seminar
"Monopolization and Abuse of Dominance" 2006

Practicing Law Institute on Intellectual Property Antitrust
"Relevant Markets for Intellectual Property Antitrust" 2006

PLI Annual Antitrust Law Institute
"Cutting Edge Issues in Economics" 2006

World Bank's Knowledge Economy Forum V
"Innovation, Growth and Competition" 2006

Charles University Seminar Series
"The Dangers of Over-Ambitious Antitrust Regulation" 2006

NY State Bar Association Antitrust Law Section Annual Meeting
"Efficient Integration or Illegal Monopolization?" 2006

World Bank Seminar
"The Dangers of Over-Ambitious Regulation" 2005

ABA Section of Antitrust Law 2005 Fall Forum
"Is There a Gap Between the Guidelines and Agency Practice?" 2005

Hearing of Antitrust Modernization Commission

"Assessment of U.S. Merger Enforcement Policy" 2005

LEAR Conference on Advances in the Economics of Competition Law
"Exclusionary Pricing Practices" 2005

Annual Antitrust Law Institute
"Cutting Edge Issues in Economics" 2005

PRIOR Symposium on States and Stem Cells
"Assessing the Economics of State Stem Cell Programs" 2005

ABA Section of Antitrust Law – AALS Scholars Showcase
"Distinguishing Anticompetitive Conduct" 2005

Allied Social Science Associations National Convention
"Antitrust in the New Economy" 2005

ABA Section of Antitrust Law 2004 Fall Forum
"Advances in Economic Analysis of Antitrust" 2004

Phoenix Center State Regulator Retreat
"Regulatory Policy for the Telecommunications Revolution" 2004

OECD Competition Committee
"Use of Economic Evidence in Merger Control" 2004

Justice Department/Federal Trade Commission Joint Workshop
"Merger Enforcement" 2004

Phoenix Center Annual U.S. Telecoms Symposium
"Incumbent Market Power" 2003

Center for Economic Policy Studies Symposium on Troubled Industries
"What Role for Government in Telecommunications?" 2003

Princeton Workshop on Price Risk and the Future of the Electric Markets
"The Structure of the Electricity Markets" 2003

2003 Antitrust Conference
"International Competition Policy and Trade Policy" 2003

International Industrial Organization Conference
"Intellectual Property System Reform" 2003

ABA Section of Antitrust Law 2002 Fall Forum
"Competition, Regulation and Pharmaceuticals" 2002

Fordham Conference on International Antitrust Law and Policy
"Substantive Standards for Mergers and the Role of Efficiencies" 2002

Department of Justice Telecom Workshop
"Stimulating Investment and the Telecommunications Act of 1996" 2002

Department of Commerce Conference on the State of the Telecom Sector
"Stimulating Investment and the Telecommunications Act of 1996" 2002

Law and Public Affairs Conference on the Future of Internet Regulation
"Open Access and Competition Policy Principles" 2002

Center for Economic Policy Studies Symposium on Energy Policy
"The Future of Power Supply" 2002

The Conference Board: Antitrust Issues in Today's Economy
"The 1982 Merger Guidelines at 20" 2002

Federal Energy Regulatory Commission Workshop
"Effective Deregulation of Residential Electric Service" 2001

IPEA International Seminar on Regulation and Competition
"Electricity Markets: Deregulation of Residential Service" 2001
"Lessons for Brazil from Abroad" 2001

ABA Antitrust Law Section Task Force Conference
"Time, Change, and Materiality for Monopolization Analyses" 2001

Harvard University Conference on American Economic Policy in the 1990s
"Comments on Antitrust Policy in the Clinton Administration" 2001

Tel-Aviv Workshop on Industrial Organization and Anti-Trust
"The Risk of Contagion from Multimarket Contact" 2001

2001 Antitrust Conference
"Collusion Cases: Cutting Edge or Over the Edge?" 2001
"Dys-regulation of California Electricity" 2001

FTC Public Workshop on Competition Policy for E-Commerce
"Necessary Conditions for Cooperation to be Problematic" 2001

HIID International Workshop on Infrastructure Policy
"Infrastructure Privatization and Regulation" 2000

Villa Mondragone International Economic Seminar
"Competition Policy for Network and Internet Markets" 2000

New Developments in Railroad Economics: Infrastructure Investment and Access Policies
"Railroad Access, Regulation, and Market Structure" 2000

The Multilateral Trading System at the Millennium
"Efficiency Gains From Further Liberalization" 2000

Singapore – World Bank Symposium on Competition Law and Policy
"Policy Towards Cartels and Collusion" 2000

CEPS: Is It a New World?: Economic Surprises of the Last Decade
"The Internet and E-Commerce" 2000

Cutting Edge Antitrust: Issues and Enforcement Policies
"The Direction of Antitrust Entering the New Millennium" 2000

The Conference Board: Antitrust Issues in Today's Economy
"Antitrust Analysis of Industries With Network Effects" 1999

CEPS: New Directions in Antitrust
"Antitrust in a High-Tech World" 1999

World Bank Meeting on Competition and Regulatory Policies for Development
"Economic Principles to Guide Post-Privatization Governance" 1999

1999 Antitrust Conference
"Antitrust and the Pace of Technological Development" 1999
"Restructuring the Electric Utility Industry" 1999

HIID International Workshop on Privatization, Regulatory Reform and Corporate Governance
"Privatization and Post-Privatization Regulation of Natural Monopolies" 1999

The Federalist Society: Telecommunications Deregulation: Promises Made, Potential Lost?
"Grading the Regulators" 1999

Inter-American Development Bank: Second Generation Issues In the Reform Of Public Services
"Post-Privatization Governance" 1999
"Issues Surrounding Access Arrangements" 1999

Economic Development Institute of the World Bank -- Program on Competition Policy
"Policy Towards Horizontal Mergers" 1998

Twenty-fifth Anniversary Seminar for the Economic Analysis Group of the Department of

Justice
"Market Definition in Antitrust Analysis" 1998

HIID International Workshop on Privatization, Regulatory Reform and Corporate Governance
"Infrastructure Architecture and Regulation: Railroads" 1998

EU Committee Competition Conference – Market Power
"US/EC Perspective on Market Definition" 1998

Federal Trade Commission Roundtable
"Antitrust Policy for Joint Ventures" 1998

1998 Antitrust Conference
"Communications Mergers" 1998

The Progress and Freedom Foundation Conference on Competition, Convergence, and the Microsoft Monopoly
Access and Bundling in High-Technology Markets 1998

FTC Program on The Effective Integration of Economic Analysis into Antitrust Litigation
The Role of Economic Evidence and Testimony 1997

FTC Hearings on Classical Market Power in Joint Ventures
Microeconomic Analysis and Guideline 1997

