

Expert Report of
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I. Qualifications and Questions to be Addressed

A. Janusz A. Ordover

1. My name is Janusz A. Ordover. I am Professor of Economics and former Director of the Masters in Economics Program at New York University, where I have taught since 1973. During 1991-1992, I served as Deputy Assistant Attorney General for Economics at the Antitrust Division of the United States Department of Justice. As the chief economist for the Antitrust Division, I was responsible for formulating and implementing the economic aspects of antitrust policy and enforcement of the United States, including co-drafting the 1992 U.S. Department of Justice and Federal Trade Commission *Horizontal Merger Guidelines*. I also had ultimate responsibility for all of the economic analyses conducted by the Department of Justice in connection with its antitrust investigations and litigation, including economic analyses of collusion and other anticompetitive industry practices. I have written and consulted in the telecommunications sector and other network industries in the US, Australia, New Zealand, and in the EU on behalf of private parties as well as regulators. A copy of my curriculum vitae is attached as Exhibit 1.

B. Allan L. Shampine

2. My name is Allan L. Shampine. I am a Senior Vice-President of Compass Lexecon, an economic consulting firm. I received a B.S. in Economics and Systems Analysis *summa cum laude* from Southern Methodist University in 1991, an M.A. in Economics from the University of Chicago in 1993, and a Ph.D. in Economics from the University of Chicago in 1996. I have been with Compass Lexecon (previously Lexecon) since 1996. I specialize in applied microeconomic analysis and have done extensive analysis of network industries, including telecommunications and payment systems. I am the editor of the book *Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies*, and I have

published a variety of articles on the economics of telecommunications and network industries and on antitrust issues. I am an editor of the American Bar Association journal *Antitrust Source*. In addition, I have previously provided economic testimony on telecommunications issues on a variety of matters before the United States Federal Communications Commission and state public utility commissions. A copy of my curriculum vitae is provided as Exhibit 2.

C. Questions to be Addressed

3. We have been asked by counsel for NBN Co Limited (“NBN Co”) to provide our advice on whether certain aspects of NBN Co’s proposed Special Access Undertaking (“SAU”) will provide appropriate incentives for, and constraints on, NBN Co over the term of the SAU. In particular, we have been asked to provide our expert opinion on whether, in the context of a vertically separated, wholesale-only network provider such as NBN Co, the proposed SAU is likely to lead to:

- Efficient investment in and use of the National Broadband Network (“NBN”), having regard to issues of network scope as determined by the Australian Government (*e.g.*, fiber to 93 percent of Australian premises);
- An efficient level of costs associated with the construction and operation of the network;
- The maintenance of (or increase in) an appropriate level of quality in the supply of wholesale service to access seekers over the NBN;
- Pricing over the entire period of the SAU that is efficient and not anti-competitive with respect to its effect on downstream markets, subject to the requirements of the pricing of Reference Offers and uniform national wholesale pricing;
- Incentives for effective engagement between NBN Co and its customers in relation to the non-price terms of supply of its services; and

- Incentives for efficient product development and withdrawal.

4. We have also been asked to consider the merits of the following elements of the

SAU:

- The overall structure of the SAU, *i.e.*, splitting out an initial regulatory period of ten years (the “Initial Regulatory Period”) from the subsequent regulatory period of twenty years (the “Subsequent Regulatory Period”) where substantial detail is provided for the Initial Regulatory Period and, for the Subsequent Regulatory Period, which is broken up in a series of three to five year SAU variations (the “regulatory cycles”), only the key principles are provided to be implemented;
- The SAU’s thirty year time frame;
- The adoption of later period regulatory cycles which are to be between three and five years;
- The switch to a “building block” period when initial costs have been recovered (*i.e.*, when the Initial Cost Recovery Account is extinguished);
- The incorporation of an expectation that the net cash flows and beginning and ending values of relevant inputs such as the Initial Cost Recovery Account and Regulatory Asset Base for a particular Annual Building Block Revenue Requirement structure specified in later regulatory cycles will have a net present value of zero; and
- Implementing contract changes resulting from regulatory recourse by an access seeker only at the end of an existing executed Standard Form of Access Agreement, which are limited to two year terms.

D. Acknowledgement

5. With respect to this report, we have read, understood and complied with the “*Practice Note CM 7: Expert Witnesses in Proceedings in the Federal Court of Australia*” supplied to us by counsel for NBN Co – Webb Henderson. We agree to comply with the terms of the Practice Note.

II. Background

6. Our opinions are based upon our specialized knowledge as economists, the economics literature as cited in the body of the report, and certain materials provided to us to consider by Webb Henderson. A complete list of the materials is attached as Exhibit 3. The materials provided by Webb Henderson are:

- NBN Co’s finalized SAU;
- The NBN Co Corporate Plan 2012 – 2015, dated August 6, 2012 (“NBN Co Corporate Plan 2012-2015”);
- ACCC Determination – Applications for authorisation lodged by NBN Co Limited in respect of provisions of the HFC Subscriber Agreement entered into with SingTel Optus Pty Ltd and other Optus Entities, dated July 19, 2012 (“ACCC Determination”);
- A Statement of Expectations from shareholder Ministers in the Australian Government to NBN Co, dated December 17, 2010 (“Statement of Expectations”); and

- Background facts provided by counsel as set forth in the remainder of this section.¹

7. NBN Co is a wholly-owned Government Business Enterprise (“GBE”) which will operate as a commercial entity and provide wholesale access to a layer 2 bitstream service on an open and equivalent access basis. NBN Co has been directed by the Australian Government to connect between 90 and 93 percent of Australian premises using fiber to the premises (“FTTP”) technology, initially supporting downlink speeds of up to 100 Mbps. The remaining 7 to 10 percent of Australian premises are to be connected through a combination of wireless and satellite technology with downlink speeds of at least 12 Mbps.

8. The Australian Government has also directed NBN Co to apply uniform national wholesale access pricing to its products. Uniform national wholesale pricing (“UNWP”) across all geographic areas is supported by an entry-level product tier with pricing and specifications independent of the technology platform over which it is delivered. NBN Co is also subject to stringent non-discrimination obligations.

