

Comments on Economic Issues Raised in EB-2016-0004
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1. Introduction

- 1.1 Counsel for Parkland Fuel Corporation (“Parkland”) has asked us to provide an independent economic evaluation of certain issues raised by the Ontario Energy Board (“OEB” or “Board”) in EB-2016-0004. This proceeding relates to the OEB’s own motion to consider alternative cost recovery mechanisms to fund the expansion of natural gas into unserved areas of Ontario.
- 1.2 The OEB raises a number of issues in its “Issues List” attached as Schedule B to its Procedural Order No.2 (“PO2”) dated March 9, 2016. We restrict our attention to certain economic issues raised by the OEB in Issues 2 and 3.¹ Specifically, we evaluate two distinct but inter-related issues:
- Whether, as a matter of economics, existing customers of gas distribution utilities (or “LDCs”) in Ontario should fund—via surcharges, for example—the expansion of another gas distribution utility’s systems into unserved areas of Ontario, chiefly rural Ontario. We label this “Issue 2.”
 - Whether, as a matter of economics, existing customers of a given utility should fund via the ratemaking mechanism—through rolled-in pricing, for example—the expansion of that utility’s system into unserved areas. Specifically, this issue is examined in light of the OEB’s current financial viability tests that are used to guide whether projects are economic, and which place some bounds on cross-subsidization of new customers by existing customers. We label this “Issue 3.”²

Principal Conclusions

- 1.3 As explained in greater detail in this paper, we have reached the following principal conclusions related to Issue 2 and Issue 3 pertaining to the economic aspects of expanding natural gas service into unserved areas:
- I. Existing ratepayers should not be required to subsidize expansions of the natural gas system into unserved areas unless (at a minimum) there are off-setting benefits that accrue specifically to these ratepayers. The magnitude of these benefits must also exceed the amount of subsidy provided. Examples of such benefits are improved system reliability or improved system performance which should, in theory, increase existing ratepayers’ willingness-to-pay for their current service.
 - II. Natural gas expansions that are justified based on broader environmental benefits or on economic development grounds should only be subsidized if (i) they produce benefits for Ontario at large and not just the areas in which the expansions occur, and (ii) those benefits are specifically linked to natural gas expansion.
 - III. Both regulatory economics and the economics of taxation unequivocally warn against cross-subsidizing natural gas expansions by distorting (upwards) natural gas prices everywhere in

¹ These Issues are listed in Schedule B of PO2. We note that our discussion of the economic aspects of Issues 2 and 3 also addresses Issue 4(f) which invites comments pertaining to the economic aspects of expanding (or not expanding) natural gas service, as well as the environmental and public interest components.

² We note that there are several more detailed sub-issues associated with Issue 2 and Issue 3 which we do not directly address. Our focus is on key economic principles. Our phrasing of Issue 2 and Issue 3 does not exactly match the OEB’s phrasing, but instead reflects the economic component of the issues posed by the OEB that we set out to address.

the Province. Moreover, from the regulatory economics standpoint, allowing incumbent gas utilities to effectively “roll-in” capital associated with uneconomic expansions into their regulated rate-base amounts to an inefficient cross-subsidy from existing to new ratepayers. Permitting roll-in artificially lowers the costs to incumbent distribution utilities of new capital projects. By doing so, it distorts competition between these incumbents on the one hand, and alternative fuel suppliers and new entrants on the other hand (since these competitors must pay market-based prices for capital expansions).

- IV. We explain the economics of cross-subsidies and the distortion to competition at greater length in this paper. In summary, however, requiring new investments to pass a “market test”—incremental benefits exceed incremental costs—is consistent with modern economic regulation and its focus on providing market-like incentives in order to maximize economic efficiency.
- V. Evidence from other Canadian jurisdictions suggests that natural gas expansions may not be economically successful (especially if current relative prices of propane and natural gas remain in place). If so, there is a great likelihood that any cross-subsidy by ratepayers will need to be increased, or that utility shareholders will have to bear large losses. Both of these circumstances will tend to undermine the existing energy regulatory framework in Ontario.
- VI. Any success of subsidized natural gas expansions will occur at the expense of other investments—by alternative fuel suppliers—that were made under the existing “rules of the game” (which attempt to limit cross-subsidies and promote market-like incentives for efficient investment decisions). An unexpected change in the “rules of the game” that reduces the value of these investments might be seen as a “regulatory taking”, and will undermine incentives to invest by anyone other than existing natural gas utilities that benefit from cross-subsidies.
- VII. Further, since natural gas systems in currently unserved areas will face competition from existing fuel suppliers (who are numerous), the OEB should consider whether competition is sufficient to protect the public interest in these areas. If it is, then allowing cross-subsidized expansion of natural gas systems amounts to a cross-subsidy provided by existing system customers not just to new system customers but also to utility shareholders. A policy that subsidizes otherwise uneconomic natural gas expansions also jeopardizes market-based investments made by existing fuel suppliers.
- VIII. The OEB should critically evaluate “public benefit” or “externality” based arguments for subsidized natural gas expansions. If such Province-wide benefits exist from natural gas expansions into unserved areas, then this suggests that subsidies should be borne by taxpayers. Ontarians may have an interest in the economic development of rural areas (where natural gas systems have lower penetration rates) or in environmentally friendly public policies. However, there is no economic reason to choose natural gas expansions as the means to affect such policies as opposed to, say, cash grants to local communities for such purposes.
- IX. By way of example, the economics literature finds that the use of regulatory cross-subsidies to achieve plausible-sounding public policy goals such as “universal telephone service” was unwarranted and created significant economic distortions. With natural gas expansions, no “universal” service rationale exists and all benefits are strictly *incremental benefits* related to any environmental and economic advantages of natural gas *relative to other fuel sources*. These benefits may be highly localized and small relative to costs, as the benefit per dollar of investment from reduced CO₂ emissions achieved by converting to cleaner fuels in a dense urban area is likely much greater than that achieved in rural areas. Moreover, there may be minimal (if any) environmental benefit of replacing some alternative fuels (e.g.,

propane) with natural gas. Given that subsidized natural gas expansions run the risk of displacing existing market-based investments in alternative fuel sources, the evidentiary burden required for establishing the “benefits” of doing so must be rigorous.

- X. Even if a subsidy were to be given, the manner in which that subsidy is implemented merits attention. The costs of a subsidy based on broader societal benefits—rather than “private” benefits to existing ratepayers—should ideally be borne by all taxpayers rather than just utility ratepayers. Further, taxes and subsidies that directly affect the price of a good create an “excess burden” in that the economic costs associated with providing them exceeds the revenues raised.³ Non-distortionary revenue-raising mechanisms such as using proceeds from privatization of public assets or public auctions, combined with lump-sum transfers (such as refunds or credits) to help consumers with the cost of switching to natural gas, do not contain such excess burdens and should be given priority to cross-subsidization by existing utility ratepayers.
- XI. Any proposed subsidy mechanism should pass the test of being the least distortionary policy instrument possible. From an economic perspective, cross-subsidies that distort the price of natural gas throughout the province are more distortionary relative to alternate policies, and fare poorly in terms of providing the right economic incentives for efficient investment by incumbent utilities and alternate fuel source providers.

Structure of Report

- 1.4 We begin our economic evaluation by discussing the nature and purpose of economic regulation. Economic regulation is a form of intervention most often used in “natural monopoly” industries. Modern regulatory economics and regulatory practice substantially focuses on preserving or maximizing economic efficiency in circumstances where competition, the mechanism that usually maximizes economic efficiency, is not feasible or desirable. We discuss the types of economic efficiency—allocative, cost and dynamic efficiency— whose achievement is of concern to regulators.
- 1.5 Economic regulation has also been used to address “externalities.” The most relevant type of externality for present evaluative purposes is one in which the market or market-like mechanisms will not provide enough of some good that society views as desirable. We briefly discuss the typical externality rationales that sometimes have been used to justify regulatory intervention. The most striking historic examples of an externality argument involve “universal” telecommunications service. Even though externality arguments in telephony have some intuitive appeal, economic literature finds that such externalities did not justify cross-subsidies and there were substantial losses to society from such cross-subsidization. We evaluate, at a high level, whether externality arguments have merit in the context of natural gas expansions, and if they justify departures from regulatory standards whose goal is to preserve economic efficiency calculated on the basis of conventionally considered costs and benefits.
- 1.6 We then turn to the economic efficiency rationales that underpin the financial viability test laid out in EBO-188. This test puts bounds on the degree to which existing ratepayers might fund system expansions that fail a market-based test. The purpose behind this test is to ensure both

³ The explicit cost of any subsidy is the per-unit subsidy multiplied by the number of units provided at the subsidized price. Economic principles illustrate that this cost will exceed the increase in welfare (as measured by consumer surplus) experienced by the subsidized consumers. Moreover, the “excess burden” of the subsidy represents a “deadweight loss” in that it is lost welfare not redistributed to some agent in the economy. It arises because the subsidized price causes some buyers to switch to the now relatively less expensive item which presumably was less desirable or uneconomic at the pre-subsidized price. Also, if production of the subsidized good increases, or production for those products that are substitutes to it decreases, such production changes would not have been profit maximizing or efficient absent the subsidy. (See, e.g., Harvey S. Rosen (1995), Public Finance, 4th edition, p. 316)

allocative efficiency (the optimal allocation of resources among different members of society) and dynamic efficiency. Dynamic efficiency in the context of regulation means that the regulated price sends the right market signals to incumbent and entrant firms alike, and ensures that incumbent firms cannot inefficiently leverage existing system assets to derive an advantage relative to potential competitors who must face the discipline of the marketplace.

- 1.7 We next discuss the risks associated with permitting (cross-) subsidized expansions of natural gas distribution systems in areas that already have competition between different fuel sources. Such subsidized expansions may (if artificially cheap natural gas wins customer acceptance) end up replacing competition with a regulated natural monopoly. Market actors such as propane distributors and alternative fuel suppliers have made investments under the assumption that the “rules of the game” between the OEB and regulated firms limited the scope for uneconomic expansions of natural gas systems. Changes to the “rules of the game” can be seen as a “regulatory taking” and would be unhelpful to the broader goal of fostering efficient investment in the energy sector in Ontario.
- 1.8 Last, we discuss the risks associated with uncertain demand for natural gas expansions. Previous experience in Canada suggests that expansions of natural gas could turn out to be less successful than anticipated.⁴ Demand shortfalls could feed into a larger funding shortfall, requiring more cross-subsidies to prevent assets from being stranded which would further add to the economic inefficiency. We note that if natural gas demand turns out to be lower than anticipated in expansion areas (based on experiences elsewhere), then other fuel suppliers would likely be less affected by the subsidized entry of natural gas as fewer customers would be switching away from alternate fuels (all else equal). However, increased future funding requirements due to any demand shortfall will still entail added economic inefficiency if additional cross-subsidies are used.

2. About the Authors

- 2.1 Dr. Nieberding and Mr. Dasgupta have worked independently and together over the last 20 years on antitrust, competition and regulatory matters including numerous engagements in Canada. We have attached our CVs which contain our contact information, a summary of our professional backgrounds and activities, our relevant experience, and other information related to our professional credentials and qualifications. We have formed our opinions based on an independent review of the relevant material in this matter. We rely on economic principles and analysis that are well established in the fields of industrial organization, antitrust, and regulatory economics. We also rely upon our academic and professional experience related to the economic and regulatory issues relevant to this proceeding, our expertise and knowledge as economists and consultants about such issues, and the materials cited in the footnotes.
- 2.2 Mr. Dasgupta has extensive experience of regulatory and competition policy issues in Canada, Europe, and the United States. He has analysed regulatory issues ranging from market power and tolling in crude oil pipelines, to regulation of rates for pole attachments by wireless carriers, to “open access” in telecommunications in proceedings before the National Energy Board, Ontario Energy Board and the CRTC. He has analyzed several economic issues such as the transition from traditional regulation to incentive regulation that arose with the restructuring and transition to competition of the U.S. telecommunications industry in the late 1990s and early 2000s. He later analyzed similar issues as they arose in Europe and Canada in the 2000s. He

⁴ For example, when the Government of New Brunswick expanded its natural gas service in 2011, the, “distribution build-out and market penetration have been much lower than were originally forecast.” [KPMG Report Commissioned by OEB (2015), “KPMG Study”, p. 37 of Section 3]

has consulted on and been involved with litigated proceedings involving competition issues in natural gas liquids, telecommunications and intellectual property, real estate, copyright, and consumer goods in Canada.

- 2.3 Dr. Nieberding's areas of expertise include microeconomics, industrial organization, antitrust and competition policy, and econometrics. His consulting work has included analysis of antitrust, competition, and regulatory issues in matters before the U.S. Federal Trade Commission, the Antitrust Division of the U.S. Department of Justice, the Directorate-General for Competition of the European Commission, the Taiwan Fair Trade Commission, the Canadian Competition Bureau, the German Federal Cartel Office, the Federal Energy Regulatory Commission, the U.S. Environmental Protection Agency, and various U.S. federal and state courts. Dr. Nieberding's experience regarding the energy industry includes analyzing the effect of proposed EPA sulfur content regulations on refiner costs and gasoline prices; estimating potential anticompetitive effects of proposed mergers and acquisitions involving U.S. petroleum refineries and terminals; estimating the effect of alleged market manipulation regarding Californian wholesale electricity prices; analyzing the effect of refinery outages on wholesale gasoline prices in the Western U.S.; assessing market definition for petroleum products in antitrust proceedings; and conducting econometric analyses related to petroleum products and the energy industry.