World Bank Economists --Week IV Keynote
Making Markets More Effective With Competition Policy 1997

Brookings Trade Policy Forum
Competition Policy and Antidumping: The Economic Effects 1997

University of Malaya and Harvard University Conference on The Impact of Globalisation and Privatisation on Malaysia and Asia in the Year 2020
Microeconomics, Privatization, and Vertical Integration 1997

ABA Section of Antitrust Law Conference on The Telecommunications Industry
Current Economic Issues in Telecommunications 1997

Antitrust 1998: The Annual Briefing
The Re-Emergence of Distribution Issues 1997

Inter-American Development Bank Conference on Private Investment, Infrastructure Reform and Governance in Latin America & the Caribbean
Economic Principles to Guide Post-Privatization Governance 1997

Harvard Forum on Regulatory Reform and Privatization of Telecommunications in the Middle East
Privatization: Methods and Pricing Issues 1997

American Enterprise Institute for Public Policy Research Conference
Discussion of Local Competition and Legal Culture 1997

Harvard Program on Global Reform and Privatization of Public Enterprises
"Infrastructure Privatization and Regulation: Freight" 1997

World Bank Competition Policy Workshop
"Competition Policy for Entrepreneurship and Growth" 1997

Eastern Economics Association Paul Samuelson Lecture
"Bottleneck Access in Regulation and Competition Policy" 1997

ABA Annual Meeting, Section of Antitrust Law
"Antitrust in the 21st Century: The Efficiencies Guidelines" 1997

Peruvian Ministry of Energy and Mines Conference on Regulation of Public Utilities
"Regulation: Theoretical Context and Advantages vs. Disadvantages" 1997

The FCC: New Priorities and Future Directions
"Competition in the Telecommunications Industry" 1997

American Enterprise Institute Studies in Telecommunications Deregulation
"The Scope of Competition in Telecommunications" 1996

George Mason Law Review Symposium on Antitrust in the Information Revolution
"Introduction to the Economic Theory of Antitrust and Information" 1996

Korean Telecommunications Public Lecture
"Market Opening and Fair Competition" 1996

Korea Telecommunications Forum
"Desirable Interconnection Policy in a Competitive Market" 1996

European Association for Research in Industrial Economics Annual Conference
"Bottleneck Access: Regulation and Competition Policy" 1996

Harvard Program on Global Reform and Privatization of Public Enterprises
"Railroad and Other Infrastructure Privatization" 1996

FCC Forum on Antitrust and Economic Issues Involved with InterLATA Entry
"The Scope of Telecommunications Competition" 1996

Citizens for a Sound Economy Policy Watch on Telecommunications Interconnection
"The Economics of Interconnection" 1996

World Bank Seminar on Experiences with Corporatization
"Strategic Directions of Privatization" 1996

FCC Economic Forum on the Economics of Interconnection
Lessons from Other Industries 1996

ABA Annual Meeting, Section of Antitrust Law
The Integration, Disintegration, and Reintegration
of the Entertainment Industry 1996

Conference Board: 1996 Antitrust Conference
How Economics Influences Antitrust and Vice Versa 1996

Antitrust 1996: A Special Briefing
Joint Ventures and Strategic Alliances 1996

New York State Bar Association Section of Antitrust Law Winter Meeting
Commentary on Horizontal Effects Issues 1996

FTC Hearings on the Changing Nature of Competition in a Global and Innovation-Driven Age
Vertical Issues for Networks and Standards 1995

Wharton Seminar on Applied Microeconomics
Access Policies with Imperfect Regulation 1995

Antitrust 1996, Washington D.C.
Assessing Joint Ventures for Diminution of Competition 1995

ABA Annual Meeting, Section of Antitrust Law
Refusals to Deal -- Economic Tests for Competitive Harm 1995

FTC Seminar on Antitrust Enforcement Analysis
Diagnosing Collusion Possibilities 1995

Philadelphia Bar Education Center: Antitrust Fundamentals
Antitrust--The Underlying Economics 1995

Vanderbilt University Conference on Financial Markets

Why Do Christie and Schultz Infer Collusion From Their Data? 1995

ABA Section of Antitrust Law Chair=s Showcase Program
Discussion of Telecommunications Competition Policy 1995

Conference Board: 1995 Antitrust Conference
Analysis of Mergers and Joint Ventures 1995

ABA Conference on The New Antitrust: Policy of the '90s
Antitrust on the Super Highways/Super Airways 1994

ITC Hearings on The Economic Effects of Outstanding Title VII Orders
"The Economic Impacts of Antidumping Policies" 1994

OECD Working Conference on Trade and Competition Policy
"Empirical Evidence on The Nature of Anti-dumping Actions" 1994

Antitrust 1995, Washington D.C.
"Rigorous Antitrust Standards for Distribution Arrangements" 1994

ABA -- Georgetown Law Center: Post Chicago-Economics: New Theories - New Cases?
"Economic Foundations for Vertical Merger Guidelines" 1994

Conference Board: Antitrust Issues in Today's Economy
"New Democrats, Old Agencies: Competition Law and Policy" 1994

Federal Reserve Board Distinguished Economist Series
"Regulated Private Enterprise Versus Public Enterprise" 1994

Institut d'Etudes Politiques de Paris
"Lectures on Competition Policy and Privatization" 1993

Canadian Bureau of Competition Policy Academic Seminar Series, Toronto.
"Public Versus Regulated Private Enterprise" 1993

CEPS Symposium on The Clinton Administration: A Preliminary Report Card
"Policy Towards Business" 1993

Columbia Institute for Tele-Information Conference on Competition in Network Industries, New York, NY
"Discussion of Deregulation of Networks: What Has Worked and What Hasn't" 1993

World Bank Annual Conference on Development Economics
"Public Versus Regulated Private Enterprise" 1993

Center for Public Utilities Conference on Current Issues Challenging the Regulatory Process
"The Economics of Current Issues in Telecommunications Regulation" 1992
"The Role of Markets in Presently Regulated Industries" 1992

The Conference Board's Conference on Antitrust Issues in Today's Economy, New York, NY
"Antitrust in the Global Economy" 1992
"Monopoly Issues for the '90s" 1993

Columbia University Seminar on Applied Economic Theory, New York, NY
"Economic Rationales for the Scope of Privatization" 1992

Howrey & Simon Conference on Antitrust Developments, Washington, DC
"Competitive Effects of Concern in the Merger Guidelines" 1992

Arnold & Porter Colloquium on Merger Enforcement, Washington, DC
"The Economic Foundations of the Merger Guidelines" 1992

American Bar Association, Section on Antitrust Law Leadership Council Conference, Monterey, CA
"Applying the 1992 Merger Guidelines" 1992