9. NBN Co is a wholesale-only broadband service provider, prohibited by legislation from supplying services over the NBN to persons other than a carrier or service provider, and from owning or controlling a retail carriage service provider.²

10. NBN Co is not a legislated monopoly. However, there are the following legislative and structural conditions on other network carriers who currently own or will build

1. We have not been asked to opine on the specifics of the methodologies, such as the precise calculation of the Regulatory Asset Base or the price levels of the Offers, but rather on the economics of the overall approach.

2. NBN Co is, in limited circumstances, permitted to also supply directly to utilities.

fixed-line superfast access networks in Australia.³ First, NBN Co has entered into commercial arrangements with two of Australia's largest telecommunications companies (Telstra and Optus) to retire their legacy networks (*i.e.*, copper and hybrid fiber networks) which will facilitate migration of retail and wholesale customers for voice and broadband services to the NBN⁴; and while a new entrant could establish and operate a network to compete with the NBN, there is a statutory obligation which requires any new FTTP infrastructure to meet the technical specifications for the NBN and for all superfast broadband networks to provide access seekers with open and equivalent access to that network on a wholesale-only basis.⁵

11. Under the Competition and Consumer Act 2010 ("CCA"), NBN Co may provide the ACCC with a written undertaking in connection with the provision of access to a listed carriage service. On December 5, 2011, NBN Co submitted an SAU with the ACCC which contained detailed commitments to apply for a period of 30 years in relation to the service description, return on revenue, and price and non-price terms of access to the NBN (the "Original SAU").

12. On December 20, 2011, the ACCC commenced formal consultation on the Original SAU as part of its assessment process but in June 2012 suspended further consultation in preparation for NBN Co's submission of a revised SAU. In response to feedback from the industry and the ACCC, NBN Co has developed a revised SAU. References to the SAU are, unless otherwise noted, to the revised SAU.

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3. A "superfast" network is a fixed-line network providing a download speed of greater than 25 Mbps.
 4. We understand that Telstra's hybrid fiber network will still be used to provide Pay TV services.
 5. We understand that these obligations are set forth in sections 141-143 of the *Telecommunications Act 1997* (Cth).

13. The SAU maintains a term of 30 years but utilizes an incentive-based modular approach which proposes different terms and conditions to apply for different periods, with varied levels of detail provided in each module. NBN Co's proposed SAU is separated into a "Main Body" – which includes a number of general terms and conditions in relation to NBN Co's SAU and which will apply for the roughly 30 years of the SAU⁶; "Module 1" – which specifies the detailed terms and conditions in relation to supply of services on the NBN for the initial roughly 10 years of the SAU (the "Initial Regulatory Period")⁷; "Module 2" – which sets out both the high-level terms and conditions in relation to supply of the NBN (which provide continuity from Module 1) for the period which commences at the end of the Initial Regulatory Period and ends at the end of the SAU term (the "Subsequent Regulatory Period") and certain detailed commitments in relation to the content of the variations to the SAU which NBN Co will submit as consecutive 3-5 year replacement modules throughout the Subsequent Regulatory Period. "Replacement Modules" are not included in the initial submission of the SAU but will be submitted as consecutive variations to the SAU immediately prior to commencement and throughout the Subsequent Regulatory Period to complement the principles contained in Module 2. These modules will contain a detailed set of terms and conditions in relation to supply of services on the NBN that will be assessed by the ACCC as part of the statutory review and acceptance process for SAU variations, and will apply for periods of between 3 and 5 years.

14. In addition to the modular approach described above, NBN Co's proposed SAU comprises the following key features. First, a commitment by NBN Co to supply certain offers over the entire period of the SAU which would allow access seekers to supply end-to-end

6. The SAU is set to expire June 30, 2040.

7. The Initial Regulatory Period is set to run through June 30, 2013 but may be extended for one year under some circumstances.

services to their customers (*i.e.*, “Reference Offers”, which are subject to periodic updating to maintain relevance), and a commitment by NBN Co to supply certain other offers at the commencement of the SAU, the withdrawal of which may only be undertaken in accordance with the withdrawal process set out in the SAU (*i.e.*, “Non-Reference Offers”, which will be added to over time). Second, the specification of maximum prices in the SAU, which are to apply as initial prices to products that comprise the Reference Offers, until June 30, 2017; and the Non-Reference Offers, as at the commencement date of the SAU. Third, a price increase limit of CPI-1.5% per annum to apply to prices of all individual products throughout the roughly 30 year term of the SAU on a use-it-or-lose-it basis (except the prices of Reference Offers which are set in nominal terms until June 30, 2017).⁸ And finally, a principled approach to pricing of new products over the entire duration of the SAU whereby NBN Co is to have regard to a variety of factors, including the Government’s Statement of Expectations, uniform national wholesale pricing, market factors, existing prices and the importance of maintaining affordability to drive product take-up rates.

15. The SAU includes the adoption of a long term revenue constraint methodology (“LTRCM”) which is consistent with the “Building Block” revenue methodologies used by the ACCC and other regulators, as well as the establishment of an Initial Cost Recovery Account (“ICRA”) as part of NBN Co’s LTRCM that is a separate regulatory account which will

8. The individual price increase limit is specified as $(1 + \text{CPI}) \times (1 - 1.5\%) - 1$, but is referred to for simplicity in the remainder of the report as CPI – 1.5%. The two are roughly equal, but CPI-1.5% results in a slightly higher individual price increase limit (assuming positive CPI). As specified in the SAU, the effect of the individual price increase limit is that real prices (with some limited exceptions concerning time or time and materials based charges) must decline by 1.5% or more per year, subject to NBN Co not having to decrease its nominal prices. That is, if CPI is below 1.5%, NBN Co is not required to decrease its nominal prices.

comprise NBN Co's unrecovered costs that have been rolled forward each year and to which a capital charge will be applied to the balance each year. By using the ICRA mechanism, NBN Co's initial under-recovery of its costs is capitalized and essentially forms part of the overall capital base that NBN Co can earn a return on over time. For the Initial Regulatory Period, the LTRCM proposed by NBN Co will comprise the following components:

- A Regulatory Asset Base ("RAB") that represents NBN Co's actual prudently incurred capital expenditure which will be rolled forward each year of the initial regulatory period by adding new investments and deducting depreciation and disposals;
- An Annual Building Block Revenue Requirement ("ABBRR"), or regulatory revenue, which is calculated at the end of each year of the initial regulatory period and which represents a level of revenue that would allow NBN Co to earn a return on its RAB and cover its depreciation, actual operating expenditure, net taxation expenses and the cost of financing capex projects that are still in progress;
- A Weighted Average Cost of Capital (WACC) that is calculated by reference to a risk free rate (*i.e.*, the 10 Year Australian Government bond rate, updated annually) plus 350 basis points;
- An ICRA that will apply until such time as NBN Co has earned sufficient revenues in excess of its ABBRR to extinguish the ICRA. Once the ICRA is extinguished, the ABBRR calculated for each year would effectively act as a cap on NBN Co's annual revenues; and
- A Building Block Revenue Period (which commences in the event that the ICRA is extinguished by year 10).