3. Economic Regulation: Rationale and Limitations

Natural Monopoly Regulation

- 3.1 Modern economic regulation focuses heavily on economic efficiency. Maximizing efficiency is the key theme of the literature in regulatory and antitrust economics. Canadian regulators have also recognized the centrality of economic efficiency in regulatory decision-making. Competitive markets achieve efficiency in the allocation of resources, in consumption, and in providing the right signals for investment and entry decisions. Regulation arises in circumstances where competition between multiple firms is not feasible (or perhaps not desirable from a cost efficiency perspective), but competitive markets nonetheless provide a benchmark or target for regulation to strive towards.
- 3.2 The OEB describes its regulatory activities in the following terms:⁵
- Regulation of electricity and gas utilities is a form of "economic regulation". Laws, regulations and other requirements have been designed to address the natural monopoly position of these energy companies, acting as a substitute for the economic forces that would normally influence them in a competitive market. In that way, economic regulation of the activities of monopoly service providers protects the interests of consumers.*
- 3.3 This explanation of regulation is what Church and Ware (2000) label a "public interest" rationale

⁵ http://www.ontarioenergyboard.ca/oeb/Documents/Documents/Energy_Sector_Regulation-Overview.pdf. This sentiment is also reflected in the literature on the economics of regulation. See, e.g., Daniel F. Spulber (1994), "Pricing and the Incentive to Invest in Pipelines After *Great Lakes*," *Energy Law Journal*, vol. 15, p. 385 ("Competitive market pricing provides a benchmark against which regulated rate structures can be evaluated. Short of deregulating [natural gas] transportation rates, it is desirable to choose between alternative pricing policies that approximate market incentives.")

for regulation.⁶ Regulation is in the public interest because there is a “market failure.” The market failure arises because with a natural monopoly, cost-minimization considerations dictate that a single firm produces the output demanded in a market.⁷ However, this unregulated single firm maximizes profits by (generally) producing less than the level of output that would be produced in a competitive market, with a correspondingly higher price.⁸

- 3.4 The (perfectly) competitive market is a very useful analytical construct because the self-interested actions of price-taking buyers and price-taking sellers⁹ produce the “efficient” or “optimal” level of output at minimum average cost. The efficient level of output is produced when gains from trade are exhausted. Consider a good called a “widget.” At the efficient level of output, the marginal cost (to society) of supplying another widget equals the marginal benefit (or marginal willingness-to-pay) for that widget. Suppose this equality happens at 100 widgets of output. The willingness to pay for the 101st widget would be below the cost of supplying that widget. In this case, while supplying the 101st widget at or below the willingness to pay of consumers for that widget would benefit widget consumers, it would make widget producers worse off. On the other hand, if only 99 widgets were supplied, then it is possible to supply the 100th widget to a willing buyer at a price without the producers incurring a loss and being made worse off. The competitive market equilibrium achieves a “Pareto Optimal” level of trade: all mutually profitable gains from trade are exhausted at this equilibrium. So-called “allocative efficiency” is maximized at this competitive equilibrium level of output and price. Additionally, in a competitive market, firms achieve cost efficiency (also known as “productive efficiency”) in that output is produced at minimum average cost.¹⁰ However, “[w]hen an industry is regulated, industry performance in terms of allocative and productive efficiency is codetermined by market forces and administrative processes.”¹¹
- 3.5 Another type of efficiency that economists consider is “dynamic efficiency.” In the present context, this means that pricing today should provide the right signals for firms to enter or exit the market. As Spulber (1994, p.386) describes, if an unregulated industry were to experience an increase in demand, this would increase prices paid by all consumers, and thus increase profit opportunities for all firms. This causes firms to optimally allocate scarce resources in the short run and provides the right signals for capacity expansion in the longer run.¹² However, in a regulated market, a cost increase caused by subsidizing the expansion of an existing system

⁶ Jeffrey Church & Roger Ware (2000). Industrial Organization: A Strategic Approach, p. 749. There are also economic theories that explain why regulation arises as a function of the demand and supply of regulation. Interest groups stand to benefit from regulation because (for example) it redistributes income or social resources in a way favourable to them, where such groups are seen as “demanders” of regulation while governments are “suppliers” of regulation.

⁷ In this discussion, “market” is used in its general sense, and not in the specific sense of a “relevant market” as defined in competition economics.

⁸ A monopolist (natural or otherwise) that is able to perfectly price discriminate among its customers may produce the same level of output as a competitive market. However, in this case it profits at the expense of consumers who lose all their “consumer surplus.”

⁹ “Price taking” refers to the notion that no buyer or seller is large enough to influence the market clearing price through their choice of how much to produce or purchase.

¹⁰ Firms in a competitive market produce at the point where price equals marginal cost, and where the marginal cost itself equals the minimum of long-run average cost.

¹¹ W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr. (1996). Economics of Regulation and Antitrust. MIT Press, p. 307.

¹² In economics, the “short-run” typically refers to a situation in which certain assets (e.g., capital and plant) are fixed, whereas the “long run” is a term that refers to a situation in which decisions are made on the basis that all factors of production including capital can be varied.

raises prices to existing customers and does not send correct signals for entry and expansion.¹³

- 3.6 Natural gas distribution is regulated in Ontario as a natural monopoly.¹⁴ The economics literature suggests that there is justification for this in that the more homes served within a service area, the lower is the average cost. Natural monopolies (such as utilities) exhibit extensive scale economies meaning that the aggregate costs of industry production are minimized by a single producer. This suggests limiting entry by other firms as well as the market power of the incumbent large firm.¹⁵ The natural monopoly rationale for regulation informs the typical North American regulators' mandate to ensure "just and reasonable" rates. In more recent times, regulators have also attempted to promote competition or to ensure that the disciplines of competitive markets are brought to bear upon the regulated firm. The OEB Act, for example, mentions as its first objective for "gas": "To facilitate competition in the sale of gas to users",¹⁶ and (as discussed previously) the OEB also believes that regulation should mimic or substitute for the normal disciplines of a competitive market.¹⁷ Using regulatory cross-subsidies to facilitate entry by incumbent natural gas distributors in areas where competition among fuels exists may, however, run counter to these goals of facilitating competition and emulating the disciplines of the market.

Regulation as a Contract

- 3.7 Regulation usually arises in industries with significant sunk costs.¹⁸ In such situations, regulation also mitigates a problem of opportunism that could arise when sunk investments specific to a particular use are involved. For example, a gas distribution company will not want to sink investment in expanding its network to serve industrial customers, and then find that those customers are only willing to pay its short-run breakeven cost (operating cost). Equally, customers will not want to make investments to switch to using natural gas only to find that the natural gas utility has raised its distribution rates well beyond what was anticipated when the investment was originally made. In this circumstance, regulation can be viewed as an "implicit contract" or a set of "rules of the game" that solves problems that private contracting would likely not be able to solve. But if regulation is seen as setting the "rules of the game" and ensuring certainty for investors and customers¹⁹, the perceived integrity and credibility of those rules is also important to maintaining investment in regulated industries. Regulatory credibility and

¹³ We discuss this in greater length in Section 5.

¹⁴ See "OEB Resource Guide: Energy Sector Regulation: A Brief Overview," February 19, 2015.

¹⁵ See Church and Ware (p.760) for a discussion of a circumstance in which natural monopoly is desirable from the perspective of minimizing aggregate industry production costs, but in which some entry may be feasible. In this circumstance, regulation (such as cost-of-service or price cap regulation) that curbs the market power of an incumbent firm but limits or prevents entry may be preferable to allowing the inefficient entry.

¹⁶ OEB Act, Section 1, Part 2 (1).

¹⁷ This view of regulation is a dominant one in the economics profession. See, e.g. Spulber (1994, p. 389) who states, "A desirable [regulated] pricing policy must lead to both allocative and dynamic efficiency" which are hallmarks of a competitive market.

¹⁸ Economies of scale associated with natural monopoly situations are very frequently derived from sunk investments in "indivisible inputs." A single right-of-way permit supports a single pipeline regardless of throughput. Halving the throughput of the pipeline does not halve the number of rights-of-way to be acquired. The right-of-way is thus indivisible and once acquired, the pipeline has incentives to minimize average costs by maximizing throughput. At the same time, the investment in the right-of-way for a pipeline is sunk. It is not (usually) useful to a telephone company, for example.

¹⁹ See Church and Ware (pp.766-767). Regulation often involves the exclusive right of a firm to serve an area as well as ensuring the right of consumers to be served. This exclusivity on either side of the market removes the potential for parties to act opportunistically. Regulators in the U.S. and Canada have been regulating for a very long time indeed, and thus can act as specialized, well-informed courts that are able to adjudicate requests to change the rules of the game.

integrity is also an important factor that the OEB should consider in the present matter, as the proposals at hand involve rewriting some of the current “rules of the game.”

- 3.8 An example of regulatory “rules of the game” changing in a way unanticipated by a natural gas utility is when the Government of New Brunswick in 2011 tabled legislation affecting the way EGNB’s rates were regulated which had the effect of disqualifying EGNB from using rate-regulated accounting. As a result, EGNB was no longer allowed to build recovery of certain deferred costs for its natural gas distribution system into its rates going forward. This change resulted in EGNB writing off \$262 million worth of assets and EGNB sued the Province for damages for breach of contract.²⁰

Positive Externalities and Regulation

- 3.9 Economists and regulators sometimes point to positive externalities from the provision of a good as a potential rationale for public intervention, including regulation.²¹ Competitive markets achieve (allocative) efficiency by equating marginal cost with marginal benefit. From the perspective of social efficiency, the relevant marginal costs and benefits to consider are social costs and social benefits. These may diverge from private costs and private benefits. If they do, then the actions of self-interested parties even in competitive markets will not achieve the socially preferred outcome. There are a variety of situations in which private benefits and social benefits (or more accurately private valuations of benefits and social valuation of benefits) can diverge, discussion of which is beyond the scope of this paper. We illustrate the relevant concepts by way of some principles that are frequently used to invoke regulatory intervention: network externalities, environmental externalities, merit goods, social equity concerns, myopic consumers versus the well-informed government, and spill-over effects.²²
- 3.10 The regulatory intervention that is invoked in the case of positive externalities is not intervention to set “just and reasonable” rates. Instead, the regulatory intervention usually takes the form of subsidies, either explicit ones (e.g., direct transfers to consumers or investors by government, a surcharge on all gas bills) or implicit ones (cross-subsidies that arise because some services or consumer classes pay above their stand-alone cost whereas others pay below their incremental cost).²³
- 3.11 *Network externalities:* By way of example, individual users of a telecommunications network (the paradigmatic example) value their telephone subscription too little. This is because they do not take into account the value that the rest of society attaches to being able to contact them. The marginal cost of supplying telephone service could exceed the perceived private benefit of the individual, i.e., his or her willingness to pay. But the marginal social benefit could still exceed the marginal cost of supply because of the “external benefit” or “network externality.”
- 3.12 *Environmental externalities:* Individuals acting in their private self-interest will not internalize the benefits that switching to a cleaner technology can have for the rest of society. Thus an individual

²⁰ See *Jurisdictional Review of Natural Gas Distribution System Expansions*, KPMG Report Prepared for the Ontario Energy Board (2015), p. 38 of Section 3. Stelzer (1994) notes that utilities are uniquely vulnerable to changes in policy. I. Stelzer, “What Happens When The Rules are Changed and the Plug is Pulled on Electric Utilities?” *The American Enterprise* 5 (Nov./Dec., 1994): 76–84).

²¹ See e.g., *Line Extensions for Natural Gas: Regulatory Considerations*. Ken Costello, National Regulatory Research Institute, Report No. 13-01, February 2013, p. 14 (“Subsidization of line extensions by charging new customers below incremental cost, as an example, may bolster fuel switching on grounds of positive externalities (i.e., an increase in public benefits and social welfare) that energy consumers or utilities do not consider in their decisions.”)

²² This discussion substantially draws upon Noll, R.G. and Wallsten S. (2005), “Universal Telecommunications Service in India” (2005), Telecommunications Regulatory Authority of India: India Policy Forum, pp.257-58.

²³ We define “stand-alone cost” and “incremental cost” more precisely below.

might look at an electric or hybrid vehicle solely in terms of the private cost of buying and operating the car relative to other types of cars (diesel, gasoline etc.) and the private benefits she derives from reduced environmental impacts. She may not value the benefits that *other members of society* attach to the environmental savings generated.