OECD Competition Policy Meeting, Paris, France
"The Economic Impacts of Antidumping Policy" 1992

Center for Public Choice Lecture Series, George Mason University Arlington, VA
"The Economic Impacts of Antidumping Policy" 1992

Brookings Institution Microeconomics Panel, Washington, DC,
"Discussion of the Evolution of Industry Structure" 1992

AT&T Conference on Antitrust Essentials
"Antitrust Standards for Mergers and Joint Ventures" 1991

ABA Institute on The Cutting Edge of Antitrust: Market Power
"Assessing and Proving Market Power: Barriers to Entry" 1991

Second Annual Workshop of the Competition Law and Policy Institute of New Zealand
"Merger Analysis, Industrial Organization Theory, and Merger Guidelines" 1991
"Exclusive Dealing and the Fisher & Paykel Case" 1991

Special Seminar of the New Zealand Treasury
"Strategic Behavior, Antitrust, and The Regulation of Natural Monopoly" 1991

Public Seminar of the Australian Trade Practices Commission
"Antitrust Issues of the 1990's" 1991

National Association of Attorneys General Antitrust Seminar
"Antitrust Economics" 1991

District of Columbia Bar's 1991 Annual Convention
"Administrative and Judicial Trends in Federal Antitrust Enforcement" 1991

ABA Spring Meeting
"Antitrust Lessons From the Airline Industry" 1991

Conference on The Transition to a Market Economy - Institutional Aspects
"Anti-Monopoly Policies and Institutions" 1991

Conference Board's Thirtieth Antitrust Conference
"Antitrust Issues in Today's Economy" 1991

American Association for the Advancement of Science Annual Meeting
"Methodologies for Economic Analysis of Mergers" 1991

General Seminar, Johns Hopkins University
"Economic Rationales for the Scope of Privatization" 1991

Capitol Economics Speakers Series
"Economics of Merger Guidelines" 1991

CRA Conference on Antitrust Issues in Regulated Industries
"Enforcement Priorities and Economic Principles" 1990

Pepper Hamilton & Scheetz Anniversary Colloquium
"New Developments in Antitrust Economics" 1990

PLI Program on Federal Antitrust Enforcement in the 90's
"The Antitrust Agenda of the 90's" 1990

FTC Distinguished Speakers Seminar
"The Evolving Merger Guidelines" 1990

The World Bank Speakers Series
"The Role of Antitrust Policy in an Open Economy" 1990

Seminar of the Secretary of Commerce and Industrial Development of Mexico
"Transitions to a Market Economy" 1990

Southern Economics Association
"Entry in Antitrust Analysis of Mergers" 1990
"Discussion of Strategic Investment and Timing of Entry" 1990

American Enterprise Institute Conference on Policy Approaches to the Deregulation of Network Industries
"Discussion of Network Problems and Solutions" 1990

American Enterprise Institute Conference on Innovation, Intellectual Property, and World Competition
"Law and Economics Framework for Analysis" 1990

Banco Nacional de Desenvolvimento Economico Social Lecture
"Competition Policy: Harnessing Private Interests for the Public Interest" 1990

Western Economics Association Annual Meetings
"New Directions in Antitrust from a New Administration" 1990
"New Directions in Merger Enforcement: The View from Washington" 1990

Woodrow Wilson School Alumni Colloquium
"Microeconomic Policy Analysis and Antitrust--Washington 1990" 1990

Arnold & Porter Lecture Series
"Advocating Competition" 1991
"Antitrust Enforcement" 1990

ABA Antitrust Section Convention
"Recent Developments in Market Definition and Merger Analysis" 1990

Federal Bar Association
"Joint Production Legislation: Competitive Necessity or Cartel Shield?" 1990

Pew Charitable Trusts Conference
"Economics and National Security" 1990

ABA Antitrust Section Midwinter Council Meeting
"Fine-tuning the Merger Guidelines" 1990
"The State of the Antitrust Division" 1991

International Telecommunications Society Conference
"Discussion of the Impact of Telecommunications in the UK" 1989

The Economists of New Jersey Conference
"Recent Perspectives on Regulation" 1989

Conference on Current Issues Challenging the Regulatory Process
"Innovative Pricing and Regulatory Reform" 1989
"Competitive Wheeling" 1989

Conference Board: Antitrust Issues in Today's Economy
"Foreign Trade Issues and Antitrust" 1989

McKinsey & Co. Mini-MBA Conference
"Economic Analysis of Pricing, Costing, and Strategic Business Behavior" 1989
1994

Olin Conference on Regulatory Mechanism Design
"Revolutions in Regulatory Theory and Practice: Exploring The Gap" 1989

University of Dundee Conference on Industrial Organization and Strategic Behavior
"Mergers in Differentiated Product Industries" 1988

Leif Johanson Lectures at the University of Oslo
"Normative Issues in Industrial Organization" 1988

Mergers and Competitiveness: Spain Facing the EEC
"Merger Policy" 1988
"R&D Joint Ventures" 1988

New Dimensions in Pricing Electricity
"Competitive Pricing and Regulatory Reform" 1988

Program for Integrating Economics and National Security: Second Annual Colloquium
"Arming Decisions Under Asymmetric Information" 1988

European Association for Research in Industrial Economics
"U.S. Railroad Deregulation and the Public Interest" 1987
"Economic Rationales for the Scope of Privatization" 1989
"Discussion of Licensing of Innovations" 1990

Annenberg Conference on Rate of Return Regulation in the Presence of Rapid Technical Change
"Discussion of Regulatory Mechanism Design in the Presence
of Research, Innovation, and Spillover Effects" 1987

Special Brookings Papers Meeting
"Discussion of Empirical Approaches to Strategic Behavior" 1987
"New Merger Guidelines" 1990

Deregulation or Regulation for Telecommunications in the 1990's
"How Effective are State and Federal Regulations?" 1987

Conference Board Roundtable on Antitrust
"Research and Production Joint Ventures" 1990
"Intellectual Property and Antitrust" 1987

Current Issues in Telephone Regulation
"Economic Approaches to Market Dominance: Applicability of Contestable Markets" 1987

Harvard Business School Forum on Telecommunications
"Regulation of Information Services" 1987

The Fowler Challenge: Deregulation and Competition in The Local Telecommunications Market
"Why Reinvent the Wheel?" 1986

World Bank Seminar on Frontiers of Economics
"What Every Economist Should Know About Contestable Markets" 1986
Bell Communications Research Conference on Regulation and Information
"Fuzzy Regulatory Rules" 1986

Karl Eller Center Forum on Telecommunications
"The Changing Economic Environment in Telecommunications: Technological Change and Deregulation" 1986