16. For the subsequent regulatory period (*i.e.*, commencing at the end of the Initial Regulatory Period), the LTRCM proposed by NBN Co will comprise the following components:

- A RAB roll forward mechanism specified in the same terms as that which applies in the initial regulatory period;
- An ABBRR set on a forecast basis for each year within a 3 to 5 year period, subject to the requirement that the expected net present value of the relevant future cash flow inputs (relating to opex, capex, tax and revenue) and beginning and ending values of relevant stock inputs (RAB and ICRA) must be zero over the period (*i.e.*, the Replacement Module periods) when using the nominal vanilla WACC relevant to that period;
- ICRA roll forward that is similar to that which applies in the initial regulatory period, except that the calculation of the unrecovered costs for a given year will reference forecast ABBRR (in real terms) and the forecast revenue (in real terms).

17. The SAU includes an approach to prudent expenditure which, for the first 10 years, is based on the requirement that expenditures must satisfy certain conditions, such as that these are consistent with NBN Co's Network Design Rules (which are to be submitted to the ACCC alongside the SAU) or, for expenditures on new network changes, that these have been endorsed by NBN Co's customer base (with a role for the ACCC in the event of a dispute). The SAU also requires NBN Co to follow appropriate procurement processes in incurring expenditure. After the first 10 years, a conventional utility regulation approach, which provides incentives for efficient expenditure, will be used, based on the provision of regular forecasts to the ACCC which, in turn, will be assessed by the regulator as part of the overall reasonableness of the replacement modules lodged as variations to the SAU.

18. With respect to quality of the services to be offered by NBN Co, the SAU includes a commitment for the Initial Regulatory Period to include in NBN Co's standard form of access agreement (*i.e.*, the standard terms and conditions on which access seekers contract with NBN Co for the supply of the NBN, also known as the "SFAA") a specified set of service level commitments (also known as service level agreements, or "SLAs") and service level rebates which will ensure that NBN Co does not minimize cost at the expense of service quality. The specified set of service level commitments is for the Initial Regulatory Period. Midway through the Initial Regulatory Period, the service levels and rebates will be the subject of a review by the ACCC, and if the ACCC is not satisfied with NBN Co's proposals then it can make a decision on what service levels and rebates should apply for the remainder of that period. In the Subsequent Regulatory Period, NBN Co must include a service levels and rebates proposal in its Replacement Module Applications, which must satisfy a range of principles as set out in the SAU.

19. In the Initial Regulatory Period, the SAU includes a commitment by NBN Co to incorporate any regulatory determinations made by the ACCC in relation to the NBN into NBN Co's SFAA to the extent that those terms and conditions are not price-related or inconsistent with NBN Co's SAU. The SFAA itself will be limited to a maximum of two years (although a customer could seek a longer time period on the same terms if desired) so that at the expiry of the term, a customer may then avail itself of the new SFAA including as amended by any ACCC regulatory determinations. A regular multilateral forum on the terms of the SFAA will be established to provide a transparent mechanism for dealing with contractual concerns.

20. Finally, the SAU provides for a role for the ACCC to periodically assess the reasonableness of new SAU terms to apply in the period after the initial 10 years of the SAU via the submission of variations to the SAU in the form of consecutive replacement modules of 3 to

5 year durations each, subject to the constraint that the CCA prohibits the ACCC from rejecting any new SAU or variation for a reason that concerns “fixed principles” terms and conditions identified within the original SAU. However, as in the first 10 years, there is no direct role for the ACCC in relation to oversight of initial or ongoing pricing.⁹

III. Economic Issues of Concern

21. It is important to note at the outset that the economics of regulation raise a host of very complex issues. Indeed, there is rarely a single “best” approach to attaining the regulatory objectives, such as ensuring short-term and long-term economic efficiency, while satisfying a potentially wide range of other public policy constraints that may be relevant. Different regulatory strategies have different strengths and weaknesses. Consequently, it is common for the regulator to adopt regulatory policies that have desirable properties in respect of the particular policy issues of most concern.¹⁰ In this report, we discuss the issues that have been identified to us as being of paramount concern and how appropriate the various measures in the SAU are to addressing those concerns. We find that the measures in the SAU are reasonable¹¹ and appropriate to the concerns identified.¹²

9. The only exception to this is in relation to a proposal by NBN Co to change the price of a Reference Offer or Other Charge associated with the supply of a Reference Offer where the current price is zero. In such cases, the ACCC may intervene within a set period of time.

10. See, for example, Mark Armstrong and David Sappington, “Recent Developments in the Theory of Regulation,” in *Handbook of Industrial Organization*, M. Armstrong and R. Porter (eds), 2007, at 1607.

11. We understand that “reasonable” is also a legal term under the legislation. We are not lawyers and do not use the term in that legal sense.

12. Although we note that the CPI – 1.5% individual price increase limits may require modification at some point if real prices fall to the point at which they interfere with NBN Co’s ability to receive a return on its investments. More generally, we assume that the reporting mechanisms required of NBN Co will produce useful, high quality information, reducing any concerns about asymmetric information between NBN Co and

22. It is also important to note that because NBN Co is a wholesale only entity prohibited from offering retail services or acquiring an interest in firms offering retail services, many of the most vexing concerns that often arise in designing and policing a regulatory scheme for an access provider do not apply. A vertically integrated access provider which also provides retail services may have an incentive and ability to discriminate in favor of its own retail services. However, structural separation of the sort implemented in Australia with respect to NBN Co should ensure that all retail customers have equal access to the network, which has no incentive to favor one over another.¹³ In this situation, as we discuss further below, NBN Co has incentives to ensure its retail customers are successful, as that will increase demand for NBN Co's own services and the concomitant revenue flow.