- 3.13 *Merit Goods*: Society may deem that it is essential or desirable for consumers to have access to or be able to consume some good or service. For example, there are many who suggest that Internet access (or telephony) is a “fundamental right.” This view may be based upon the notion that absent Internet access, individuals will suffer an unwarranted degree of social exclusion. Thus, in a society whose members care about inclusiveness, Internet or telephone access might be considered a “merit good”—something everyone should have. Although economic theory generally suggests that cash transfers rather than “in kind” provision of goods is an economically more efficient way to help certain members of society,²⁴ merit goods might be one instance in which direct subsidization aimed at enabling consumption of the merit good is preferable to cash transfers.²⁵
- 3.14 *Social equity concerns*: Social equity arguments are sometimes used to justify subsidies if it encourages increased supply and consumption of products that yield high external benefits when private markets fail to generate the socially preferred outcome. For example, society may want to subsidize public transportation if it believes that it is important for those who cannot afford a car to also have access to social and economic opportunities that require travel.²⁶
- 3.15 *Myopic consumers versus the well-informed government*: This can be understood with an example relating to fuel switching. In the context of natural gas expansions, some commentators suggest that consumers tend to overweight switching costs and under-estimate or under-value future cost savings.²⁷ Consumers may lack accurate information or incur significant search costs or switching costs in converting to something that could ultimately be beneficial for them. Consequently, their willingness to pay for a new technology or service might be below what it would be if they were able to access information and more accurately assess switching costs and lifecycle cost savings.
- 3.16 *Spill-over effects*: Investment in a technology like energy or telecommunications networks can create economic spill-overs that the original investor cannot monetize. Telecommunications networks and electricity networks have contributed to enabling or speeding up numerous economic activities, but since the returns from these spill-over effects accrue to society broadly and not the investor, the investor in these networks is unable to monetize them and will under-

²⁴ See, e.g., Jeffrey M. Perloff (2009), *Microeconomics*, 5th edition, pp. 99-102. Rosen states, “This is one of the reasons many economists prefer direct income transfers to commodity subsidies.” [*Public Finance*, Harvey S. Rosen (1995), 4th ed., pp. 316-317.]

²⁵ This is because society values consumption of the merit good per se, as distinct from its general concern about the welfare of some groups in society.

²⁶ A type of social equity argument that can be applied to natural gas systems might be as follows: no system is ever built on a customer-by-customer basis, but is instead made in increments of substantial size. For the first increment that is served, there is already a degree of roll-in inherent in that costs are averaged across the first and last customers who constitute that increment. Thus some customers benefit from an inherent “roll-in” and receive gas service (at a reduced price) today. The question might be asked as to why other consumers should not be rolled-in (or perhaps even cross-subsidized) just because they were “late to the game.” Spulber (1994, p.380) cites to a FERC decision (1989) supporting roll-in on the ground that it prevented “undue discrimination” against customers simply based on the date that they signed up for the service. This logic is different from the justification for rolled-in pricing based on the notion that the benefits from a natural gas pipeline expansion accrue to all customers in the system in the form of increased capacity, flexibility, and reliability. Spulber (1994, p.380)

²⁷ Costello (2013), pp.15-16.

invest in the network relative to the socially desirable level.²⁸

3.17 In the remainder of this paper, we discuss:

- The evidence on the strength of positive externality arguments as a cue for intervention in general, and in natural gas specifically. This is informative with respect to both Issues 2 and 3.
- The specific economic evidence on cross-subsidies and inefficiencies that could arise with rolling-in of rates, and the merits of permitting more roll-in than is currently allowed. This addresses Issue 3 specifically.
- The impact of allowing cross-subsidized natural gas expansions in areas where there is unregulated competitive supply of alternative fuel sources. This is informative with respect to both Issues 2 and 3.
- Risk factors associated with natural gas expansions that could lead to problems such as stranded costs/assets. We also discuss how attempts to mitigate investor risk can result in policies that further encourage uneconomic system expansions. This is informative with respect to both Issues 2 and 3.

4. The Merits of “Positive Externality” Arguments

4.1 This section briefly reviews the merits of positive externality arguments and their history in regulated industries. The main arena in which this type of argument has been invoked as a basis for extensive regulatory intervention is the pricing process in the telecommunications industry. This is the arena in which “positive externality” arguments appear to have greatest traction, but sceptical analysis shows that such arguments have either been conceptually flawed or empirically overstated (or both).²⁹ We note too that the manner in which support to fund “universal service” was provided in the USA and Canada was highly distortionary and created severe economic inefficiencies.³⁰ While some of these inefficiencies may be linked to specific aspects of telecommunications universal service regulation,³¹ this nonetheless shows that *how*

²⁸ The same type of spill-over argument can be used to justify subsidies to research and development and investment in human capital, both of which have spill-over effects since social returns exceed private returns. See Jones, C. and J. Williams (1998), “Measuring the Social Returns to R&D,” *Quarterly Journal of Economics*, 113, pp. 1119-1135. See also Griffith, R. (2000), “How Important is Business R&D for Economic Growth and Should the Government Subsidize It?”, Institute for Fiscal Studies Briefing Note 12. An important point to remember in these cases is that the subsidies carry an opportunity cost to society too, and the subsidized investments should have external benefits (the difference between social and private returns) that exceed these opportunity costs.

²⁹ Social “externality” rationales have a long history in justifying regulatory cross-subsidies (e.g., telephony). But these externality rationales seem less intuitively appealing with natural gas expansions than with (for example) telecommunications technologies. In any event, in the case of telephony, relevant economic literature suggests that extensive cross-subsidization was not justified by any “spill over” or “externality” arguments. Even if achieving external benefits required providing subsidies, one would need to carefully evaluate whether taxing other Ontarians’ consumption of natural gas is the most efficient way to provide a subsidy.

³⁰ See for example, Hausman J. (1998) “Taxation by Telecommunications Regulation”, in Poterba, J. (ed.), *Tax Policy and the Economy*, Volume 12, pp.29-48. See also Crandall, R.W. and Waverman, L (2000), *Who Pays for Universal Service: When Telephone Subsidies Become Transparent*, (Washington DC: Brookings Press).

³¹ In telecommunications, urban consumers and long-distance calls cross-subsidized local access service and rural consumers. This created an especially severe distortion because the theory of optimal commodity taxation, as well as the theory of efficient recovery of common costs by a multiproduct firm, suggests that the highest tax or “mark-up” (over marginal cost) should be placed on services with the least elastic demand (lowest price sensitivity), i.e., access.

a subsidy is provided can make a substantial difference regarding economic efficiency (we reserve extended discussion of this topic for the last section). We also critically evaluate the likely applicability of these factors to natural gas expansions.

- 4.2 First, *network externality factors* were frequently cited as the basis for subsidizing “marginal” consumers of telecommunications services (e.g., higher rates in urban areas or for long-distance calls). There is obvious appeal in telecommunications networks to the network externality argument (as there is to Internet networks too). It is much less obvious that natural gas expansions have any type of network externality effect. A business in Toronto plausibly derives benefits from being able to reach customers in Kincardine using an integrated telephony system. This consideration of being “networked”, as a matter of economics, simply does not apply to natural gas expansions.
- 4.3 Second, even if they existed, network externalities may not require subsidies. Wireless telephony networks have achieved nearly universal penetration without the type of regulatory intervention or subsidization that characterized the construction of fixed line networks. For example, customers surely recognize the value of being connected to a large and universal telephone network. Even if there is still some uncaptured externality, the private willingness to pay for a network that everyone else has access to may still exceed the cost of providing the network (Wallsten and Noll, p.258). Additionally, all subscribers should provide subsidies to all other subscribers if what they value is having more subscribers on the network.³² In this case, however, there is no systematic cross-subsidy from customers in low-cost areas to customers in high-cost areas. Wallsten and Noll (p.263) point out (in the context of rural communities) that “subsidizing rural areas simply because they have high costs is not implied by optimal pricing unless rural customers generate a much greater subscription externality than urban customers.” This same reasoning is applicable to extending natural gas pipelines into rural areas of Ontario.
- 4.4 Third, some scholars point out that the push for universal service in telecommunications was not motivated by “the desire to ensure telephone access to all people.” Instead, it was designed to ensure that “everyone who had telephone service should be allowed to have only a Bell telephone....[I]t was a rationale for granting and preserving monopoly.” (Wallsten and Noll, pp. 259-61). This is an important point to remember as there may be a parallel in natural gas expansions creating and preserving a regulated natural gas monopoly where there currently is competition among fuel sources.³³
- 4.5 Fourth, extensive and elaborate schemes of cross-subsidization in pricing and taxation created large welfare losses. For example, in telecommunications long-distance prices were too high for too long, urban consumers paid too much for too long, and competitive entry was distorted towards urban markets because of inefficiently high and distorted prices. The welfare losses associated with these policies in the late 1990s were estimated to exceed a dollar for every dollar raised in revenues. By comparison, estimates of the welfare loss associated with raising a dollar from general taxation were estimated at between 26 and 40 cents.³⁴ One authoritative survey of telephone universal service subsidies concludes that most studies of universal service policies

³² The average amount of each subscriber’s subsidy should equal the subsidy that they are willing to pay to have others join the network.

³³ See, e.g., W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr. (1996). Economics of Regulation and Antitrust. MIT Press, p. 637 (“Although a local [natural gas] distribution network is a monopoly and a pipeline may also be the only supplier to that network, it is important to recognize that competitive forces are still at work inasmuch as natural gas must compete with other energy sources.”) Natural gas monopolies may still face “inter-modal” competition from other fuel sources in much the same way as pipelines face competition from railroads and barges.

³⁴ Hausman (1998), *Taxation by Telecommunications Regulation*, p.31 and p.42.

found that they failed to increase subscription or penetration levels, that they principally subsidized those who would have subscribed anyway, and that the manner in which universal service subsidies was implemented created substantial economic distortions.³⁵ Even though universal service in telecommunications seems somewhat appealing (on network externality or merit good grounds), the actual history of subsidies in telecommunications provides both a cautionary tale and a reminder that the means of funding a subsidy is also important. Some means of subsidization are simply more distortionary than others.

- 4.6 The telephone network (and its offshoots such as Internet networks or cellular networks) is unique in a way that natural gas distribution networks never have been.³⁶ For example, the KPMG report on gas expansions commissioned by the OEB states that only a third of households in Connecticut use natural gas for heating purposes, compared to one half in Massachusetts and Rhode Island.³⁷ It is far from clear that Connecticut suffers any substantial economic loss from its fuel mix, compared to what one might expect if only a third of households in Connecticut had broadband connectivity or telephone access. As a result, the case for subsidizing natural gas expansion in rural parts of Ontario by the rest of Ontario on the grounds of an external benefit that accrues to the whole Province would appear intuitively far less strong than the similar argument for telecommunications (in itself flawed).
- 4.7 There is some evidence to suggest that society considers the telephone and Internet to be merit goods (e.g., moves to make the Internet a “fundamental right” in many countries). However, we are unaware of any substantial evidence that society considers natural gas to be a merit good in the same way, i.e., it considers communities deprived simply because they lack access to natural gas and must rely on propane or fuel oil to heat homes or power businesses. The theory of merit goods would potentially provide the rationale for subsidizing consumption of the merit good, but it does not seem to apply here. If the rest of Ontario supports the general goal of economic development of rural communities, then such support might justify increased income transfers to these rural communities, but it would not justify subsidizing natural gas expansions through increased taxation of natural gas consumption by other Ontarians. More generally, even if there were an interest in promoting a specific economic activity, “it is well established that targeted subsidies paid from general taxation are often the most efficient way to fund specific activities.”³⁸
- 4.8 In addition, lack of consumer information about switching costs and future cost savings, myopia and inertia might be pointed to as reasons for why consumers within rural communities may be reluctant to adopt natural gas.³⁹ The presumption is that gas expansions are uneconomic because consumers’ low (relative to deployment cost) willingness-to-pay for these expansions is the result of poor information on the benefits of fuel switching. If this were the case, however, it would seem that rather than build natural gas expansions, there should be targeted intervention designed to educate consumers on the benefits of fuel switching. Such interventions have been

³⁵ Crandall and Waverman (2000), p.21.

³⁶ One fundamental difference related to natural gas distribution is that it is not as essential as telephony or electricity because customers can always consume some other energy source (e.g., oil, propane, electricity) to satisfy their end-use energy demands. Indeed, the energy needs of rural Ontario customers who do not currently have natural gas service lines are met by numerous natural gas substitutes.

³⁷ KPMG Report Commissioned by OEB (2015), p. 6 of Section 3.

³⁸ Hausman, J. and Shelanski, H. (1999), “Economic Welfare and Telecommunications Regulation: The E-Rate Policy for Universal Service Subsidies”, *Yale Journal on Regulation*, Volume 16, pp.19-51 at 33.

³⁹ Costello (2013), pp.15-16. If consumers are ill-informed, myopic or somehow “too impatient”, their perceived private benefit and willingness-to-pay is too low relative to what it would be with better-informed decision making.

adopted in other jurisdictions in North America, e.g., Connecticut.⁴⁰ Certainly, if informational barriers were genuine obstacles to switching, then removing such barriers presumably would increase willingness-to-pay for gas expansions, with a commensurate reduction (or elimination) in any required subsidy. The other benefit of “educating first and building later” is that it would stimulate demand and thus reduce the risk of under-recovery or stranded investment. It likely would also avoid distorting prices and investment signals in the gas distribution sector.⁴¹

- 4.9 The implicit premise that there is a well-informed government which can calculate the benefits of natural gas adoption more accurately than consumers is economically similar to suggesting that consumers’ discount rates are somehow too high relative to the government’s discount rate.⁴² In most economic surveys, the social rate of discount is the risk-free rate, or the rate at which governments borrow. Of course, since governments can borrow (especially today) at much lower rates than private corporations, this suggests that one way of reducing the costs and risks associated with natural gas expansions is to back them with government financing rather than private financing.⁴³ This would avoid distorting prices to customers who do not benefit directly from the expansion, and it would also avoid using the regulatory ratemaking process to fund projects that are justified on inherently hard-to-quantify “externality” or “social benefit” premises.
- 4.10 Any “multiplier” or “spill over” effects due to subsidized natural gas expansions (for example, multiplier effects generated by rural consumers spending their cost savings) will need to recognize that these effects are achieved at a significant opportunity cost to society and at a direct cost to urban and suburban ratepayers. That is, the income transferred due to subsidies could have been used by those paying the subsidy in the same “multiplier” manner that is attributed to rural consumers.⁴⁴ Therefore, any use of “multipliers” will need to account for the opportunity costs involved.
- 4.11 Lastly, environmental externality effects from a subsidized switchover to natural gas in rural Ontario might be small. These communities may have alternative fuel sources such as propane that do not have a substantially different environmental impact than natural gas, and any switching to natural gas would have minimal environmental effects. The incremental environmental benefits may also be modest because of the small populations and smaller industrial bases of rural areas relative to urban areas.
- 4.12 In summary:
- Regulatory intervention to fulfil social objectives such as “universal service” has a chequered history. Even where such rationales have seemed clearest cut—as in telecommunications—it is far from clear that regulatory intervention was required to fulfil the alleged social

⁴⁰ KPMG Report Commissioned by OEB (2015), p.8 of Section 3.