Railroad Accounting Principles Board Colloquium
"Contestable Market Theory and ICC Regulation 1986

Canadian Embassy Conference on Current Issues in Canadian -- U.S. Trade and Investment
"Regulatory Revolution in the Infrastructure Industries" 1985

Eagleton Institute Conference on Telecommunications in Transition
"Industry in Transition: Economic and Public Policy Overview" 1985

Brown University Citicorp Lecture
"Logic of Regulation and Deregulation" 1985

Columbia University Communications Research Forum
"Long Distance Competition Policy" 1985

American Enterprise Institute Public Policy Week
"The Political Economy of Regulatory Reform" 1984

MIT Communications Forum
"Deregulation of AT&T Communications" 1984

Bureau of Census Longitudinal Establishment Data File and Diversification Study Conference
"Potential Uses of The File" 1984

Federal Bar Association Symposium on Joint Ventures
"The Economics of Joint Venture Assessment" 1984

Hoover Institute Conference on Antitrust
"Antitrust for High-Technology Industries" 1984

NSF Workshop on Predation and Industrial Targeting
"Current Economic Analysis of Predatory Practices" 1983

The Institute for Study of Regulation Symposium: Pricing Electric, Gas, and Telecommunications Services Today and for the Future
"Contestability As A Guide for Regulation and Deregulation" 1984

University of Pennsylvania Economics Day Symposium
"Contestability and Competition: Guides for Regulation and Deregulation" 1984

Pinhas Sapir Conference on Economic Policy in Theory and Practice
"Corporate Governance and Market Structure" 1984

Centre of Planning and Economic Research of Greece
"Issues About Industrial Deregulation" 1984
"Contestability: New Research Agenda" 1984

Hebrew and Tel Aviv Universities Conference on Public Economics
"Social Welfare Dominance Extended and Applied to Excise Taxation" 1983

NBER Conference on Industrial Organization and International Trade
"Perspectives on Horizontal Mergers in World Markets" 1983

Workshop on Local Access: Strategies for Public Policy
"Market Structure and Government Intervention in Access Markets" 1982

NBER Conference on Strategic Behavior and International Trade
"Industrial Strategy with Committed Firms: Discussion" 1982

Columbia University Graduate School of Business, Conference on Regulation and New Telecommunication Networks
"Local Pricing in a Competitive Environment" 1982

International Economic Association Roundtable Conference on New Developments in the Theory of Market Structure

"Theory of Contestability" 1982
"Product Dev., Investment, and the Evolution of Market Structures" 1982

N.Y.U. Conference on Competition and World Markets: Law and Economics
"Competition and Trade Policy--International Predation" 1982

CNRS-ISPE-NBER Conference on the Taxation of Capital
"Welfare Effects of Investment Under Imperfect Competition" 1982

Internationales Institut fur Management und Verwalturg Regulation Conference
"Welfare, Regulatory Boundaries, and the Sustainability of Oligopolies" 1981
NBER-Kellogg Graduate School of Management Conference on the Econometrics of Market Models with Imperfect Competition
"Discussion of Measurement of Monopoly Behavior: An Application to the Cigarette Industry" 1981

The Peterkin Lecture at Rice University
"Deregulation: Ideology or Logic?" 1981

FTC Seminar on Antitrust Analysis
"Viewpoints on Horizontal Mergers 1982
"Predation as a Tactical Inducement for Exit" 1980

NBER Conference on Industrial Organization and Public Policy
"An Economic Definition of Predation" 1980

The Center for Advanced Studies in Managerial Economics Conference on The Economics of Telecommunication
"Pricing Local Service as an Input" 1980

Aspen Institute Conference on the Future of the Postal Service
"Welfare Economics of Postal Pricing" 1979

Department of Justice Antitrust Seminar
"The Industry Performance Gradient Index" 1979

Eastern Economic Association Convention
"The Social Performance of Deregulated Markets for Telecom Services" 1979

Industry Workshop Association Convention
"Customer Equity and Local Measured Service" 1979

Symposium on Ratemaking Problems of Regulated Industries
"Pricing Decisions and the Regulatory Process" 1979

Woodrow Wilson School Alumni Conference
"The Push for Deregulation" 1979

NBER Conference on Industrial Organization
"Intertemporal Sustainability" 1979

World Congress of the Econometric Society
"Theoretical Industrial Organization" 1980

Institute of Public Utilities Conference on Current Issues in Public Utilities Regulation
"Network Access Pricing" 1978

ALI-ABA Conference on the Economics of Antitrust
"Predatoriness and Discriminatory Pricing" 1978

AEI Conference on Postal Service Issues
"What Can Markets Control?" 1978

University of Virginia Conference on the Economics of Regulation
"Public Interest Pricing" 1978

DRI Utility Conference
"Marginal Cost Pricing in the Utility Industry: Impact and Analysis" 1978

International Meeting of the Institute of Management Sciences
"The Envelope Theorem" 1977

University of Warwick Workshop on Oligopoly
"Industry Performance Gradient Indexes" 1977

North American Econometric Society Convention
"Intertemporal Sustainability" 1979
"Social Welfare Dominance" 1978
"Economies of Scope, DAIC, and Markets with Joint Production" 1977

Telecommunications Policy Research Conference
"Transition to Competitive Markets" 1986
"InterLATA Capacity Growth, Capped NTS Charges and Long Distance Competition" 1985
"Market Power in The Telecommunications Industry" 1984
"FCC Policy on Local Access Pricing" 1983
"Do We Need a Regulatory Safety Net in Telecommunications?" 1982
"Anticompetitive Vertical Conduct" 1981
"Electronic Mail and Postal Pricing" 1980
"Monopoly, Competition and Efficiency": Chairman 1979

"A Common Carrier Research Agenda" 1978
"Empirical Views of Ramsey Optimal Telephone Pricing" 1977
"Recent Research on Regulated Market Structure" 1976
"Some General Equilibrium Views of Optimal Pricing" 1975

National Bureau of Economic Research Conference on Theoretical Industrial Organization
"Compensating Variation as a Measure of Welfare Change" 1976
Conference on Pricing in Regulated Industries: Theory & Application
"Ramsey Optimal Pricing of Long Distance Telephone Services" 1977

NBER Conference on Public Regulation
"Income Distributional Concerns in Regulatory Policy-Making" 1977