A. Incentives for Investment

23. We begin by examining the question of incentives for investment in the network infrastructure. The Australian Government has stated that its central objective in this case is the deployment of the National Broadband Network, “a significant piece of Australian critical infrastructure,” to provide high speed broadband service to all Australians.¹⁴ The initial roll-out of the National Broadband Network is anticipated to cost in the neighborhood of \$37.4 billion.¹⁵ This is a huge investment by any measure and which for the most part will be sunk. Firms make such investments in anticipation of earning profits, *i.e.*, at least a risk-adjusted normal rate of

(...continued)

- the regulator, and we do not discuss issues of “regulatory capture”.
13. David Newbery, *Privatization, Restructuring, and Regulation of Network Utilities*, 1999, MIT Press, at 188.
14. Statement of Expectations, at 1 and 2.
15. The Government will make an equity contribution of \$30.4 billion. NBN Co Corporate Plan 2012-2015, at 10, 71. The remainder of the amount is intended to be raised by NBN Co issuing debt. Statement of Expectations, at 11 and 12.

return on the investments. If the risk-adjusted, expected profits on an investment are insufficient, then the firm will not make the investment or will scale back on its investment plans. In the regulatory context, sunk aspects of the investment create a concern that after a firm has made an investment, the regulator may “expropriate” that investment by materially reducing (or even eliminating) the expected return.¹⁶ Fears of such expropriation have significantly reduced infrastructure investments in many countries.^{17,18}

24. A regulated utility’s concerns about the risks of expropriation can be quite rational, driven in part by competing priorities on the part of policy-makers. This report discusses this issue in the context of some of the topics we have been asked to address, in particular, as it bears on proper regulation of pricing as well as investment. There can be tension between these twin objectives of spurring investment and ensuring that prices are sufficiently low to encourage the take-up of the service. In order to earn a return on its investments, a firm must be able to earn profits, loosely defined as excess of revenues over the proper measure of the flow of costs. However, once the firm has made that investment, the policy-maker may wish to lower prices below the level that would ensure full recovery of the prudently incurred costs over the appropriate regulatory horizon. To see how this could occur, suppose that, as specified in NBN Co’s Corporate Plan, NBN Co invests \$37.4 billion in the National Broadband Network, spends \$26.4 billion on operating expenses through 2021 and receives only \$23.1 billion in

16. Armstrong & Sappington (2007) at 1631-32.

17. See, for example, Paul Levine, John Stern and Francesc Trillas, “Utility price regulation and time inconsistency: comparisons with monetary policy” *Oxford Economic Papers* 2005, 57, at 449; and B. Levy and P. Spiller (eds) (1996) *Regulations, Institutions and Commitment*, Cambridge University Press, Cambridge, at 2.

18. At the same time, a legal monopolist subject to regulatory oversight is to a significant extent protected from the rigors of market competition which should reduce the risk from investment. Such reduction in risk can, all else being equal, encourage investment.

revenues. At that point NBN Co will have accumulated a large deficit.¹⁹ Soon after, customers of NBN Co complain to the regulator that while the (marginal) cost of providing access is very low, NBN Co is charging prices in excess of marginal costs and thereby earning high margins. The customers stress that broadband costs and prices are therefore higher than they ought to be and demand price reductions. In response, the regulator forces NBN Co to lower its prices, reducing or eliminating NBN Co's margins. Alternatively, NBN Co could simply be forced into writing off its unrecovered losses. As a result, NBN Co's anticipated return on its \$37.4 billion investment evaporates, and, potentially, a part or its entire capital investment as well. Clearly, had NBN Co known in advance that such course of action were possible or even likely, it would not have been willing to make an initial investment.²⁰ Indeed, companies such as NBN Co are well aware of the possibility of such *ex post* expropriation and make investment decisions accordingly. Thus, the mere fear of such action can deter or depress investment.

25. In fact, this concern is well known in the economics literature in general and the literature dealing with utility regulation.²¹ The usual solution is a credible commitment to not expropriate firms' investments. That commitment is often made in the form of rate of return regulation, which explicitly guarantees firms an appropriate return on investment.²² A government can never provide complete certainty, as there is always a possibility that the

19. NBN Co Corporate Plan 2012-2015, at 10, 71.

20. We understand that, at the present, NBN Co is entirely government owned. If NBN Co were to operate strictly as a government funded entity, then return on investment would not necessarily impact its investment decisions (*i.e.*, if the Government wished to run NBN Co at a loss it could do so). However, the Australian Government has stated that it intends NBN Co to operate as a commercial entity and to raise billions of dollars of debt on its own behalf. Statement of Expectations, at 2; and NBN Co Corporate Plan 2012-2015, at 71.

21. See, for example, Newbery (1999), at 29.

22. Armstrong & Sappington (2007) at 1632; Newbery (1999) at 72 and 73.

government itself may change or that certain elements of the compact between the regulated firm and the regulator will be changed or modified. However, the rule of law is well established in Australia and the ACCC cannot unilaterally vary the SAU once it is in force. In the Initial Regulatory Period, the Long Term Revenue Constraint Methodology with its Initial Cost Recovery Account is a credible form of rate of return regulation intended to guarantee an eventual return on NBN Co's investment. In the Subsequent Regulatory Period, the LTRCM continues to provide the opportunity for NBN Co to earn a return on investment, but also functions in part as a revenue cap based on a forecast of demand and costs. Because the cap is based on forecasts incorporating the allowed rate of return, it will provide appropriate incentives for investment (*i.e.*, NBN Co's revenue cap will include the allowed return on previous and planned investment, which offers assurance that the investment will not be expropriated).

26. As noted earlier, we have not been asked to opine on the individual components of the formulae in the SAU.²³ However, based on our knowledge and experience, we can conclude that the general approach of using a credible long-term commitment to a rate of return acceptable to the investors is commonly used and a reasonable and effective means of encouraging durable sunk investment.²⁴ Thus, the proposed SAU is likely to engender investments in the National Broadband Network sufficient to obtain the specified network scope.

B. Impact on Efficiency and Quality

27. We have been asked to discuss whether and how the SAU will affect incentives to control costs and maintain quality. We address these incentives together because they are often

23. Although we note that rate of return regulation remains an effective means of encouraging investment for a broad class of rate base rules. See, for example, Bruce Greenwald, "Rate base selection and the structure of regulation," *RAND Journal of Economics* (1994) 15(1), at 85 and 94.