⁴¹ Even if such educational interventions were funded out of natural gas ratepayers in other parts of Ontario, the sums involved would be much lower than the capital costs associated with constructing a pipe in the hope that demand would materialize.

⁴² A high discount rate means that potential natural gas customers in expansion areas place a diminished value on future benefits compared to current costs that could cause them not to switch when it might be in their long-term interest.

⁴³ The KMPG report on gas expansions for the Ontario Energy Board notes (pp. 3- 5 of Section 3) that Alaska awarded a new natural gas franchise to an entrant utility, IGU, at least partly because that utility was able to finance its operations through government-backed debt, and did not need a return on equity.

⁴⁴ In theory, a positive “net” multiplier effect would only exist if those receiving the subsidy had a greater multiplier than those paying it. We note that “multipliers” derived from private investments made in the course of competing for business (and where investors expect investments to generate a return that equals or exceeds their opportunity cost of capital) are different than those generated from subsidies from one group being spent by another group.

objectives. Conversely, as a matter of economic efficiency, it seems relatively clear that using regulation and the rate-setting process to cross-subsidize services for some consumers through rates paid by other consumers created extensive distortions and welfare losses.

- At an intuitive level, “externality” and “spill-over” arguments to justify subsidies for consumption of natural gas services seem substantially weaker than similar arguments in support of subsidizing some other regulated services, i.e., telecommunications.
- In particular, there is likely to be very minimal (if any) benefit to natural gas expansions outside the rural communities in which the expansions take place. It is not clear to what degree the rest of Ontario would benefit, unlike the case with telecommunications, highways or railroads that increase economic interconnectedness. Incremental environmental benefits to the province-at-large are also likely to be very small.
- Whereas some other services like telecommunications, Internet or electricity are plausibly “merit goods” that society deems everyone should be able to consume based upon network economics, this is not true of natural gas.
- Even if factors such as consumer myopia or poor information realistically resulted in consumers under-valuing the switch to natural gas service, the best initial response might be to subsidize education that would increase willingness to pay for natural gas. This would also reduce the risks associated with stranding assets.
- A National Regulatory Research Institute (NRRI) working paper describes the hypothesized benefits from natural gas expansion as “so far lack[ing] empirical support, at least in providing policy-makers with reliable evidence that their magnitude is sufficient to warrant governmental actions.”⁴⁵

4.13 These factors caution significantly against the broad socialization of costs associated with uneconomic expansions of gas systems by private utilities. In the past, the OEB has been cautious in accepting public benefit arguments as a reason to socialize the costs of gas system expansion.

In OEB proceedings from the 1990s on the issue of natural gas system expansions, Board staff noted that it would “not be effective, efficient or fair to ‘tax’ existing ratepayers for general societal benefits” and that “economic development and the enforcement of social policy objectives is not the purpose of utility regulation.” (Interim Board Report, August 15th 1996, EBO-188, at 3.4.1). The Board Staff’s warnings might be especially true when any “general” societal benefits are very small and hard to distinguish from society’s broader interest in assisting rural or less well-off communities.

4.14 A recent report on natural gas system expansions prepared for the OEB also confirms that North American regulators recognize that there are dangers in socializing the costs associated with private utility system expansions on the basis of wider public benefits. The report states:

- “Decision-makers were generally not willing to broadly socialize the costs associated with extending service to areas that did not pass the economic test over the existing natural gas distribution grid and existing natural gas distribution customers.” [KPMG Report Commissioned by OEB (2015), p. 4 of Section 2.]
- “With the exception of North Carolina, where certain refunds/ monies were made available to natural gas distributors from the upstream transportation sector, none of the jurisdictions

⁴⁵ Costello (2013), p.38.

we examined were willing to impose a surcharge or subsidy on the commodity cost of natural gas to fund system expansions.” [KPMG, Id.]

5. Economic Principles of Regulation and Economic Tests for Cross-Subsidies

- 5.1 Issue 3 concerns potential changes to the OEB’s current test (laid out in EBO-188) for financial viability of system expansions. We understand the existing OEB test in the following terms: utilities are allowed to maintain a (rolling) portfolio of capital projects which must, in the aggregate, be likely to pass a benefit-cost test. That benefit-cost test is based upon subtracting the present value of capital costs from the present value of operating cash flows. The ratios of the present values must equal or exceed 1.0 on a portfolio-wide basis. This ratio is known as the “profitability index.” Within the portfolio, however, individual projects can proceed even if they do not meet a profitability index of 1.0, as long as they have a profitability index of at least 0.8.
- 5.2 For our purposes, there are two relevant aspects of the test:
- The overall constraint on portfolio profitability is designed to ensure that existing ratepayers do not cross-subsidize new capital projects in the long-run. At least in the long-run, new capital projects are expected to pay for themselves.⁴⁶
 - Within a portfolio, however, there could be some cross-subsidies from profitable projects to unprofitable projects, as individual projects can proceed with a profitability index of between 0.8 and 1. There may even be many more unprofitable expansion projects within the portfolio that one or two profitable projects pay for.
- 5.3 A “cross-subsidy” in regulatory economics has a precise meaning. This can be understood through the example of a gas pipeline. Consider an existing pipeline. It must recover all its costs—capital costs, operating costs, overheads, and a return on (and of) capital—from its existing customer base. These costs might be labelled the “stand-alone” cost of the pipeline. Now consider an expansion of the gas pipeline into new areas, reaching a new customer base. The company that owns the existing and expansion systems may be able to share certain costs such as overheads between the two systems. The incremental cost of the new system is the difference in the total cost of the pipeline company with and without the expansion. The “stand-alone” cost of each portion of the system, however, is the cost associated with running that portion of the system and recovering all common costs from just that portion of the system alone.
- 5.4 A cross-subsidy occurs when one portion of the system pays more than its stand-alone cost of operation. By definition, this means that the other portion of the system—the receiver of the subsidy—pays less than its incremental cost. Prices that are between the incremental cost price

⁴⁶ The emphasis here is on the long-run because the profitability calculation is done in present value terms. As long as cash flows in later years (discounted at the utility’s cost of capital) compensate for early losses, there may be no cross-subsidy over the relevant time horizon that the test evaluates profitability over.

floor and the stand-alone cost price ceiling are “subsidy-free” prices.⁴⁷ As one text notes:

Economists argue that if one must examine cross-subsidization issues...the most logical tests are the so-called stand-alone average cost and the average incremental cost tests – which are, in fact, equivalent.”⁴⁸

- 5.5 Another way to look at the issue of cross-subsidy is through the regulatory lens of “rolled-in” pricing. “The traditional method of pricing new [natural gas pipeline] construction has been to ‘roll in’ new capital expenditures with the existing rate base of pipelines and to increase rates accordingly.” (Spulber, p. 378).⁴⁹ Under this rolled-in approach, a cross-subsidy occurs when the average cost taken across the existing and expanded systems exceeds the average cost of the existing system. The construction of a cross-subsidized new system does not meet the Pareto efficiency criteria for allocative efficiency: new system customers receive a benefit by paying less than their incremental costs, but existing system customers are made worse off by paying more. If economic regulation attempts to substitute for the forces of competition when competition is not feasible or desirable, then cross-subsidization policies are economically inefficient.⁵⁰ To the extent that rolled-in pricing allows for cross-subsidization, it too is not desirable. Regulators across North America have economic tests for projects precisely because they understand that cross-subsidization of uneconomic projects run counter to their mandate for “just and reasonable rates.”
- 5.6 From a strict economic efficiency perspective, the correct approach to follow is a strict incremental cost approach: each project should produce incremental revenues that exceed its incremental cost. This test approximates market-like disciplines because only if benefits from a project exceed costs are projects undertaken. This type of rule provides the correct economic incentives to expand capacity. In competitive markets, scarce capacity is allocated to users in accordance with their willingness-to-pay. The market “clears” when the cost of providing the last unit or last increment of capacity equals the willingness-to-pay for it. However, this rule is not satisfied under rolled-in pricing because the last unit or last increment of capacity is obtained at

⁴⁷ These tests were formally developed in Faulhaber, G. (1975) “Cross-Subsidization: Pricing in Public Enterprises”, American Economic Review, Volume 65, No.5, pp.966-977. If a service receives less than its incremental cost, it means that other services are paying more than the stand-alone cost of providing just those services alone. Suppose that the stand-alone cost of providing an existing service (or group of services) is C_1 , and that the total cost of providing the existing and new service is $C = C_1 + C_2$. The incremental cost of the new service is C_2 . If the price charged to users of the new service does not cover C_2 , then the users of the existing service would need to pay more than C_1 (the stand-alone cost) in order to cover C . Per unit of output, incumbent users pay a higher price than before and thus provide a cross-subsidy to users of the new service. When one service receives less than its incremental cost, the other must pay more than its stand-alone cost. The existence of a cross-subsidy necessitates such a situation.

⁴⁸ Viscusi et. al. (1996), p. 394 (footnote omitted).

⁴⁹ This “traditional” method discussed by Spulber applied to natural gas and oil transportation pipelines. In these cases, there may be significant improvements in system reliability and performance from operating the system on an integrated basis. In Canada, the National Energy Board (NEB) uses similar reasoning in that a condition for rolled-in pricing is that an expansion is integrated with the existing system and provides service of a similar nature (see NEB Decision in Re: Nova Gas Transmission Limited, GH-001-2014) at p.30 (“Views of the Board”). As the OEB has noted, however, most natural gas expansions are localized and site specific (Interim Report in EBO-188, August 15th, 1996 at 4.7.5), so even this traditional regulatory rationale for rolled-in pricing is unlikely to hold in the case of natural gas expansions. In any case, system integrity is a factor that the NEB has considered in addition to what it calls the core principle of toll-making: the “cost causer pays” principle. The NEB has, in fact, turned down rolled-in pricing in the last two proceedings in which it considered the issue (GH-001-2012 and GH-001-2014). The U.S. Federal Energy Regulatory Commission (FERC) issued a “Statement of Policy” with respect to certification of natural gas pipelines in the mid-1990s generally requiring incremental cost pricing for new pipelines.

⁵⁰ As Spulber (1994, p.385) notes “Short of deregulating...it is desirable to choose between alternative pricing policies that approximate market incentives.”

a price which is below the cost of providing it. Incremental cost pricing however restores market-like discipline by equating incremental benefits and costs. As summarized by Spulber (1994, pp.393-394):

Incremental-cost pricing reflects marginal cost pricing more closely than rolled-in pricing. New customers are charged for the marginal cost of adding the new service. A rolled-in price would not signal marginal cost to new customers particularly when the rolled-in price is well below the incremental cost. Therefore, new customers will pay less at the margin than the additional cost caused by their added demand.

Similarly, Joskow (2007) notes:

Regulated prices should provide consumers with efficient price signals to guide their consumption decisions. Ideally, prices will equal the relevant marginal or incremental costs.”⁵¹

Rolled-in pricing also offers excessive incentives for expansion and investment and, where there is competition between systems or inter-modal competition (e.g., between transportation modes or across fuel sources), rolled-in pricing distorts the competitive landscape. The reason is simple: utilities like Ontario’s gas utilities have existing rate-bases that are valued at book value. This book value in distribution and pipeline systems is often below (or well below) the market value of the relevant assets. An incumbent system with a base of depreciated assets will be able to expand at lower cost than a system with assets of newer vintage and higher book value. The incumbent system that is able to roll-in new capital with existing capital pays below the market price for expansion capacity,⁵² whereas an entrant or newer system pays the market price or something closer to it. Rolled-in pricing provides incentives for over-investment by incumbent firms while disadvantaging new entrants who must pay (close to) market prices for expansion capacity. Thus, rolled-in pricing does not achieve dynamic efficiency, encourages the misallocation of resources and enables incumbent regulated firms with dominant positions to potentially block entry.^{53, 54}

- 5.7 The dangers of cross-subsidization are inherent in rolled-in pricing. Rolled-in pricing does not respect the principle of “cost causer pays.” If a primary or at least substantial goal of economic regulation is promoting economic efficiency—such as would be achieved in competitive markets—rolled-in pricing fails the test. As the NEB puts it,

⁵¹ Paul L. Joskow (2007). “Regulation of Natural Monopolies,” Chapter 16, *Handbook of Law and Economics*, Vol. 2, edited by A. Mitchell Polinsky, Steven Shavell, p. 1260.