Allied Social Science Associations National Convention
"Merger Guidelines and Economic Theory" 1990
Discussion of "Competitive Rules for Joint Ventures" 1989
"New Schools in Industrial Organization" 1988
"Industry Economic Analysis in the Legal Arena" 1987
"Transportation Deregulation" 1984
Discussion of "Pricing and Costing of Telecommunications Services" 1983
Discussion of "An Exact Welfare Measure" 1982
"Optimal Deregulation of Telephone Services" 1982
"Sector Differentiated Capital Taxes" 1981
"Economies of Scope" 1980
"Social Welfare Dominance" 1980
"The Economic Definition of Predation" 1979
Discussion of "Lifeline Rates, Succor or Snare?" 1979
"Multiproduct Technology and Market Structure" 1978
"The Economic Gradient Method" 1978
"Methods for Public Interest Pricing" 1977
Discussion of "The Welfare Implications of New Financial Instruments" 1976
"Welfare Theory of Concentration Indices" 1976
Discussion of "Developments in Monopolistic Competition Theory" 1976
"Hedonic Price Adjustments" 1975
"Public Good Attributes of Information and its Optimal Pricing" 1975
"Risk Invariance and Ordinally Additive Utility Functions" 1974
"Consumer's Surplus: A Rigorous Cookbook" 1974

University of Chicago Symposium on the Economics of Regulated Public Utilities
"Optimal Prices for Public Purposes" 1976

American Society for Information Science
"The Social Value of Information: An Economist's View" 1975

Institute for Mathematical Studies in the Social Sciences Summer Seminar

"The Sustainability of Natural Monopoly" 1975

U.S.-U.S.S.R. Symposium on Estimating Costs and Benefits of Information Services
"The Evaluation of the Economic Benefits of Productive Information" 1975

NYU-Columbia Symposium on Regulated Industries
"Ramsey Optimal Public Utility Pricing" 1975

Research Seminars:

Bell Communications Research (2)
Bell Laboratories (numerous)
Department of Justice (3)
Electric Power Research Institute
Federal Reserve Board
Federal Trade Commission (4)
Mathematica
Rand
World Bank (4)
Carleton University
Carnegie-Mellon University
Columbia University (4)
Cornell University (2)
Georgetown University
Harvard University (2)
Hebrew University
Johns Hopkins University (2)
M. I. T. (4)
New York University (4)
Northwestern University (2)
Norwegian School of Economics and Business Administration
University of California, San Diego
University of Chicago
University of Delaware
University of Florida
University of Illinois
University of Iowa (2)
Universite Laval
University of Maryland
University of Michigan
University of Minnesota
University of Oslo
University of Pennsylvania (3)
University of Toronto
University of Virginia
University of Wisconsin
University of Wyoming
Vanderbilt University
Yale University (2)
Princeton University
Rice University
Stanford University 5
S.U.N.Y. Albany

EXHIBIT 2

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26 April 2018

By email

Professor Robert D Willig
Senior Consultant
Compass Lexicon

Email [redacted]

Confidential and privileged

Dear Professor Willig

Advice on workable competition

We act for APA Group (**APA**). The purpose of this letter is to seek, on behalf of APA, your independent expert opinion as to the key economic features of a workably competitive market, and on the economic outcomes which might be expected from a workably competitive market for the provision of gas transmission pipeline services.

Background

On 1 August 2017, amendments to the National Gas Law (**NGL**) and National Gas Rules (**NGR**) to introduce a new arbitration framework for 'non-scheme pipelines' took effect. Non-scheme pipelines include certain transmission pipelines owned by APA that are not covered pipelines. As these pipelines are not covered, the tariffs that APA may charge for use of these pipelines (and hence the revenues that it may earn) are not subject to regulation. The tariffs and other terms and conditions of access for these pipelines have been (until now) subject to commercial negotiation between APA and its customers.

Under the new arbitration framework, if a prospective user or user cannot agree with APA about one or more aspects of access to a pipeline service after a request for access has been made in accordance with the NGR, the prospective user or user, or APA, may notify the scheme administrator that an access dispute exists.[1] If the scheme administrator receives notification of an access dispute, the dispute must be referred to arbitration.[2]

The objective of the new Part 23 of the NGR, which forms part of the new access framework for non-scheme pipelines, is as follows:[3]

> *The objective of this Part is to facilitate access to pipeline services on non-scheme pipelines on reasonable terms, which, for the purposes of this Part, is taken to mean at prices and on other terms and conditions that, so far as practical, reflect the outcomes of a workably competitive market.*

[1] NGL, s 216H.
[2] NGL, s 216J.
[3] NGR, rule 546.

When making a determination in respect of an access dispute, the arbitrator must take into account the principle that access to pipeline services must be on 'reasonable terms', as defined in the objective.

Independent expert opinion

APA is seeking an economist with recognised expertise in competitive markets to provide an opinion on the key economic features of a workably competitive market, and on the economic outcomes which might be expected from a workably competitive market for the provision of gas pipeline services.

In particular, APA is seeking advice which addresses the following questions:

1 What are the key economic features of a workably competitive market, and how do these compare to models of perfect competition?

2 What economic outcomes (in terms of price, service differentiation, etc.) may be expected in a workably competitive market?

3 What principles should be applied in assessing whether prices for pipeline services reflect, in a so far as reasonably practical, the outcome of a workably competitive market?

Your opinion on these matters should be set out in a report addressed to Gilbert + Tobin.

APA is intending to use this advice in preparing for the arbitration of disputes over access to its non-scheme pipelines. At the present time, no access dispute has been initiated, but should such a dispute arise, APA may wish to submit the advice it has received to the arbitrator appointed to determine the dispute. APA may also wish to make the advice available to a prospective shipper during access negotiations. If the advice is provided to an arbitrator, it may be placed on the public record.

Guidelines for preparing your report

There are certain principles governing the content and form of expert reports set out in the Federal Court of Australia Expert Evidence Practice Notes. Those principles are set out in Attachment A and we request they be observed when you are preparing your report.

Please contact me if you require any further information.

Yours sincerely

Geoff Petersen
Special Counsel
[redacted]

ATTACHMENT A: FEDERAL COURT PRACTICE NOTE

FEDERAL COURT OF AUSTRALIA

EXPERT EVIDENCE PRACTICE NOTES (GPN-EXPT)

General Practice Note

1. INTRODUCTION

1.1 This practice note, including the *Harmonised Expert Witness Code of Conduct* ("**Code**") (see **Annexure A**) and the *Concurrent Expert Evidence Guidelines* ("**Concurrent Evidence Guidelines**") (see **Annexure B**), applies to any proceeding involving the use of expert evidence and must be read together with:

(a) the Central Practice Note (CPN-1), which sets out the fundamental principles concerning the National Court Framework ("**NCF**") of the Federal Court and key principles of case management procedure;

(b) the Federal Court of Australia Act 1976 (Cth) ("**Federal Court Act**");

(c) the *Evidence Act 1995* (Cth) ("**Evidence Act**"), including Part 3.3 of the Evidence Act;

(d) Part 23 of the *Federal Court Rules 2011* (Cth) ("**Federal Court Rules**"); and

(e) where applicable, the Survey Evidence Practice Note (GPN-SURV).