24. Armstrong & Sappington (2007) at 1608.

closely related. In particular, strong incentives to control costs may also create incentives to reduce quality. Indeed, a recognized issue with price caps is that quality may suffer as a result.²⁵

28. Rate of return regulation, with its low-powered incentives, is very effective at providing incentives for durable sunk investment, but has limited ability to encourage cost reductions. At the same time, rate of return regulation does not typically raise concerns about underprovision of quality. To the contrary, one concern with rate of return regulation is the possibility of “gold plating.” When a firm is guaranteed a rate of return on its capital and operating expenses, it has an incentive to increase its spending in those areas, increasing quality more than the regulator might prefer.²⁶ On the other hand, high-powered incentive schemes, such as price-caps, can discourage provision of quality. As we have seen, the SAU contains elements of both rate of return regulation and price caps.

29. The SAU has mechanisms in place to address both potential “gold plating” and potential under-provision of quality. With respect to the former, to encourage efficient development and operation of the network, the SAU includes a process for determining whether investments and expenses are “prudent.” These requirements are explicit in the Initial Regulatory Period and implicit in the Subsequent Regulatory Period through the ACCC’s approval of forecast spending through the replacement Module Application process.²⁷ The requirements generally are to meet the network design standards and to obtain competitive bids wherever possible. Those expenses which do not meet the criteria will not be reimbursed under

25. Jean-Jacques Laffont and Jean Tirole, *Competition in Telecommunications*, 2001, MIT Press, at 5; Armstrong & Sappington (2007) at 1636 and 1637.

26. Newbery (1999) at 38 and 50.

27. The requirements to be found “prudent” are spelled out (primarily) in §§1.E.3 – 1.E.11 and 2.D.6 of the SAU. Note that the capex and opex forecasts in the Subsequent Regulatory Period are required to be “prudent and efficient.”

the rate of return methodology, *e.g.*, the RAB is rolled forward based on actual allowed capex even during the Subsequent Regulatory Period.²⁸ Such measures are a common and reasonable means of addressing potential overinvestment and can lead to more efficient investment than could have been achieved by the rate of return regulation alone. Specified *ex ante* criteria for prudence also help protect against the use of *ex post* reviews as another means of expropriation.²⁹

30. As noted earlier, in the Subsequent Regulatory Period, the LTRCM functions as a revenue cap based on forecast demand and costs (although that cap will not be binding until after NBN Co recovers its initial investment), but NBN Co will bear at least some of the risk and rewards of demand and cost variations.³⁰ Thus, if NBN Co can reduce costs more than forecast, it will reap the rewards, as with a price cap. This approach will provide similar incentives to price caps for reducing costs but will raise similar concerns with respect to quality. The proposed SAU can be expected to provide appropriate incentives to achieve an efficient level of costs associated with the construction and operation of the network and common and reasonable safeguards against overinvestment.

28. More specifically, during the Initial Period, the RAB is rolled forward based on actual capex to the extent it satisfies the prudence commitments. In the Subsequent Regulatory Period, the RAB is rolled forward based on actual capex. The forecast capex, as part of a replacement module, is subject to approval by the ACCC and so is subject to an implicit prudence requirement. Indeed, the SAU requires that the forecast expenses be prudent and efficient. Furthermore, NBN Co will have an incentive to constrain actual capex spending to at or below the forecast.

29. For further discussion of such prudence requirements, see William Encinosa, III and David Sappington, "Toward a Benchmark for Optimal Prudence Policy," *Journal of Regulatory Economics* (1995) 7, 111-130; Richard Gilbert and David Newbery, "The dynamic efficiency of regulatory constitutions," *RAND Journal of Economics* (1994) 25(4), at 538 and 539; and Armstrong & Sappington (2007) at 1632.

30. A common issue in regulation is structuring incentives to address asymmetric information. That is, if the firm is better able to forecast than the regulator, how should regulation be structured to prevent the firm from, for example, forecasting higher costs than it actually expects? Repeated reviews at relatively short intervals, such as will occur with the SAU, can help address such concerns.

31. With respect to quality, we first discuss the incentives provided by the different elements of the SAU. First, the SAU includes a set of price caps – the Reference Offers and Non-Reference Offers. The salient features of those price caps are described in the Background section. Price caps are effective at providing incentives for firms to minimize costs. However, unlike rate of return regulation, they also raise concerns about quality, as cost reductions may reduce quality below the level consistent with the objectives of the regulator. The question then is how do the rate of return and price cap regulations interact. They may do so in two ways.³¹ First, the price caps may not be binding in the sense that, although the price caps limit NBN Co's pricing flexibility, NBN Co is still able to achieve the profits allowed under the rate of return regulation. In this situation, the price caps can have other desirable features, which we discuss further in the next section, such as encouraging investment by downstream customers of the firm by reducing pricing uncertainty, in much the same fashion rate of return regulation encourages investment by the firm itself.

32. If the price caps are not binding, then they are unlikely to raise concerns about reduced quality.³² If anything, as we noted above, rate of return regulation is associated with concerns about overprovision of quality, not underprovision. However, as discussed in section III, it is anticipated that in the Initial Regulatory Period NBN Co's allowable costs will exceed its revenues by many billions of dollars. NBN Co is allowed to carry forward the balance, but market risks remain, such as new entry or emergence of new technologies, and there is still some

31. It is theoretically possible that the price caps could be set so high as to have no conceivable constraint upon pricing, in which case their presence or absence in the SAU would be irrelevant. As a practical matter, such a case is not of interest here.

32. See, for example, David Sappington, "Regulating Service Quality: A Survey," *Journal of Regulatory Economics* (2005) 27(2), at 130-132 and 147, for a discussion of circumstances where price caps may not lead to incentives to reduce quality.

uncertainty in the long run about regulatory expropriation, so NBN Co has an incentive to reduce its costs in the short run in order to speed up the recovery process. That is, during the Initial Regulatory Period price caps and market realities limit NBN Co's annual revenues, not the rate of return structure, and NBN Co can increase its return in any year during the recovery period by reducing its costs.³³ Furthermore, as discussed earlier, in the Subsequent Regulatory Period, the LTRCM functions as a revenue cap and should provide incentives similar to price caps for reducing costs but will also raise similar concerns with respect to quality. Therefore, the SAU includes an additional precaution to maintain quality – a requirement that NBN Co offer and maintain SLAs, including both service levels and service level rebates, which are a form of minimum quality standard. Such explicit quality requirements are a commonly observed and reasonable means of addressing concerns about quality.³⁴ The proposed SAU is thus conducive to the maintenance of an appropriate level of quality in the supply of wholesale service to access seekers over the NBN.³⁵

33. However, if the price cap regulations become binding in the sense that they replace the LTRCM rate of return regulation, *i.e.*, NBN Co would be allowed to earn higher revenues under the rate of return regulation than it is able to obtain given the price caps, then NBN Co would be unable to earn the rate of return called for under the LTRCM, thereby

33. The LTRCM provides for a rate of return on the carried forward balance of the ICRA. NBN Co's incentive to receive the required returns sooner rather than later, stems from residual uncertainty about future expropriation as well as other market risks. For examples of how such uncertainty can impact investment, see Levy and Spiller (eds.) (1996).