⁵² This is because the cost of capacity, when the firm can roll-in new capital, is effectively averaged across old and new capital. “Such a [natural gas] pipeline only considers the effect of the additional investment on the average cost of its total capacity.” (Spulber, 1994, p.391)

⁵³ For a similar discussion of dynamic efficiency and over-investment, see Spulber 1994 (pp.389-92). Similar descriptions regarding the impact of rolled-in pricing on both over-investment and distortion of competition were offered by witnesses for FortisBC (Makholm) and Westcoast (Cicchetti) in the NEB’s hearing regarding the expansion of the NGTL pipeline (see GH-001-2014 at pp.25-26 and p.28).

⁵⁴ Regulated firms may have incentives to expand into other regulated activities (and thus to prevent competitive entry into these activities) because rate-of-return regulation can provide incentives to expand the rate base (this is true when the allowed rate of return exceeds the firm’s true financing costs and thus expanding the capital base allows the firm to earn economic profits). While incentive regulation was designed to counter this incentive for over-capitalization (known as the “Averch-Johnson” effect), it does not eliminate such incentives (see L.L. Johnson, “Price Caps in Telecommunications Regulatory Reform”, available at <https://www.rand.org/content/dam/rand/pubs/notes/2005/N2894.pdf>). Even with incentive regulation plans such as those used for Union Gas and Enbridge in Ontario, price cap plans are based on constraining the growth of a basket of prices, but the initial price is based on the revenue requirement (the revenue level at which the firm just earns its allowed return). The more frequently a price cap plan is revised the more price cap regulation will resemble rate-of-return regulation.

A principle referenced in many Board decisions is that tolls should be, to the greatest extent possible, cost-based and that the users of a pipeline system should bear the financial responsibility for the costs caused by the transportation of their product through the pipeline. This is often referred to as the cost causation principle, which the Board views as a primary toll-making principle....economic efficiency generally means that pricing should promote proper price signals to maximize the utilization of the pipeline system (GH-001-2014, p.31).

- 5.8 The OEB's current approach, as we understand it, involves some degree of cross-subsidization within the portfolio and allows for short-run cross-subsidization from the existing rate-base to the capital projects portfolio. However, Board Staff in previous submissions have clearly recognized the "cost causer pays" principle.

Board Staff submitted that under the principle of cost causality, it is not proper for the existing subscribers to pay for the private benefit of a new group of subscribers. [1996 OEB Interim Report of the Board, 8/15/96, 3.6.1]

- 5.9 The Board Staff's statement highlights an important point: the only circumstance in which economic efficiency might tolerate a violation of the "cost causer pays" principle is when the benefit from the expansion would not be private to the cost causers. In gas transportation pipelines, the rationale for departures from the strict "cost causer pays" rule is benefits to all system members from increased reliability and better system performance. This same logic suggests that if there are (social) benefits to Ontario as a whole, then any subsidies should be paid by Ontario as a whole rather than a specific segment of the population. If, per the Board's previous findings, gas distribution expansions into rural areas are "localized and site-specific" then benefits to the wider distribution system would logically be small in this case.⁵⁵ Benefits might, however, not be private if, as discussed in the previous section, there are externality effects operative outside the areas in which the expansions occur. Thus, a relaxation of the "cost causer pays" principle should require a tangible demonstration of the benefit to other system ratepayers or to the *rest of Ontario* in expanding gas systems in rural Ontario.⁵⁶ Since these other Ontarians would be paying a subsidy specifically for provision of natural gas, the benefit must be specifically linked to other Ontarians' desire to provide natural gas to rural areas.⁵⁷
- 5.10 Economic efficiency is consistent with incremental cost pricing, and thus inconsistent with a relaxation of the OEB's current financial viability test. Relaxing the constraint that the capital projects portfolio receive no long-term subsidy from existing ratepayers would not only reduce allocative efficiency—as cross-subsidization from existing ratepayers would automatically follow when incrementally unviable projects are chosen—but would also guarantee the dynamic inefficiencies identified with rolled-in pricing. A particular concern would be the distortion of competition between fuel sources and between competing would-be providers of gas distribution services. Incumbents with depreciated rate-bases would be able to expand at effectively below-market rates, whereas others would have to effectively purchase capacity at market rates.⁵⁸ We

⁵⁵ In any case, if a tax is imposed on, say, Enbridge's customers and this funds Union's expansion into rural areas, there can be no benefits at all to Enbridge's customers in terms of system performance, economies of scope, economies of scale etc.

⁵⁶ If rolled-in pricing were proposed as the means of (cross) subsidy, then the expansion must be shown to produce external benefits for other system ratepayers that equal or exceed the amount of the subsidy. If the subsidy were from all Ontario ratepayers (not just ratepayers of the system which is expanding), then it must be shown to generate external benefits for these ratepayers that equal or exceed the amount of the subsidy.

⁵⁷ See the discussion of merit goods in the previous section.

⁵⁸ Would-be gas entrants would pay market rates for their capital, while unregulated providers of alternative fuel sources would also pay market prices for their various inputs.

turn next to a discussion of the impact of subsidized natural gas expansion on markets where other fuels compete to serve customers.

6. Natural Gas Expansions into Markets with Competition from Other Fuels

- 6.1 The extensive presence of other fuel sources in Ontario is a prominent factor that undermines the validity of any subsidy policy and increases concerns about competitive distortions in the supply of fuels to homes and businesses. A necessary (but not sufficient) condition for taxing other Ontarians' natural gas service to pay for otherwise unviable expansions is that other Ontarians specifically derive benefits from rural consumers having access to natural gas *rather than the other fuels that they have access to*.⁵⁹ Similarly, firms that have invested in building up fuel distribution networks or are interested in providing gas distribution services in competition with regulated gas incumbents would face disadvantages if existing limits on rolled-in pricing and cross-subsidies were significantly relaxed.
- 6.2 In this section, we discuss:
- The prevalence of competition from other fuels in Ontario, and the economic harm to these fuel suppliers due to the subsidized entry of natural gas.⁶⁰
 - The risk factors inherent in a policy that consciously favours natural gas based on cost advantages that are inherently difficult to project into the future. This is highly relevant given the long life-span of the capital assets in natural gas distribution.
 - The risk that firms providing alternative fuels in markets in Ontario find that subsidized gas expansions effectively “strand” their existing investments.
 - Alternatively, the risk—which appears substantial—that demand for natural gas will be much weaker than anticipated in expansion areas,⁶¹ thus creating funding shortfalls that will require ever-higher levels of cross-subsidy from existing ratepayers.
 - The merits of effectively extending natural monopoly regulation into areas where historically there has been unregulated competition
- 6.3 *Competition from other fuels:* Rural areas in Ontario are served by alternative fuel sources. Propane is one such fuel source. As discussed in Mr. Goobie's report for the Canadian Propane Association, the market penetration of propane itself varies from 14% to 53% in five markets for

⁵⁹ In fact, if there is a distinction between taxpayers and ratepayers, then the subsidy should be paid by all taxpayers and not just those taxpayers who are also gas customers.

⁶⁰ The Ontario Government recently announced a \$100 million home energy retrofit program to subsidize customers who might be interested in switching to natural gas. Source: <http://www.cbc.ca/news/canada/toronto/ontario-home-energy-efficiency-retrofit-rebate-1.3434385> (Feb 4, 2016)

⁶¹ The “free rider problem” would be at work and likely contribute to any lower than expected switching to natural gas. That is, while customers of other fuel sources might indicate a relatively high willingness to pay to switch *ex ante*, once expansion occurs they might prefer to let others in the customer base pay for it.

which Union Gas provided specific penetration data.⁶² Other sources include wood, fuel oil and electricity. This is a heterogeneous mixture of alternatives. Some of these alternatives rely on networks (e.g., electricity) that require large sunk capital investments. In the case of propane and oil, suppliers have to invest in distribution networks, customer relationships and advertising. For example, a propane supplier wishing to sign up customers in a given area does have to sink expenditure in advertising and in creating a distribution capability that it can use to serve that area.⁶³ The existence of competition from alternative fuel sources has two important implications. First, any benefit to consumers from natural gas expansion is an *incremental benefit* defined by the net present value of the advantages of natural gas *compared to other fuel sources*. Second, natural gas will effectively be an entrant in these areas, and will lack the type of market power that has normally been a pre-requisite for regulation.

- 6.4 *Cost advantages of natural gas:* The cost advantages of natural gas relative to other fuel sources are likely to vary considerably over time and to the precise fuel chosen for comparison. Any analysis of “consumer savings” is thus vulnerable to the underlying assumptions regarding fuel costs. Consider a comparison of the costs of using natural gas relative to propane for home heating. One cost advantage that natural gas possesses is the wholesale market price of natural gas relative to propane. This varies significantly over time: Between 1997 and 2005, propane prices per GJ (at Mont Belvieu) averaged around 1.4 times the per GJ price of natural gas at Henry Hub. From the period from 2006 to 2015, the average of this ratio increased to roughly 2.6 times.⁶⁴ In recent months, however, propane prices have fallen dramatically, especially in parts of Canada (with the price even being negative in Edmonton). It would thus be risky to project the cost advantages achievable in the 2006 to 2015 time period into the long-term future.
- 6.5 In addition to fluctuating dynamics in wholesale markets, there may be retail market conditions that influence cost comparisons. We understand from Mr. Goobie’s report and Mr. Highfield’s affidavit that there are numerous competing suppliers of residential propane, and that residential propane is typically cheaper than auto propane.⁶⁵ The precise magnitude of current cost savings of natural gas relative to propane is thus not clear and may be lower than those presented to the Board by Union Gas. The ratio of (auto) propane to natural gas costs at the retail level used by Union Gas (2.8, or \$2500 to \$850) may well represent a historically high ratio, and may be an inappropriate basis upon which to project future cost savings. Recent events suggest that propane prices have fallen sharply and that customers are actually considering switching from natural gas to propane:

- Enbridge Gas in New Brunswick has budgeted \$500,000 this year to pay commercial

⁶² Expert Report of G. Goobie (GPML), p.12. We understand that there is no material difference in savings in terms of greenhouse gas (GHG) from switching from propane and NG (as opposed to, say, gasoline, heating oil and coal). To the extent that the areas where natural gas wishes to expand have high propane penetration rates, the environmental savings would also be modest. Indeed if environmental benefits are the key public policy concern, then subsidizing the expansion of natural gas (which requires high capital outlays in the distribution system) instead of a nearly-as-clean fuel such as propane (which requires lower capital outlays to expand) appears to be a highly wasteful way to achieve incremental environmental benefits. See also Costello (2013) at footnote 103, who says that the environmental effects of propane are similar to natural gas.

⁶³ Mr. Highfield’s Affidavit states that the market value of Parkland’s investments in bulk propane and fuel facilities in and around rural Ontario is around \$24 million. It also reports 61 propane delivery retailers and 70 heating oil delivery retailers in the Province.

⁶⁴ Source: BRG analysis of data from U.S. Energy Information Administration. Within 2015 itself, the ratio varied between 1.3 and 2.6.

⁶⁵ We understand that in the application made by Union Gas before the OEB that motivated this proceeding, Union Gas’ projections of cost savings of natural gas relative to propane were based on comparison of auto propane costs to natural gas costs.

customers to stay with natural gas rather than switch to propane. Enbridge has proposed recovering the costs from existing ratepayers because these customers would benefit from other customers remaining on the system.⁶⁶

- Heritage Gas in Nova Scotia recently filed an application before the Nova Scotia Utility and Review Board asking the Board to let it lower rates for certain customers, and for special treatment regarding capitalization of certain costs and of depreciation, citing competition from other fuels. The application noted that more than 250 commercial customers had switched, or were considering switching to propane.⁶⁷
- Propane prices fell to as low as 13 cents per litre in Sarnia, Ontario. In Edmonton, for parts of 2015, propane prices were actually negative.⁶⁸

As Mr. Goobie describes in his report, propane prices in North America are likely to remain low for an extended period of time. Since propane prices follow crude oil prices (demand for both propane and crude-oil-based products is driven by the same end-uses, e.g. for petrochemical feedstock and for heating purposes), a prolonged period of low crude oil prices in North America is likely to constrain propane prices, too.

6.6 *Stranded natural gas investments:* Uncertain and highly variable cost savings are another powerful reason to be weary of subsidizing consumption of natural gas in rural areas. From an economic perspective, using current cost ratios to justify subsidies to capital deployments featuring long-lived durable assets seems particularly risky. High up-front costs of equipment and conversion of existing heating systems mean that natural gas expansions may well struggle to attract customers to begin with and projects may turn out to be even less economic than currently projected. If demand shortfalls are not fully compensated for by the existing ratepayers (from whom even higher cross-subsidies would be required), expansion system assets may effectively be “stranded.” Given that expansions occur in areas that have a large installed base of users of other fuels, and that switching costs are relatively large, sophisticated utility investors will be cognizant of the risk of such stranding. Once the principle of an economic test for investment projects has been significantly relaxed, a regulator may find it difficult to put bounds on just how uneconomic projects are allowed to be.⁶⁹ It has historically proven difficult and controversial for regulators to resist claims of asset stranding when the assets in question were not deployed on an economic basis, but because of a non-economic policy mandate.⁷⁰

6.7 *Stranded investments of other fuel providers:* Other fuel providers have made investments under competitive market conditions and on the expectation that the regulatory regime will not permit

⁶⁶ See Robert Jones, “Enbridge Gas Warns Loss of Customers to Cheap Propane Hurts System”, CBC News, February 29th, 2016, available at <http://www.cbc.ca/news/canada/new-brunswick/enbridge-propane-customers-1.3468695>.