1.2 This practice note takes effect from the date it is issued and, to the extent practicable, applies to proceedings whether filed before, or after, the date of issuing.

2. APPROACH TO EXPERT EVIDENCE

2.1 An expert witness may be retained to give opinion evidence in the proceeding, or, in certain circumstances, to express an opinion that may be relied upon in alternative dispute resolution procedures such as mediation or a conference of experts. In some circumstances an expert may be appointed as an independent adviser to the Court.

2.2 The purpose of the use of expert evidence in proceedings, often in relation to complex subject matter, is for the Court to receive the benefit of the objective and impartial assessment of an issue from a witness with specialised knowledge (based on training, study or experience - see generally s 79 of the Evidence Act).

2.3 However, the use or admissibility of expert evidence remains subject to the overriding requirements that:

(a) to be admissible in a proceeding, any such evidence must be relevant (s 56 of the Evidence Act); and

(b) even if relevant, any such evidence, may be refused to be admitted by the Court if its probative value is outweighed by other considerations such as the evidence being unfairly prejudicial, misleading or will result in an undue waste of time (s 135 of the Evidence Act).

2.4 An expert witness' opinion evidence may have little or no value unless the assumptions adopted by the expert (ie. the facts or grounds relied upon) and his or her reasoning are expressly stated in any written report or oral evidence given.

2.5 The Court will ensure that, in the interests of justice, parties are given a reasonable opportunity to adduce and test relevant expert opinion evidence. However, the Court expects parties and any legal representatives acting on their behalf, when dealing with expert witnesses and expert evidence, to at all times comply with their duties associated with the overarching purpose in the Federal Court Act (see ss 37M and 37N).

3. INTERACTION WITH EXPERT WITNESSES

3.1 Parties and their legal representatives should never view an expert witness retained (or partly retained) by them as that party's advocate or "hired gun". Equally, they should never attempt to pressure or influence an expert into conforming his or her views with the party's interests.

3.2 A party or legal representative should be cautious not to have inappropriate communications when retaining or instructing an independent expert, or assisting an independent expert in the preparation of his or her evidence. However, it is important to note that there is no principle of law or practice and there is nothing in this practice note that obliges a party to embark on the costly task of engaging a "consulting expert" in order to avoid "contamination" of the expert who will give evidence. Indeed the Court would generally discourage such costly duplication.

3.3 Any witness retained by a party for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based in the specialised knowledge of the witness[4] should, at the earliest opportunity, be provided with:

(a) a copy of this practice note, including the Code (see Annexure A); and

(b) all relevant information (whether helpful or harmful to that party's case) so as to enable the expert to prepare a report of a truly independent nature.

3.4 Any questions or assumptions provided to an expert should be provided in an unbiased manner and in such a way that the expert is not confined to addressing selective, irrelevant or immaterial issues.

[4] Such a witness includes a "Court expert" as defined in r 23.01 of the Federal Court Rules. For the definition of "expert", "expert evidence" and "expert report" see the Dictionary, in Schedule 1 of the Federal Court Rules.

4. ROLE AND DUTIES OF THE EXPERT WITNESS

4.1 The role of the expert witness is to provide relevant and impartial evidence in his or her area of expertise. An expert should never mislead the Court or become an advocate for the cause of the party that has retained the expert.

4.2 It should be emphasised that there is nothing inherently wrong with experts disagreeing or failing to reach the same conclusion. The Court will, with the assistance of the evidence of the experts, reach its own conclusion.

4.3 However, experts should willingly be prepared to change their opinion or make concessions when it is necessary or appropriate to do so, even if doing so would be contrary to any previously held or expressed view of that expert.

Harmonised Expert Witness Code of Conduct

4.4 Every expert witness giving evidence in this Court must read the *Harmonised Expert Witness Code of Conduct* (attached in Annexure A) and agree to be bound by it.

4.5 The Code is not intended to address all aspects of an expert witness' duties, but is intended to facilitate the admission of opinion evidence, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is expected that compliance with the Code will assist individual expert witnesses to avoid criticism (rightly or wrongly) that they lack objectivity or are partisan.

5. CONTENTS OF AN EXPERT'S REPORT AND RELATED MATERIAL

5.1 The contents of an expert's report must conform with the requirements set out in the Code (including clauses 3 to 5 of the Code).

5.2 In addition, the contents of such a report must also comply with r 23.13 of the Federal Court Rules. Given that the requirements of that rule significantly overlap with the requirements in the Code, an expert, unless otherwise directed by the Court, will be taken to have complied with the requirements of r 23.13 if that expert has complied with the requirements in the Code and has complied with the additional following requirements. The expert shall:

(a) acknowledge in the report that:

(i) the expert has read and complied with this practice note and agrees to be bound by it; and

(ii) the expert's opinions are based wholly or substantially on specialised knowledge arising from the expert's training, study or experience;

(b) identify in the report the questions that the expert was asked to address;

(c) sign the report and attach or exhibit to it copies of:

(i) documents that record any instructions given to the expert; and

(ii) documents and other materials that the expert has been instructed to consider.

5.3 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the other parties at the same time as the expert's report.

6. CASE MANAGEMENT CONSIDERATIONS

6.1 Parties intending to rely on expert evidence at trial are expected to consider between them and inform the Court at the earliest opportunity of their views on the following:

(a) whether a party should adduce evidence from more than one expert in any single discipline;

(b) whether a common expert is appropriate for all or any part of the evidence;

(c) the nature and extent of expert reports, including any in reply;

(d) the identity of each expert witness that a party intends to call, their area(s) of expertise and availability during the proposed hearing;

(e) the issues that it is proposed each expert will address;

(f) the arrangements for a conference of experts to prepare a joint-report (see Part 7 of this practice note);

(g) whether the evidence is to be given concurrently and, if so, how (see Part 8 of this practice note); and

(h) whether any of the evidence in chief can be given orally.

6.2 It will often be desirable, before any expert is retained, for the parties to attempt to agree on the question or questions proposed to be the subject of expert evidence as well as the relevant facts and assumptions. The Court may make orders to that effect where it considers it appropriate to do so.

7. CONFERENCE OF EXPERTS AND JOINT-REPORT

7.1 Parties, their legal representatives and experts should be familiar with aspects of the Code relating to conferences of experts and joint-reports (see clauses 6 and 7 of the Code attached in Annexure A).