34. See, for example, Armstrong & Sappington (2007) at 1636 and 1637; and Sappington (2005) at 132-137.

35. We assume that the quality standards set out are acceptable to the regulators. As noted earlier, we have not been asked to opine on the specific details but rather on the overall approach.

undermining incentives for investment.³⁶ If this were to occur, NBN Co and the regulator would likely be compelled to revisit the provisions of the SAU, as the different measures would be in conflict with one another. NBN Co's ability to seek ACCC approval to vary the SAU to reflect market developments over time provides a necessary safeguard against such a situation, which in turn helps to ensure that incentives for investment in the network are sufficient to achieve the desired network scope.

C. Pricing

34. We have been asked to discuss the efficiency and incentives related to NBN Co's pricing starting from the premise that uniform national wholesale pricing and price caps are required. That is, we take the cross subsidies inherent in such a system as a given and do not discuss their economic characteristics or overall desirability.³⁷ With respect to achieving those social goals, uniform national wholesale pricing is unlikely to result absent direct regulation, so the inclusion in the SAU of Reference Offers with the appropriate characteristics is necessary and appropriate to achieve that goal.

35. More generally, there is some tension between the desire to induce investment in areas where the market has not resulted in such investment and the desire to maintain low prices and limit the returns earned by NBN Co. To date, the market has not provided superfast internet and data access to many Australians and is unlikely to given current technology. Such access is

36. A general concern with respect to price caps that decline in real terms, as those here do, is that firms may encounter financial difficulties as the allowable rates continually fall. Armstrong & Sappington (2007) at 1619.

37. We do note, however, that although we understand that there are certain structural and legal barriers to entry, the fact that NBN Co is not a legal monopolist can create competitive and cost-recovery concerns if entry were to occur in low-cost areas, leading to cream-skimming and undermining the required cross-subsidy scheme. See, for example, Laffont & Tirole (2001), at 218. If that were to occur, NBN Co is permitted to file for a variation of the SAU to address the situation.

simply too expensive relative to the returns offered on the provision of such service in those areas. While requiring that prices be set at, say, incremental cost would encourage take-up relative to the rate of return framework, it would be in conflict with the goal of encouraging the investment required to build the National Broadband Network. Thus, the need to ensure that the National Broadband Network is deployed in the first place limits the ability to reduce prices *ex post*. The rate of return regulation specifies the allowed margin which, as a result of negotiation between NBN Co and the Government, is presumably sufficient to ensure investment of the \$37.4 billion needed to build the National Broadband Network. With respect to the choice of price caps, it is expected that the prices on average will include the allowed margin, and the Australian Government has previously supported NBN Co's product, pricing and service offerings and the process by which they have been developed in consultation with the industry.³⁸

36. NBN Co's pricing flexibility is limited by the price caps, but NBN Co has incentives to price in such a way as to encourage take-up of its services. While NBN Co will price so as to maximize its expected profits given the constraints it faces, it is important to note that NBN Co will seek to maximize the *present value* of its expected profits, not just its profits on a year by year basis. That is, NBN Co, like most firms, has to focus on the net present value of its future revenues and costs. In a dynamic industry, particularly one displaying network effects, the distinction between short-term and long-term goals is important.³⁹ Encouraging take-up initially can yield great dividends down the road. Similarly, pricing too high initially could

38. Statement of Expectations, at 10.

39. Technically, the presence of intertemporal network effects implies a higher elasticity of demand and thus creates incentives for lower prices relative to those that would be profit maximizing in the absence of such effects.

stunt industry development and cost NBN Co significant profits in later years.⁴⁰ Those effects are strengthened when there are network effects present, as each additional sale increases the likelihood of further sales by increasing the value of the services. For example, lower access prices may help downstream firms in creating demand for video telephony services. The benefit to any one consumer from subscribing to such a service depends on the number of other customers who subscribe to the service – as in any network industry. As a result, the more valuable those services become to consumers, the higher will be volume of sales by the downstream telecommunications vendors. In turn, NBN Co's sales of the underlying access service would increase. Similarly, if access prices were too high, video telephony services might never become more than a niche service. NBN Co has incentives to price in such a way as to ensure the growth of downstream services, provided of course, that it receives some upside from such pro-growth policies. The SAU provides such opportunity by, for example, allowing NBN Co's revenues to exceed the LTRCM revenue caps during the initial cost recovery period, as discussed above.

37. The ACCC has cited this economic logic in its Determination authorizing the agreement between NBN Co and Optus, stating that:

Amongst other things, the constraint of long-term price controls (including for basic services) in the context of a significant up-front capital commitment mean that NBN Co will only be able to fully recover the costs of its investment if, over time, users demand and migrate to higher speed services with greater usage. If such demand does not eventuate, then NBN Co will incur a loss. This creates some incentives for NBN Co to keep costs to efficient levels and to encourage take-up of higher speed services and greater usage.⁴¹

40. NBN Co's Corporate Plan anticipates that recovery of its investment will take decades, providing NBN Co with a long time horizon over which it will be seeking good returns while not being bound by the revenue caps. NBN Co Corporate Plan 2012-2015, at 79 to 81.

41. ACCC Determination, at 3.158.

38. The Reference Offers and Non-Reference Offers also can serve an important function by providing assurance about potential costs to customers of NBN Co. Downstream customers have similar concerns to NBN Co itself about possible expropriation of their investments. If downstream customers make sunk investments to use NBN Co's services, NBN Co could potentially raise rates at some future date and reduce the downstream customers' returns. Fear of such potential rate increases can discourage investment and take-up of NBN Co's services. The concern is less for downstream customers than for NBN Co for at least three reasons. First, the scale of investment by downstream customers is likely to be substantially smaller than that required to deploy the National Broadband Network. Second, the sunk investments made by downstream customers may be smaller relative to their overall expenses than for NBN Co. Third, NBN Co relies upon its customers for revenue. Given a rapidly evolving market, exploiting one group of customers in the short run may discourage development of new services and thus future customers.