⁶⁷ Heritage Gas Limited, Customer Retention Program Application, March 2nd, 2016, pp.6-7.

⁶⁸ For a discussion of the recent plunge in Canadian propane prices, see Jones, *supra*, and Sandy Fielden, “Nowhere to Run Nowhere to Hide? – The Great Edmonton Propane Giveaway,” RBN Energy LLC, June 2, 2015.

⁶⁹ While specific proposals for natural gas expansions may contain commitments to cap rate increases for existing ratepayers, these commitments may be hard to enforce if the expansions face serious financial difficulty.

⁷⁰ The issues raised by the “stranding” of assets is similar (but not identical) to the issues raised by the stranding of nuclear power assets such as the Diablo Canyon facility in California. As the industry transitioned to competition, these facilities faced the threat of being shut down because they would be too high cost relative to new sources of generation. See New York Times, “Utility Shareholders Face a New Hurdle As Deregulation Nears”, April 16th, 1996. In the present case, “stranding” might occur if the regulator (the OEB) attempts to place limits on other ratepayers’ liability for “worst case” outcomes relating to expansions that were known to be uneconomic to begin with.

subsidized expansions of natural gas systems. In this case, the investments in question might be stranded too. Although suppliers of fuels such as propane are not regulated entities, their investment decisions were also predicated on the “rules of the game” for regulated natural gas systems. If regulation is indeed a type of implicit contract, then these firms and their investors were also party to the “contract”. Changes to the contract that adversely affect them might be seen as a form of expropriation of their assets with regulatory approval. Such a situation meets one definition of a regulatory taking: “a loss in value following a change in regulatory policy.”⁷¹

- 6.8 *Competition sufficient to protect the public interest.* Section 29 of the OEB Act provides for a means by which the OEB, upon application by a party, must refrain from regulation where there is “competition sufficient to protect the public interest.” In two recent cases involving liquefied natural gas (LNG) and attachments made by wireless carriers to utility poles, the OEB has effectively forborne from regulation.⁷² In areas currently served by alternative fuel sources, natural gas is an entrant technology, whereas other technologies have significant installed bases and switching out of those technologies involves substantial costs to consumers. An important reason for regulating a firm is that it has market power that is unlikely to be corrected by competitive entry. This would not, however, describe the position of a new natural gas system in areas where other fuels are “incumbent.” The areas that are currently unserved by natural gas pipelines may well be relevant geographic markets for the purpose of competitive analysis.⁷³ In these putative markets, since natural gas distributions systems would not appear to have market power, there would not appear to be any basis for regulating retail rates.⁷⁴
- 6.9 This competition economics perspective suggests that far from rolling-in the capital of these systems into a regulated rate base, these systems should be operated much as unregulated affiliates are operated, and that their entry should not be cross-subsidized by the activities of the regulated firm.⁷⁵ In its recent LNG forbearance decision, the Board stated that given its finding of competition sufficient to protect the public interest, it “*had little choice but to refrain from*

⁷¹ Brennan, Timothy and James Boyd, “Stranded Costs, Takings and the Law and Economics of Implicit Contracts”, Resources for the Future Discussion Paper 97-02, October 1996, at p.5. There is another form of taking that may be relevant here. Existing Ontario residential and industrial consumers have, in some cases, made investments to convert their homes or industrial facilities so that they could use natural gas. These investments were made under the existing rules of the game—just and reasonable rates, and limits on rate increases stemming from cross-subsidized expansions of natural gas into uneconomic areas. To the extent that regulatory policy reversals cause these investments to lose value, this too is a form of “hold-up” or “taking.” For a perspective on this type of “taking”, see Darryl Biggar, “Is Protecting Sunk Investments by Consumers a Key Rationale for Natural Monopoly Regulation”, Review of Network Economics, Volume 8, Issue 2, June 2009.

⁷² OEB Decision with Reasons in EB-2014-0012 (re: *Application by Union Gas for an order approving rates and other charges for an interruptible natural gas liquefaction service*) and Decision and Order in EB-2013-0234 (*In the Matter of an Application by Toronto Hydro-Electric System Limited for an order under Section 29 of the Ontario Energy Board Act*). In both these decisions, the OEB considered competition economics-based analyses of the relevant markets.

⁷³ The markets would likely be local if suppliers have to have a local distribution presence in order to serve these areas. One may be able to aggregate several local geographic markets into a larger provincial market or sub-provincial market, but only if conditions of competition are similar across these areas.

⁷⁴ The other rationale for regulation that we discuss is cost efficiency, but it would be difficult to claim a cost efficiency rationale for regulating distribution systems that require large subsidies to be built in the first place.

⁷⁵ There is a large economics literature on the dangers of regulated firms using their regulated system assets to cross-subsidize entry into competitive markets. Many regulators developed rules guarding against cross-subsidization of affiliates because of fears that the true economic costs of the affiliate would be recovered by loading the affiliate’s assets into the regulated rate base and then recovering them via rates charged to captive regulated customers. See, for example, Timothy Brennan (1990), “Cross-Subsidization and Cost Misallocation by Regulated Monopolists”, *Journal of Regulatory Economics*, Volume 2, pp.37-51.

*regulation.*⁷⁶ The same principle should be applied here.

7. Concluding Remarks

- 7.1 Even if a subsidy to specifically fund natural gas expansions into unserved areas were justified (which we suggest it is not), it may not be optimal to raise this subsidy by taxing natural gas consumption in the rest of Ontario. A tax on marginal consumption (i.e., an increase in the per-unit price of gas) by other Ontario consumers would be the most distortionary way to pay for rural gas expansions. This is because such a tax would distort consumption decisions and work against economic efficiency. A flat surcharge that only raised the fixed part of each consumer's bill would be less distortionary in that consumption decisions would not be changed (but long-run decisions such as whether to install natural gas heating or electric heating could be impacted by this type of charge).⁷⁷
- 7.2 The least distortionary way of funding natural gas expansion would be a straightforward transfer from the Provincial Government to fund it. An example of a non-distortionary revenue-raising device would be the privatization of a state-owned asset which could then be sold off to the highest bidder. For example, the Province is already using proceeds from the part-privatization of Hydro One to fund infrastructure investments⁷⁸, and there is no economic reason that money has to come from within the regulated natural gas sector (that is, ratepayers) to fund pipeline system build outs. Auctions of state assets (e.g., radio spectrum for wireless devices) have raised billions of dollars of revenue in Canada, and have done so without any of the distortions associated with taxation.⁷⁹ These revenues could then be paid out as refunds to consumers who incur high costs in switching to natural gas.
- 7.3 The \$230 million earmarked by Ontario for natural gas expansion are subsidies available only to natural gas utilities. Even if these subsidies are distributed in a lump-sum manner (compared to a rate distorting manner such as cross-subsidies), they are still restrictive of how the money can be spent, effectively rendering them an "in-kind" subsidy rather than a cash transfer.⁸⁰ Moreover, there is the added "economic cost" inherent in this type of assistance because market-based investments made by other fuel type suppliers will be displaced in the face of subsidized natural gas entry. Therefore, the "hurdle" that any economic benefit calculation must surmount to support natural gas expansion is that much higher.
- 7.4 Most fundamentally, we do not think that there is strong economic evidence supporting subsidized expansion of natural gas systems into uneconomic areas. These areas have

⁷⁶ Decision with Reasons in EB-2014-0012, at p.7.

⁷⁷ The economic principle at work here is akin to a business facing an increase in fixed costs (e.g., a rent increases of 10%). A one-time change in fixed costs does not influence the firm's decision about how much to produce or sell (or its optimal price) because it does not affect any part of the profit maximization condition where marginal revenue equals marginal cost. Therefore, the optimal price will remain the same after the increase in fixed costs, and the firm should not increase price because doing so would decrease the amount it sells below the level that already was profit maximizing. However, an increase in fixed costs will increase the firm's total costs so that its total profits will decrease.

⁷⁸ We understand, for example, that some of the proceeds from the Hydro One part-privatization are to be put into a fund for transit infrastructure. Likewise, money from sale of assets could be set aside to augment existing programs such as the Ontario government's existing \$200 million Natural Gas Access Loan program to assist communities in obtaining natural gas supplies, and the \$30 million Natural Gas Economic Development Grant for projects with economic development potential.

⁷⁹ See Paul Klemperer (2000), "What Really Matters in Auction Design", page 11. Available online at <http://www.nuff.ox.ac.uk/users/klemperer/designnew.pdf>.

⁸⁰ See Rosen (1995, pp. 167-171) for a discussion of why in-kind transfers (generally) are inferior with respect to economic efficiency than are equivalent income transfers.

remained “off-grid” for a half-century or more, through various changes in economic conditions and regulatory rules, indicating the very high costs of serving them. There is no “universal service” rationale for natural gas given that other fuels are available. Subsidized expansion, especially subsidized expansion that involves relaxing well-developed and well-grounded regulatory rules designed to protect economic efficiency, runs the risk of stranding investments made by alternative fuel suppliers. Subsidized expansion funded by raising existing customers’ rates through rolled-in pricing or via a surcharge can also be seen as “taking” sunk investments made by them.

- 7.5 Alternatively, if natural gas expansions turn out to be even more uneconomic than envisaged when originally planned, this raises problems familiar to utility regulators who have experience with “stranded assets”, particularly those related to investments that were never made on an economic basis. New Brunswick offers a cautionary tale for all natural gas expansions in Canada.
- 7.6 Subsidized natural gas expansions by regulated incumbents extend natural gas regulation to areas where the OEB should consider whether there is existing competition from other fuels sources sufficient to protect the public interest.
- 7.7 The Board has previously determined that “a public utility does not have an obligation to serve without regard for the cost of providing the infrastructure that will permit it to provide the service.” [Interim Report in EBO-188, August 15th 1996, 4.3.5] We would submit that the subsidized expansion of natural gas into unserved areas effectively amounts to providing consumers with the right to be served and utilities with the obligation to serve in areas where the cost of doing so is prohibitive, i.e., “universal service.” Innovation in the principles behind regulated ratemaking, as a matter of economics, appear to be a particularly poor method to implement any universal service policy regarding natural gas.

FORM A

Proceeding: EB-2016-0004

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is James F. Nieberding. I live at 1052 Wilbert Rd. in the state of OHIO (United States).
2. I have been engaged by or on behalf of Parkland Fuel Corporation to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.
3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:
 - (a) to provide opinion evidence that is fair, objective and non-partisan;
 - (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and
 - (c) to provide such additional assistance as the Board may reasonably require, to determine a matter in issue.
4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: March 20, 2016.



Signature

FORM A

Proceeding **EB-2016-0004**

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is **.Kalyan Dasgupta..** I live at **.27 Mapesbury Court...**, in the **City of London, United Kingdom.**
2. I have been engaged by or on behalf of **Parkland Fuel Corporation.** to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.
3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:
 - (a) to provide opinion evidence that is fair, objective and non-partisan;
 - (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and
 - (c) to provide such additional assistance as the Board may reasonably require, to determine a matter in issue.
4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date **.March 4th, 2016.**

Signature

Kalyan Dasgupta

KALYAN DASGUPTA
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Summary

I am currently a Principal affiliated with Berkeley Research Group in London. I have significant experience, going back over eighteen years, in antitrust/competition policy, matters at the intersection of competition and intellectual property, telecommunications and oil and gas. In the last several years, my experience has included:

- Evaluating efficient royalty rates for re-transmitted distant signals in Canada. These rates are payable by ILEC, satellite and cable companies.
- Econometric evaluation of market boundaries, and analysis of foreclosure issues, in the hot beverage market in Canada.
- Analysis of potential competitive issues created by the hypothetical implementation of a clause in a joint venture agreement in the petrochemicals industry in Western Canada.
- Econometric estimation of consumer surplus in the wireless industry in a small national market.
- Analysis of market definition issues, and “essential facilities” tests in fixed telecommunications and in the use of electric utility infrastructure for mobile telecommunications in matters before the CRTC and the Ontario Energy Board.
- Evaluating whether a crude oil pipeline was likely to have had market power when it conducted an open season to allocate firm capacity on a new expansion in a proceeding before the National Energy Board (NEB).
- Evaluating whether restrictions on the display of certain fields of information from a proprietary database of real estate listings constituted an abuse of dominance by the Toronto Real Estate Board.
- Analysis of (a) whether proposed royalty rates for standards-essential technology used in 3G mobile telecommunications were consistent with the licensor’s obligation to license technology on FRAND terms; (b) whether the licensor had monopoly power and had unlawfully acquired that monopoly power in the context of an antitrust

claim brought in the Northern District of California; (c) whether the licensor's proposed licensing rates and other practices would have substantially lessened competition in the downstream market for handsets, in relation to competition claims brought before the Federal Court of Australia.