7.2 In order to facilitate the proper understanding of issues arising in expert evidence and to manage expert evidence in accordance with the overarching purpose, the Court may require experts who are to give evidence or who have produced reports to meet for the purpose of identifying and addressing the issues not agreed between them with a view to reaching agreement where this is possible ("**conference of experts**"). In an appropriate case, the Court may appoint a registrar of the Court or some other suitably qualified person ("**Conference Facilitator**") to act as a facilitator at the conference of experts.

7.3 It is expected that where expert evidence may be relied on in any proceeding, at the earliest opportunity, parties will discuss and then inform the Court whether a conference of experts and/or a joint-report by the experts may be desirable to assist with or simplify the giving of expert evidence in the proceeding. The parties should discuss the necessary arrangements for any conference and/or joint-report. The arrangements discussed between the parties should address:

(a) who should prepare any joint-report;

(b) whether a list of issues is needed to assist the experts in the conference and, if so, whether the Court, the parties o r the experts should assist in preparing such a list;

(c) **t**he agenda for the conference of experts; and

(d) arrangements for the provision, to the parties and the Court, of any joint-report or any other report as to the outcomes of the conference ("**conference report**").

Conference of Experts

7.4 The purpose of the conference of experts is for the experts to have a comprehensive discussion of issues relating to their field of expertise, with a view to identifying matters and issues in a proceeding about which the experts agree, partly agree or disagree and why. For this reason the conference is attended only by the experts and any Conference Facilitator. Unless the Court orders otherwise, the parties' lawyers will not attend the conference but will be provided with a copy of any conference report.

7.5 The Court may order that a conference of experts occur in a variety of circumstances, depending on the views of the judge and the parties and the needs of the case, including:

(a) while a case is in mediation. When this occurs the Court may also order that the outcome of the conference or any document disclosing or summarising the experts' opinions be confidential to the parties while the mediation is occurring;

(b) before the experts have reached a final opinion on a relevant question or the facts involved in a case. When this occurs the Court may order that the parties exchange draft expert reports and that a conference report be prepared for the use of the experts in finalising their reports;

(c) after the experts' reports have been provided to the Court but before the hearing of the experts' evidence. When this occurs the Court may also order that a conference report be prepared (jointly or otherwise) to ensure the efficient hearing of the experts' evidence.

7.6 Subject to any other order or direction of the Court, the parties and their lawyers must not involve themselves in the conference of experts process. In particular, they must not seek to encourage an expert not to agree with another expert or otherwise seek to influence the outcome of the conference of experts. The experts should raise any queries they may have in relation to the process with the Conference Facilitator (if one has been appointed) or in accordance with a protocol agreed between the lawyers prior to the conference of experts taking place (if no Conference Facilitator has been appointed).

7.7 Any list of issues prepared for the consideration of the experts as part of the conference of experts process should be prepared using non-tendentious language.

7.8 The timing and location of the conference of experts will be decided by the judge or a registrar who will take into account the location and availability of the experts and the Court's case management timetable. The conference may take place at the Court and will usually be conducted in-person. However, if not considered a hindrance to the process, the conference may also be conducted with the assistance of visual or audio technology (such as via the internet, video link and/or by telephone).

7.9 Experts should prepare for a conference of experts by ensuring that they are familiar with all of the material upon which they base their opinions. Where expert reports in draft or final form have been exchanged prior to the conference, experts should attend the conference familiar with the reports of the other experts. Prior to the conference, experts should also consider where they believe the differences of opinion lie between them and what processes and discussions may assist to identify and refine those areas of difference.

Joint-report

7.10 At the conclusion of the conference of experts, unless the Court considers it unnecessary to do so, it is expected that the experts will have narrowed the issues in respect of which they agree, partly agree or disagree in a joint-report. The joint-report should be clear, plain and concise and should summarise the views of the experts on the identified issues, including a succinct explanation for any differences of opinion, and otherwise be structured in the manner requested by the judge or registrar.

7.11 In some cases (and most particularly in some native title cases), depending on the nature, volume and complexity of the expert evidence a judge may direct a registrar to draft part, or all, of a conference report. If so, the registrar will usually provide the draft conference report to the relevant experts and seek their confirmation that the conference report accurately reflects the opinions of the experts expressed at the conference. Once that

confirmation has been received the registrar will finalise the conference report and provide it to the intended recipient(s).

8. CONCURRENT EXPERT EVIDENCE

8.1 The Court may determine that it is appropriate, depending on the nature of the expert evidence and the proceeding generally, for experts to give some or all of their evidence concurrently at the final (or other) hearing.

8.2 Parties should familiarise themselves with the *Concurrent Expert Evidence Guidelines* (attached in Annexure B). The Concurrent Evidence Guidelines are not intended to be exhaustive but indicate the circumstances when the Court might consider it appropriate for concurrent expert evidence to take place, outline how that process may be undertaken, and assist experts to understand in general terms what the Court expects of them.

8.3 If an order is made for concurrent expert evidence to be given at a hearing, any expert to give such evidence should be provided with the Concurrent Evidence Guidelines well in advance of the hearing and should be familiar with those guidelines before giving evidence.

9. FURTHER PRACTICE INFORMATION AND RESOURCES

9.1 Further information regarding Expert Evidence and Expert Witnesses is available on the Court's website.

9.2 Further information to assist litigants, including a range of helpful guides, is also available on the Court's website. This information may be particularly helpful for litigants who are representing themselves.

J L B ALLSOP
Chief Justice
25 October 2016

Annexure A

HARMONISED EXPERT WITNESS CODE OF CONDUCT[5]

APPLICATION OF CODE

1. This Code of Conduct applies to any expert witness engaged or appointed:

   (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or

   (b) to give opinion evidence in proceedings or proposed proceedings.

GENERAL DUTIES TO THE COURT

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

CONTENT OF REPORT

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide:

   (a) the name and address of the expert;

   (b) an acknowledgment that the expert has read this code and agrees to be bound by it;

   (c) the qualifications of the expert to prepare the report;

   (d) the assumptions and material facts on which each opinion expressed in the report is based [a letter of instructions may be annexed];

   (e) the reasons for and any literature or other materials utilised in support of such opinion;

   (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;

   (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;

   (h) the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and the opinion expressed by that other person;

   (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly

[5] Approved by the Council of Chief Justices' Rules Harmonisation Committee

in the report), and that no matters of significance which the expert regards as relevant have, to the knowledge of the expert, been withheld from the Court;

(j) any qualifications on an opinion expressed in the report without which the report is or may be incomplete or inaccurate;

(k) whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and

(l) where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

SUPPLEMENTARY REPORT FOLLOWING CHANGE OF OPINION

4. Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (l) of clause 3 of this code and, if applicable, paragraph (f) of that clause.

5. In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

DUTY TO COMPLY WITH THE COURT'S DIRECTIONS

6. If directed to do so by the Court, an expert witness shall:

(a) confer with any other expert witness;

(b) provide the Court with a joint-report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and

(c) abide in a timely way by any direction of the Court.