39. Price uncertainty is a concern for making investment decisions. Consequently, the Reference Offers and Non-Reference Offers provide explicit assurances to potential customers that future prices for an extensive list of services will not exceed specified prices. The actual prices charged by NBN Co may be lower, but they will not be any higher than provided for in the SAU. This certainty will stimulate downstream incentives for investment and take-up of NBN Co's services. We understand that the prices in the Reference Offers and the Non-Reference Offers have been set in consultation with potential customers. If potential customers find the SAU acceptable with the Offers in place, then their actions suggest that their take-up and investment will not be suppressed because of particular concerns about *ex post* rate increases. The Reference and Non-Reference Offers will thus have served important functions in

encouraging take-up and downstream investment and implementing the Government's stated social policies.

40. Because NBN Co is not a vertically integrated access provider and thus does not compete with its downstream customers, it will not have incentives to discriminate in an anticompetitive manner against its downstream customers. In addition, NBN Co is subject to explicit non-discrimination obligations. Overall, subject to the requirements of the Reference Offers and uniform national wholesale pricing, NBN Co will have incentives to price in a manner which encourages the development of downstream markets.

D. Introduction and Removal of Products

41. The incentives for the introduction or removal of products are closely related to the limitations on NBN Co's ability to price its products. As just discussed, NBN Co generally has incentives to provide its customers with products its customers wish to purchase. As a vertically separated wholesale supplier, NBN Co has no incentive to withhold desired products to advantage its own (nonexistent) retail operations. However, when price caps are applied to individual products, a firm may have an incentive to withdraw those products and replace them with substitutes that are not subject to the price caps. Here, new products (Non-Reference Offers) will be subject to price caps, but the initial level need not be related to that of earlier products. That is, an existing offer will have been declining over time in real terms at the specified rate (or faster).⁴² A new offer will also decline in real terms over time at the specified rate (or faster), but can begin at a higher rate than the existing offer. This possibility is not a flaw but is included as an intended feature, as noted by the ACCC. The expectation is that NBN Co

42. As discussed earlier, the maximum regulated prices are subject to the individual price increase limit of CPI-1.5% with no nominal price decrease required if CPI is less than 1.5%, so that prices will decline each year in real terms (assuming positive CPI).

will develop new products for which it will be able to charge higher prices. Indeed, the ability to charge higher prices is intended to provide incentives for NBN Co to develop and introduce such new products.

42. The potential concern, as noted earlier, is that NBN Co might try to shift demand to those new products by eliminating existing substitutes, even if customers might prefer to obtain the existing service. The SAU addresses this concern in two ways. First, NBN Co is required to maintain its Reference Offers, and there are explicit anti-avoidance provisions in the SAU. Second, NBN Co is required to update its Reference Offers, ensuring that the basic access services the NBN is intended to provide will remain available and relevant. We have been told that NBN Co's 2012-15 Corporate Plan forecasts that the fiber-based Reference Offers are expected to account for over 65 percent of total fiber network revenues by 2024-25.

43. The nature of the industry makes it difficult to predict what new services may become desirable in the future. The ability of NBN Co to introduce such services at higher rates than existing services provides incentives for NBN Co to develop and offer such services in a timely fashion, while the provisions requiring maintenance and updating of the Reference Offers provide protection against NBN Co forcing customers to upgrade to those services from the basic access services currently intended to be provided by the NBN. The requirement that prices for new Non-Reference Offers decline in real terms at the specified rate (or faster) also provides assurance for customers making investments in products and services relying upon those new Non-Reference Offers.

E. Non-Price Terms

44. Vertically integrated firms which supply both access and retail services may have an incentive to disadvantage access customers (*e.g.*, raise rivals' costs). When prices are regulated, firms may attempt to disadvantage rivals through non-price terms. Here, however,

NBN Co is not permitted to offer retail services. Such vertical separation is one means of aligning the incentives of the access provider and its customers and inducing higher levels of service quality.⁴³ That is, all of NBN Co's revenues will derive from wholesale services. Since NBN Co's rate of return will be regulated, NBN Co can increase total profits by increasing its volume of sales. Accommodating customers with respect to non-price terms can increase sales by increasing quality (and reducing quality-adjusted prices). Furthermore, to the extent that accommodating non-price terms will increase NBN Co's operating expenses, NBN Co will be able to recover those costs under the LTRCM and so is likely to accommodate such requests from customers as long as these expenditures are considered to be prudent.⁴⁴ Thus, under the proposed SAU, NBN Co has incentives for effective engagement with its customers on the issue of the non-price terms of its services.

45. Non-price terms are also subject to regulatory review by the ACCC during the Initial Regulatory Period. Nor can customers be locked in to long-term contracts subject to onerous non-price terms. The SAU commits NBN Co to offering customer contracts with a specified expiration date no later than two years after the date on which the SFAA commences and provides for a multilateral forum for resolving contractual concerns for the Initial Regulatory Period. Each new contract will benefit from any ACCC regulatory determinations during the intervening period.⁴⁵

43. Sappington (2005) at 145.

44. There could be concerns about interconnection with horizontal customers (*i.e.*, competing access providers), but we understand that such entry is not expected any time soon, so this is not a pressing concern and, if the SAU's provisions on interconnection proved to be inadequate, could be handled via competition policy tools.

45. ACCC determinations will only flow through to the SFAAs to the extent they are not inconsistent with the terms and conditions of the SAU, which includes a number of key non-price terms and conditions, which will themselves be subject to review in 2017-18.