- Analysis of geographic market definition and the effects of agreements to share certain types of information on fuel surcharges in the air cargo industry. This was as part of a litigation in the Federal Court of Australia between the Australian Competition and Consumer Commission and numerous airline defendants. (*With Professor Jeffrey Church and Church Economic Consultants*).
- Several studies looking at market structure in mobile/wireless telecommunications, in the context of spectrum licensing policies such as set-asides of spectrum for new entrants.
- Critical analysis of international comparisons and other metrics used to address the performance of wireless and broadband markets in a cross-country context.

Prior to June 2010, I was a senior managing consultant at LECG Limited. During my time at LECG, I worked on three major disputes involving FRAND licensing in the mobile telecommunications industry. A significant amount of my work centered around telecommunications and the regulation—particularly, policies of network unbundling and functional separation—of access to fixed-line networks. However, my assignments also included providing advice to the British Horseracing Authority on the setting of the “levy” paid by bookmakers to the racing industry; a merger case in the petroleum industry; and the “Connectivity Scorecard”, a composite index that ranked countries according to their effective use of telecommunications and other information technologies.

I also worked as a researcher at London Business School, where I researched both telecommunications regulation and the impact of telecommunications deployment on productivity in the wider economy. The core of the work involved the estimation of a hedonic production function. From 1998 to 2001, I was an analyst at NERA Economic Consulting in the telecommunications practice based in Cambridge, Massachusetts. During that period, I worked on several cases involving the unbundling of network elements, price cap regulation, and mergers between local exchange carriers in the wake of the 1996 Telecommunications Act in the United States. I have substantial experience with econometric analysis and have experience with the econometric package, STATA.

PRESENT EMPLOYMENT

Principal/Director (Affiliate) Berkeley Research Group (UK), 2010-present.
Independent economic consultant, 2011-

PREVIOUS POSITIONS

Senior Consultant to Senior Managing Consultant, LECG, London, UK, 2006-2010
Consultant and Senior Consultant (affiliate), LECG, London, UK, 2005-06
Researcher, London Business School, 2004-2006
Analyst, NERA Economic Consulting, Cambridge, MA, USA, 1998-2001
Research Analyst, Brattle Group, Washington DC, USA, 1997-98.

EDUCATION

B.A., Economics and Government (*Magna cum Laude*), Franklin and Marshall College, USA.

M.Sc. Economics (Merit), London School of Economics.

SELECTED ENGAGEMENTS, 2006-PRESENT

(Since 2010)

- (2016) Econometric analysis of consumer surplus in the wireless market in a small Middle Eastern country (ongoing).
- (2015) Evaluated efficient royalty rates for re-transmitted distant signals in Canada. Key issues included defining an efficient royalty rate for a statutory license, an analysis of market power in markets being used as “benchmarks” and the suitability of viewership as a proxy for the value of content.
- (2015 and 2011-12) Evaluated abuse of dominance claims stemming from certain policies of the Toronto Real Estate Board which restricted the display of certain fields of information on Virtual Office Websites (VOWs). The case was initially heard in 2012 and a redetermination hearing requiring new analysis was held in 2015.
- (2014-15) Econometric tests for market boundaries, and analysis of foreclosure issues, in hot beverage machines and “after-market” products.
- (2013-2015) Analysis of competitive issues regarding a joint venture affecting processing of natural gas liquids by petrochemical manufacturers in Western Canada. This was as part of an analysis of liability in a damages claim relating to the failure to implement purchasing restrictions governing the operation of a jointly-owned facility.
- (2013-14) Analysis of market definition and essential facilities tests for current-generation and next-generation networks of both ILECs and cable-cos. This was as

part of a review of the wholesale regulatory regime by the Canadian Radio-Telecommunications Commission (CRTC).

- (2013-14) Analysis of whether electric utility poles were “essential facilities” for purposes of cellular attachments made by wireless operators wishing to “complete” their urban networks using small cell and DAS technology. A thorough antitrust market definition and market power analysis effectively overturned precedent which favoured regulating utility poles in precisely the same fashion for wireless as was done for wireline. This was before the Ontario Energy Board.
- (2011-2013) Analysis of multi-jurisdictional competition claims (in the U.S. and Australia) related to the licensing of standards-essential technology relating to 3G and 4G standards, between two large smartphone manufacturers. I drafted large sections of the expert report replying to claims of unlawful monopolization and “misuse of market power” in different jurisdictions.
- (2012-13) Analysis of market definition methodologies for crude oil pipelines in the context of whether the owners of a proposed pipeline expansion would have been able to exercise market power when signing up long-term contracts during an open season process.
- (2012) Analysis of the competitive effect of practices imposed by the Toronto Real Estate Board (TREB) on its members. These practices restricted the display of certain informational fields drawn from the Multiple Listing Service (MLS) on the Internet and were alleged to discriminate against brokers with non-traditional business models (e.g., Internet brokerages).
- (2011-13) Analysis of market definition, particularly the scope of the relevant geographic market, in the context of fuel surcharges imposed by airlines on air cargo traffic (*with Professor Jeffrey Church and Church Economic Consultants*).
- (2011) Study of the economic impact of increased LTE investment on regional economies in the United States. This was in the context of the AT&T/T-Mobile merger.
- (2010-11) Analysis of spectrum set-asides, market structure and asymmetric restrictions on foreign ownership in the context of the auction of 700 MHz spectrum in Canada and proposed reforms to rules restricting foreign investment in telecommunications and broadcasting entities.
- (2010) Analysis of a proposed pipeline reversal and its impact on regulated pipeline tolls.
- (2010) Analysis of the potential contribution of Information and Communications Technologies (ICTs) to the Saudi Arabian economy.

- (2010) Analysis of Canada's broadband market in international comparative context. The white paper we authored discussed the limitations of methodologies that were most often suitable for European countries with very different characteristics to the USA and Canada: smaller households, greater density and shorter loop lengths, a lack of inter-modal competition in fixed wireline markets, and a wireless market where pre-paid customers were either the majority or substantial minority.

(2006-2010)

- Co-authored the Connectivity Scorecard for Nokia Siemens Networks from 2008-2011. The Scorecard was a composite index ranking developed and developing countries according to their deployment and usage of Information and Communications Technologies (ICTs).
- Provided advice and analysis of upstream (production, exploration and development) issues relating to a merger between two large vertically integrated Canadian petroleum firms.
- Econometric analysis of the impact of access regulation—local loop unbundling—on the deployment of cable and alternative infrastructures.
- Analysis of functional separation and the economic impact of delayed investment in next-generation networks for a major European incumbent telecommunications operator.
- Advice regarding framework for analyzing economically efficient, commercially determined roaming rates for a large Canadian wireless operator.
- Provided advice and assisted in the preparation of expert testimony in three major litigations involving the licensing of standards-essential patents on Fair, Reasonable and Non-Discriminatory (FRAND) terms.
- Advice to the British Horseracing Authority on the appropriate licensing rate that could be expected in a hypothetical fully commercialised negotiation between the racing industry and the UK licensed bookmakers. This involved studying the interaction between betting on horseracing and other forms of betting and gambling in the United Kingdom.
- Advice to a UK mobile operator on the business impact of alleged failure to implement a timely and efficient mobile number portability system in the U.K.
- Estimation of damages in a dispute regarding refusal of landing rights for a major submarine cable in Mumbai, India.
- Provided analysis of damages related to a claim brought in an arbitration tribunal by a European telecommunications conglomerate. The claim related to the right of first refusal to the sale of shares in a mobile operator in the Near East.

SELECTED PAST WORK

- Provided analysis of the contribution of under-investment in ICTs to the gap in productivity between the United States and Canada (report prepared for Bell Canada and submitted to the Telecom Policy Review Panel).
- Provided analysis of mergers, including Bell Atlantic-GTE, in several U.S. States.
- Provided analyses related to cost-of-capital, price cap plans and interconnection arrangements in the North American telecommunications industry, 1998-2001.
- Provided analyses of RBOC entry into long-distance services.

CONFERENCE AND WORKSHOP PRESENTATIONS

- 2011: Georgetown University (Connectivity Scorecard), and Manning Centre, Ottawa.
- 2010: University of California-Berkeley, Georgetown University, International Telecommunications Union (ITU).
- 2009: London Business School, Nokia Siemens Networks Transformations Forum, London.
- 2008: ETNO Regulatory Economics Workshop (Brussels), Nokia Siemens Networks Transformations Forum (Paris & London).
- 2007: European Telecommunications Network Operators (ETNO) General Assembly (Copenhagen), ETNO Workshop (Brussels).
- 2006: Digital Transformations Conference, Geneva, Switzerland, 2006.



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PROFESSIONAL PROFILE

Dr. Nieberding is Founder and Principal of North Coast Economics, LLC. He provides expert economic analysis in areas such as antitrust and competition policy, regulatory proceedings, merger reviews, intellectual property, economic damages analysis, econometrics, statistics, and class certification. Previously, Dr. Nieberding was Principal at LECG (formerly Law and Economics Consulting Group) – an international firm providing expert analysis and management consulting in the areas of economics, finance, accounting, and statistics – from 1998 through 2010.

Dr. Nieberding's consulting work encompasses a wide variety of matters including antitrust and intellectual property, damages analysis in complex business litigation, regulatory submissions, and econometric/statistical analysis. His work has included analysis of antitrust issues in matters before the U.S. FTC, the U.S. DOJ, the European Commission (DG Comp), the Taiwan FTC, the Competition Bureau of Canada, the German Federal Cartel Office, the Federal Energy Regulatory Commission, the U.S. Environmental Protection Agency, and various federal and state courts. He has analyzed various forms of business conduct, and developed or analyzed damages models in business disputes for a range of industries and a variety of claims. These include issues related to the analysis of lost profits in disputes between licensors and licensees and between manufacturers and dealers, breach of contract claims, dealer termination, antitrust damages, unfair competition, market foreclosure, patent infringement, and price erosion. He has worked extensively on matters involving economic damages such as lost profits claims, including those related to price erosion due to patent infringement; the appropriateness of class certification involving direct and indirect purchasers; merger reviews; the analysis of antitrust liability and damages; and the estimation of overcharges in monopolization, conspiracy, price fixing, and abuse of dominance inquiries.

Dr. Nieberding has taught undergraduate, graduate, and MBA courses in economics, statistics, and business strategy. He has offered Continuing Legal Education training to attorneys, presented papers at conferences, and published articles in academic and professional journals pertaining to antitrust, industrial organization, econometrics and statistics, international trade, economic damages, and the estimation of lost profits. Dr. Nieberding currently is a Lecturer in the Department of Economics at Cleveland State University. He has held academic appointments at The Johns Hopkins University (Graduate Part-Time Program in Engineering and Applied Science, Whiting School of Engineering, Washington, DC); University Of Notre Dame (Department of Finance and Business Economics, College of Business, South Bend, IN); Baldwin Wallace College (Department Of Economic, Berea, OH); and The Ohio State University (Department of Economics, Columbus, OH). Dr. Nieberding was selected for inclusion in the 2012 Edition of *The International Who's Who of Competition Lawyers & Economists*, as well as the 2015 Edition of *Who's Who Legal: Competition, Global Competition Review*.



North Coast Economics, LLC
Insightful & Expert Economic Analysis

EDUCATION

PhD, Economics, The Ohio State University, Columbus, Ohio, 1994

MA, Economics, The Ohio State University, Columbus, Ohio, 1990

BA, University Scholar in Economics, Xavier University, Cincinnati, Ohio 1987

PRESENT POSITIONS

Principal, North Coast Economics, LLC, January 2011 – present

Lecturer, Cleveland State University, Department of Economics; MBA Program, Cleveland, Ohio, 2007 – present.

- Economic Analysis (MBA)
- Principles of Microeconomics
- Intermediate Microeconomics
- Economic Perspectives in Management (EMBA)
- Economic Concepts (EMBA)

PREVIOUS PROFESSIONAL POSITIONS

LECG, Global Competition Policy Group, Washington, DC, 1998 to 2011

- *Principal*, January 2008 – December 2010
- *Senior Managing Economist*, January 2003 – December 2008
- *Managing Economist*, July 2000 – January 2003
- *Senior Economist*, July 1998 – July 2000

Lecturer, Johns Hopkins University, Part-Time Program in Engineering and Applied Science, Whiting School of Engineering, Graduate Part-Time Program, Washington, DC, 2002 – 2004

- Economic Foundations for Public Decision Making

Visiting Assistant Professor, Cleveland State University, Department of Economics, Cleveland, Ohio, 1997 – 1998

- Economic Analysis (MBA)
- Intermediate Price Theory
- Intermediate Macroeconomics
- Managerial Economics for Engineers
- Advanced Mathematical Economics (MA Economics Program)
- Advanced Microeconomics II (MA Economics Program)
- Principles of Macroeconomics



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Adjunct Assistant Professor, Baldwin Wallace College, Department Of Economics, Berea, Ohio, 1996 – 1997

- Statistics for Business & Economics

Economist, Business Research Econometrics (*dba* Burke, Rosen & Associates), Cleveland, Ohio, 1995 – 1997

- Provided economic analysis for litigation support in commercial litigation, torts, and discrimination cases
- Performed a variety of statistical and econometric analyses in support of damage theories and models in complex commercial litigation cases:
 - Estimated product-specific cost function for a vertically-integrated U.S. steel manufacturer as a means to quantify the economic benefit gained due to rationalization of production within a multi-plant steel firm
 - Estimated hedonic model of housing prices to quantify the diminution of value due to alleged environmental contamination
 - Performed nonparametric statistical tests in alleged discrimination cases

Visiting Assistant Professor, University Of Notre Dame, Department of Finance and Business Economics, College of Business, Notre Dame, Indiana, 1994 – 1995

- Managerial Economics
- Business Conditions Analysis

Graduate Research Associate, The Ohio State University, Department of Economics, Columbus, Ohio, 1993 – 1994

- International Economics and Finance
- Economic Development

Graduate Teaching Associate, The Ohio State University, Department of Economics, Columbus, Ohio, 1989 – 1993

- Principles of Microeconomics
- Principles of Macroeconomics

Economic Analyst, Benefit Designs, Inc., Cincinnati, Ohio, 1986 – 1989

- Prepared economic loss analysis reports, and provided annuity financing of structured settlements under IRC 104(a)(2), in support of major medical malpractice/tort claims.