CONFERENCE OF EXPERTS

7. Each expert witness shall:

(a) exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and

(b) endeavour to reach agreement with the other expert witness (or witnesses) on

any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

ANNEXURE B

CONCURRENT EXPERT EVIDENCE GUIDELINES

APPLICATION OF THE COURT'S GUIDELINES

1. The Court's Concurrent Expert Evidence Guidelines ("**Concurrent Evidence Guidelines**") are intended to inform parties, practitioners and experts of the Court's general approach to concurrent expert evidence, the circumstances in which the Court might consider expert witnesses giving evidence concurrently and, if so, the procedures by which their evidence may be taken.

OBJECTIVES OF CONCURRENT EXPERT EVIDENCE TECHNIQUE

2. The use of concurrent evidence for the giving of expert evidence at hearings as a case management technique[6] will be utilised by the Court in appropriate circumstances (see r 23.15 of the *Federal Court Rules 2011* (Cth)). Not all cases will suit the process. For instance, in some patent cases, where the entire case revolves around conflicts within fields of expertise, concurrent evidence may not assist a judge. However, patent cases should not be excluded from concurrent expert evidence processes.

3. In many cases the use of concurrent expert evidence is a technique that can reduce the partisan or confrontational nature of conventional hearing processes and minimises the risk that experts become "opposing experts" rather than independent experts assisting the Court. It can elicit more precise and accurate expert evidence with greater input and assistance from the experts themselves.

4. When properly and flexibly applied, with efficiency and discipline during the hearing process, the technique may also allow the experts to more effectively focus on the critical points of disagreement between them, identify or resolve those issues more quickly, and narrow the issues in dispute. This can also allow for the key evidence to be given at the same time (rather than being spread across many days of hearing); permit the judge to assess an expert more readily, whilst allowing each party a genuine opportunity to put and test expert evidence. This can reduce the chance of the experts, lawyers and the judge misunderstanding the opinions being expressed by the experts.

5. It is essential that such a process has the full cooperation and support of all of the individuals involved, including the experts and counsel involved in the questioning

[6] Also known as the "hot tub" or as "expert panels".

process. Without that cooperation and support the process may fail in its objectives and even hinder the case management process.

CASE MANAGEMENT

6. Parties should expect that, the Court will give careful consideration to whether concurrent evidence is appropriate in circumstances where there is more than one expert witness having the same expertise who is to give evidence on the same or related topics. Whether experts should give evidence concurrently is a matter for the Court, and will depend on the circumstances of each individual case, including the character of the proceeding, the nature of the expert evidence, and the views of the parties.

7. Although this consideration may take place at any time, including the commencement of the hearing, if not raised earlier, parties should raise the issue of concurrent evidence at the first appropriate case management hearing, and no later than any pre-trial case management hearing, so that orders can be made in advance, if necessary. To that end, prior to the hearing at which expert evidence may be given concurrently, parties and their lawyers should confer and give general consideration as to:

   (a) the agenda;

   (b) the order and manner in which questions will be asked; and

   (c) whether cross-examination will take place within the context of the concurrent evidence or after its conclusion.

8. At the same time, and before any hearing date is fixed, the identity of all experts proposed to be called and their areas of expertise is to be notified to the Court by all parties.

9. The lack of any concurrent evidence orders does not mean that the Court will not consider using concurrent evidence without prior notice to the parties, if appropriate.

CONFERENCE OF EXPERTS & JOINT-REPORT OR LIST OF ISSUES

10. The process of giving concurrent evidence at hearings may be assisted by the preparation of a joint-report or list of issues prepared as part of a conference of experts.

11. Parties should expect that, where concurrent evidence is appropriate, the Court may make orders requiring a conference of experts to take place or for documents such as a joint-report to be prepared to facilitate the concurrent expert evidence process at a

hearing (see Part 7 of the Expert Evidence Practice Note).

PROCEDURE AT HEARING

12. Concurrent expert evidence may be taken at any convenient time during the hearing, although it will often occur at the conclusion of both parties' lay evidence.

13. At the hearing itself, the way in which concurrent expert evidence is taken must be applied flexibly and having regard to the characteristics of the case and the nature of the evidence to be given.

14. Without intending to be prescriptive of the procedure, parties should expect that, when evidence is given by experts in concurrent session:

    (a) the judge will explain to the experts the procedure that will be followed and that the nature of the process may be different to their previous experiences of giving expert evidence;

    (b) the experts will be grouped and called to give evidence together in their respective fields of expertise;

    (c) the experts will take the oath or affirmation together, as appropriate;

    (d) the experts will sit together with convenient access to their materials for their ease of reference, either in the witness box or in some other location in the courtroom, including (if necessary) at the bar table;

    (e) each expert may be given the opportunity to provide a summary overview of their current opinions and explain what they consider to be the principal issues of disagreement between the experts, as they see them, in their own words;

    (f) the judge will guide the process by which evidence is given, including, where appropriate:

        (i) using any joint-report or list of issues as a guide for all the experts to be asked questions by the judge and counsel, about each issue on an issue-by-issue basis;

        (ii) ensuring that each expert is given an adequate opportunity to deal with each issue and the exposition given by other experts including, where considered appropriate, each expert asking questions of other experts or supplementing the evidence given by other experts;

        (iii) inviting legal representatives to identify the topics upon which they will cross-examine;

(iv) ensuring that legal representatives have an adequate opportunity to ask all experts questions about each issue. Legal representatives may also seek responses or contributions from one or more experts in response to the evidence given by a different expert; and

(v) allowing the experts an opportunity to summarise their views at the end of the process where opinions may have been changed or clarifications are needed.

15. The fact that the experts may have been provided with a list of issues for consideration does not confine the scope of any cross-examination of any expert. The process of cross-examination remains subject to the overall control of the judge.

16. The concurrent session should allow for a sensible and orderly series of exchanges between expert and expert, and between expert and lawyer. Where appropriate, the judge may allow for more traditional cross-examination to be pursued by a legal representative on a particular issue exclusively with one expert. Where that occurs, other experts may be asked to comment on the evidence given.

17. Where any issue involves only one expert, the party wishing to ask questions about that issue should let the judge know in advance so that consideration can be given to whether arrangements should be made for that issue to be dealt with after the completion of the concurrent session. Otherwise, as far as practicable, questions (including in the form of cross-examination) will usually be dealt with in the concurrent session.

18. Throughout the concurrent evidence process the judge will ensure that the process is fair and effective (for the parties and the experts), balanced (including not permitting one expert to overwhelm or overshadow any other expert), and does not become a protracted or inefficient process.