AREAS OF CONSULTING EXPERIENCE

Economic damages analysis

Exclusive dealing/refusal to deal

Non-price vertical restraints

Resale price maintenance (RPM) and most-favored-nation (MFN) agreements

Vertical restraints, vertical integration, and their impact on competition

Price-fixing/allegation of conspiracy

Economic analysis of pass-through

Merger analysis

Monopolization/attempted monopolization

Monopsony

Market foreclosure (horizontal and vertical)

Market definition (geographic and product)

Antitrust counterclaims and Walker Process claims

Intellectual property claims

Antitrust liability and damages

Aftermarket analysis

Antitrust analysis in bidding markets

Antitrust issues related to standard-setting organizations (SSOs)

Antitrust analysis in price discrimination markets

Applied economic modeling, econometric analysis, and statistical methods

- Econometric analysis using time-series, cross-section, and panel data
- Estimation of systems of simultaneous equations and reduced-form models; analysis of survey data and estimation of limited dependent variable models; development and estimation of models using nonlinear least squares; cointegration analysis; VARs and VECMs; error-correction models; forecasting
- Economic modeling of industry behavior/structure to analyze competitive effects
- Analysis of issues pertaining to surveys, experimental design, and sampling techniques
- Estimation of industry-level and firm-level conduct parameters using NEIO techniques to test for changes in market power
- Economic and econometric analyses related to the energy industry:
 - analyze the effect of proposed EPA sulfur content regulations on refiner costs and gasoline prices in a U.S. regulatory proceeding
 - estimate potential anticompetitive effects of proposed acquisitions involving petroleum refineries for U.S. and non-U.S. merger reviews



- assess the likelihood of anticompetitive effects of a gasoline terminal acquisition (along with gasoline supply agreements)
- analyze the impact of vertical integration on a refiner's unilateral incentives to restrict output to independent gas stations
- estimate the effect of alleged market manipulation regarding Californian wholesale electricity prices
- model and forecast the quantity (and price) of electricity produced at a gas-fired combined cycle electricity generating unit
- provide forecast values of petroleum products to estimate economic damages
- estimate lost profits in an international arbitration related to petroleum products
- analyze the reasonableness of intercompany loans for a petroleum firm in an international arbitration

Estimation of demand systems using scanner data for the recovery of elasticity matrices and the calculation of diversion ratios

Estimation of econometric models of overcharge due to alleged anticompetitive behavior (e.g., price-fixing, attempted monopolization, abuse of dominance, bid rigging)

Analysis of issues pertaining to patent and trademark claims and the estimation of damages due to the alleged misuse of intellectual property; analysis of antitrust claims and counterclaims embedded in intellectual property litigation; licensing issues; alleged anticompetitive withholding of intellectual property

Analysis of issues concerning class-certification in the context of price fixing/conspiracy claims made by direct purchasers and indirect purchasers; statistical and economic analysis related to class-certification

Analysis in complex business litigation concerning predatory pricing; disputes between licensors and licensees, franchisors and franchisees, and manufacturers and dealers; dealer termination, business interruption, tortious interference, breach of contract, lost profits, and price erosion

Analysis for a Sunset Review before the Department of Commerce's International Trade Administration and the US International Trade Commission of existing antidumping orders on brass sheet and strip products from the Netherlands

HONORS, AWARDS, AND MEMBERSHIPS

Selected for inclusion in the 2012 Edition of *The International Who's Who of Competition Lawyers & Economists*.

Awarded the *Abramson Scroll* in recognition of an outstanding feature article in *Business Economics*; presented at the Presidential Lunch, NABE's 2005 Annual Meeting, Chicago IL (September 25, 2005)



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Excellence in Economic Instruction Teaching Award, Undergraduate Economics Society, The Ohio State University, Spring 1993

President of the Economics Graduate Student Committee, The Ohio State University, 1993-94

Recipient of the Craig Menderson Memorial Economics Award, Xavier University, 1987

National Merit Scholar Finalist, 1983

Member, American Economic Association (AEA)

Member, Industrial Organization Society (IOS)

Member, National Association for Business Economics (NABE)

Member, Cleveland Association for Business Economics (CABE)

Associate Member, American Bar Association (ABA), Section of Antitrust Law

PUBLICATIONS

“The Anticompetitive Potential of MFNs,” Competition Policy International (CPI) Antitrust Chronicle, Number 2, August 2014.

“Do Low-Price Guarantees Guarantee Low Prices?,” Cleveland Metropolitan Bar Journal, Volume 6, Number 3, pp. 9-10, November 2013.

“A Profitable Pricing Strategy for Tie-In Sales: A Look at *Webkinz*,” The Price Point, Newsletter of the ABA Section of Antitrust Law Pricing Conduct Committee, Volume 10, Number 3, Fall 2011, pp. 8-11.

“When to Involve Counsel and Consultants in Antitrust Matters,” Antitrust Compliance: Perspectives and Resources for Corporate Counselor, American Bar Association, Section of Antitrust Law, October 2010. (with Henry Kahwaty)

“The But-For Market, Economic Damages, and Elasticity Considerations,” Economics Committee Newsletter, the American Bar Association, Section of Antitrust Law, Volume 9, Number 2, pp. 17-28, Fall 2009.

“*Leegin*, the Use of RPM, and Antitrust Liability,” Cleveland Metropolitan Bar Journal, Volume 1, Number 10, pp. 12-14, January 2009.

“Price Dispersion and Class Certification in Antitrust Cases: An Economic Analysis,” Journal of Legal Economics, Volume 14, Number 2, pp. 61-84, September 2007. (with Robin Cantor)

“Estimating Overcharges in Antitrust Cases Using a Reduced-Form Approach: Methods and Issues,” Journal of Applied Economics, Volume IX, No. 2, pp. 361-380, November 2006.

“Game Theory, Q & A on Economic Concepts: Free Lunch Column,” Antitrust Magazine, pp.98-100, Spring 2006. (with David Weiskopf and Susan C. S. Lee)



“The Benefits of Free Trade to US Consumers,” Business Economics (Journal of the National Association for Business Economics), pp. 41-51, July 2005. (with James Langenfeld)

Book Review of Phillip I. Good and James W. Hardin (2003), Common Errors in Statistics (and How to Avoid Them). John Wiley & Sons, Inc. Published in Risk Analysis: An International Journal, 25(3), 773-775, June 2005.

“Lost Profits and Price Erosion in Patent Infringement Cases: Implications of *Crystal Semiconductor*,” Journal of Forensic Economics, 16(1): pp. 37-49, July 2004.

“Price Dispersion, the ‘Bogosian Short Cut,’ and Class Certification in Antitrust Cases,” Economics Committee Newsletter, distributed in the American Bar Association Antitrust Section Spring Meetings, March 31, 2004. (reprinted in Texas Business Litigation Quarterly, Spring 2005, pp. 23-25). (with Robin A. Cantor)

“The Importance of Price Elasticity of Demand in Computing Total Lost Profits in Patent Infringement Cases: A Reminder From The CAFC,” Journal of the Patent and Trademark Office Society, 85(10): pp. 835-848, October 2003.

“The Effect of Antidumping Law on Firms’ Price-Cost Margins: An Empirical Test,” Review of Industrial Organization, 14 (1): pp. 65-84, February 1999.

“Firm Market Power and US Antidumping Law,” Ohio Journal of Economics and Politics, 12 (1): pp. 13–26, 1998.

The Anticompetitive Nature and Political Economy Issues of US Antidumping Law. The Ohio State University. Ph.D. Dissertation. 1994.

PROFESSIONAL PRESENTATIONS AND ACTIVITIES

Served as a judge to determine the recipients of the 2015 Vernon Jordan Fellowship Award and the Philip M. Dearborn Fellowship Award of the Economic Club of Washington, DC. These programs award \$10,000 stipends to doctoral-level students from Consortium institutions in the Washington, DC area. Performed this function in awarding the 2010 through 2014 Fellowships.

Fundamentals of Economic Damages: Re-creating the But-For Market While Obeying the Law of Demand. Presentation delivered before the Cleveland Metropolitan Bar Association, The Legal Eagles (CLE Session), December 6, 2014.

Class Certification in Antitrust Cases: Update and Evolving Standards. Presentation delivered before the Cleveland Metropolitan Bar Association, Legal Eagles (CLE Session), December 5, 2009.

Submitted Comment entitled “The Role of Price Tests in Market Definition” pertaining to the FTC's and DOJ's joint Horizontal Merger Guidelines Review Project, November 8, 2009.



“Price Tests and Geographic Market Definition,” Contribution to Mergers and Acquisitions: Understanding the Antitrust Issues, 3rd Edition, American Bar Association (2008).

Trying and Winning a Civil Antitrust Case, ALI-ABA (CLE Session), Washington DC, December 7–8, 2006. Participated as panelist/discussant.

“Issues in the Analysis of Vertical Restraints: Implications of *LePages’s* and *Dentsply*,” LECG Summer Seminar, July 16, 2005. Organized seminar; served as a panelist and discussant.

Participated in the preparation of Econometrics: Legal, Practical, and Technical Issues. American Bar Association Book, 2005.

Economic Analysis in Class Certification in Antitrust, Antitrust & Trade Regulation Section, Dallas Bar Association (CLE Session), September 21, 2004.

Estimating Overcharges in Price-Fixing Cases Using a Reduced-Form Approach, working paper presented at Contemporary Issues in Law, Economics, and Antitrust session, WEA International Conference, Vancouver, BC, July 2, 2004. Also served as a discussant.

The Implication of Price Variability on Class Certification in Antitrust Cases (with Robin A. Cantor), working paper presented at Empirical Topics in Antitrust session, WEA International Conference, Denver, CO, July 12, 2003.

LECG Summer Seminar Series: Daubert and Economic Experts, Mock *Daubert* hearing, July 2003; served as discussant.

Lost Profits and Price Erosion in Patent Infringement Cases: Implications of *Crystal Semiconductor*, working paper presented at Applied Topics in Law and Economics session, WEA International Conference, Seattle, WA, June 30, 2002. Served as a discussant.

Referee to the *Review of Industrial Organization*, *Journal of Legal Economics*, and *Journal of Forensic Economics*.

WORKING PAPERS

Pass-Through of Crude Oil Prices to California Gasoline Prices as a Way to Estimate the Elasticity of Supply Response

An Agreement in the Rough: A Modified Cournot Model Approach to Distribution Agreements

Patentee Risk Aversion and “Reverse Payments”

Exclusive Dealing: Judicial Treatment, Competitive Effects, and Category Management

The Economics of Private Label Versus Branded Goods

The Economics of Value-of-Life-Estimates, Hedonic Damages, and *Daubert*

The Political Economy of Protection Under US Antidumping Law: An Empirical Analysis



TESTIMONY & EXPERT WORK

- Submitted Declaration in a business litigation matter (December 2014)
- Submitted Affidavit relating to sampling and statistical issues in a class certification matter (February 2013)
- Submitted Declaration and provided deposition testimony regarding lost profits and price erosion claims in a patent damages matter (July-August 2012)
- Retained as Consulting Expert for plaintiff in a false-claims matter (March 2012)
- Retained as Consulting Expert for an opt-out defendant in a major antitrust litigation (November 2011)
- Submitted Expert Report in a matter regarding lost profits and survey issues (February 2011)
- Submitted Affidavit relating to survey and sampling issues in an antitrust matter (June 2009)
- Submitted Expert Report and provided deposition testimony in a complex commercial damages matter involving breach of contract, lost profits damages, and survey/sampling issues (March 2008)
- Submitted Expert Report in a complex commercial damages matter (January 2006)
- Provided Affidavit in a patent damages matter (March 2004)

REPORTS

- Confidential Whitepaper submitted before the European Commission concerning various price tests for geographic market definition regarding a proposed merger between two European firms, January 2005 (co-authored with James Langenfeld and Mary Coleman).
- Economic experts' report in the matter of Brass Sheet and Strip From the Netherlands – Sunset Review: Economic and Strategic Issues Regarding Revocation of the Existing Antidumping Duty Order and the Likelihood of Continuation or Recurrence of Material Injury (USITC Inv. No. 731-TA-380), submitted before the US International Trade Commission, March 23, 1999 (co-authored).
- Economic experts' report in the matter of Brass Sheet and Strip From the Netherlands – Sunset Review: Economic and Strategic Issues Regarding Revocation of the Existing Antidumping Duty Order and the Likelihood of a Resumption of LTNV Sales, International Trade Administration, US Department of Commerce, March 3, 1999 (co-authored).

PERSONAL

- Birthplace: Cleveland, Ohio
- Married, two children