46. We have also been asked to consider the merits of service providers being unable to update contract terms as a result of seeking regulatory recourse from the ACCC regarding contract terms while they have an executed SFAA with NBN Co. As noted above, during the Initial Regulatory Period the SFAAs have a maximum term of two years. All customers signing up within that period will have the same end date, no more than two years away from the date of signing. Service providers which are dissatisfied with the proposed terms may seek recourse from the ACCC before or after executing the SFAA, although any changes will not be implemented until the SFAA term ends. The regulatory scheme must balance the need for contractual certainty for business planning purposes with the need to modify the SFAA over time as circumstances change. The SAU provides that if the ACCC makes a determination that the terms of the SFAA should be modified, the existing SFAA will run out its term (of no more than two years), and then all customers will obtain the new terms. Thus, business plans based on the initial terms would not be disrupted. Such a transition period is a reasonable means of providing some contractual certainty to the parties while still allowing relatively quick regulatory changes to the SFAA.

F. Timing and Structure of the SAU

47. The structure of the SAU must balance the need to provide certainty for investing significant capital in long-lived infrastructure with the fact that telecommunications is a dynamic and rapidly changing industry, making it difficult to specify contractual and other terms far in advance. The SAU provides for the former by setting in place a framework assuring that NBN Co may recover its investment, along with a reasonable rate of return, over a lengthy period – up to thirty years. NBN Co’s Corporate Plan tentatively forecasts recovery of the principal of the

initial investment over roughly two decades, but we understand this period does not include any return on investment.⁴⁶ Furthermore, such long-term forecasts are subject to significant uncertainty, certainly in an industry like telecommunications. Thus, it is appropriate for the SAU to specify a longer period during which explicit regulations are in place assuring recovery of NBN Co's initial investment. By the same token, once the investment has been earned back, the ICRA will have served its purpose and it is appropriate to switch the regulatory regime to a "building block" approach in which the revenue cap specified by the ABBRR becomes binding.

48. The same uncertainty referred to above raises concerns about specifying detailed terms far in advance. There is a risk that in the future such terms will be no longer relevant. The SAU addresses this risk by providing significant detail for the initial period of roughly ten years and then setting out key principles to be implemented in a series of three to five year regulatory cycles for the remaining roughly twenty years. These principles include "refresh" mechanisms for the various Reference Offers to be periodically updated to be kept relevant. The SAU also contemplates specific details on various elements to be determined in future Modules submitted to the ACCC for review, subject to ongoing principles and continuation of matters such as year-over-year reductions in the maximum prices allowed for the Reference Offers. Non-price terms can also be determined by the ACCC on an ongoing basis as discussed in the previous section (*i.e.*, to the extent those determinations are not inconsistent with the terms and conditions of the SAU). The ability to adjust the length of the regulatory cycles provides further flexibility. A shorter cycle may be appropriate during periods of particularly rapid change when forecasting is difficult, while a longer cycle may be appropriate in periods of relative stability. Together, these mechanisms are reasonable and appropriate methods for providing flexibility needed for

46. NBN Co Corporate Plan 2012-2015, at 79-81.

addressing industry changes and concerns that may arise while still providing adequate assurance to investors as to their likely potential returns.

G. Other Issues

49. We have been asked to opine on the value of incorporating an expectation that the net cash flows and beginning and ending values of relevant inputs such as the ICRA and RAB for a particular ABBRR structure specified in later regulatory cycles should have a net present value of zero, using the specified rate of return as the discount rate (*i.e.*, the nominal vanilla WACC). We begin by noting that the structure contemplated in the Initial Regulatory Period should produce such a result by construction. That is, any revenues in excess of the ABBRR go to lower the ICRA (and *vice versa*). The ICRA grows at the discount rate, so the net present value of the net cash flow, taking into account the ICRA, should be zero. In the Subsequent Regulatory Period, the SAU sets forth principles for how the ABBRR for each regulatory cycle should be specified, but does not require a particular formula. Those principles include that the elements in the ABBRR formula for the Initial Regulatory Period (*i.e.*, operating expenditure, capital expenditure, tax, revenue, RAB and ICRA) be present in the later regulatory cycles. However, the possibility is left open to specify new elements which could produce a net present value other than zero (if not for the requirement to the contrary).

50. Alterations to the formula could raise two issues. First, new elements which resulted in a positive net present value would represent a windfall for NBN Co – a rate of return in excess of that provided for in the SAU. The principle noted above is designed to help prevent NBN Co from making such a proposal. Second, new elements which resulted in a negative net present value would represent a reduction in the rate of return provided for in the SAU. NBN Co would presumably not make a proposal to under-recover its investment, but if the ACCC rejects an NBN Co proposal for a regulatory cycle, the ACCC has some scope to propose

its own regulatory framework subject to the principles set forth in the SAU. This principle can help provide assurance against expropriation of the returns on NBN Co's investment in such circumstances. That is, if a specific formula is not specified for later regulatory cycles, a principle such as this, based around a discount rate equal to the specified rate of return, can help assure that NBN Co receives the specified rate of return over the regulatory cycle.

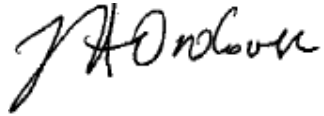
IV. CONCLUSION

51. The SAU provides for commonly observed, reasonable and effective methods of achieving the goals set forth by the Australian Government. In particular, the LTRCM's assurance of a specified rate of return is very effective at providing incentives for durable sunk investment, such as the \$37.4 billion required to build the National Broadband Network. The Reference and Non-Reference Offers combined with SLAs provide assurance to potential customers that will encourage take-up and investment, and the modular nature of the SAU allows adaptation to changing circumstances expected in a dynamic industry such as telecommunications.

V. DECLARATION

52. We declare that we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld.

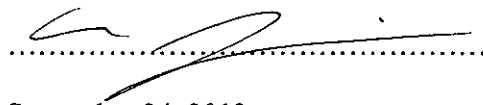
Janusz Ordover

A handwritten signature in black ink, appearing to read 'J. Ordover', written in a cursive style.

.....

September 24, 2012

Allan Shampine

A handwritten signature in black ink, appearing to read 'Allan Shampine', is written over a horizontal dotted line.

September 24, 2012

EXHIBIT 1

July 2012

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EDUCATION

- 1968-1973 Columbia University, New York, New York
Graduate Department of Economics and European Institute of the School of International Affairs
Doctoral Dissertation: Three Essays on Economic Theory (May 1973). Ph.D 1973.
- 1967-1968 McGill University, Montreal, Canada
Departments of Economics and Political Science
- 1963-1966 Warsaw University, Warsaw, Poland
Department of Political Economy. B.A. (equiv.), 1966.

HONORS

- 2011 "The Economist of the Year 2010" voted by the Global Competition Review
- 1973 Columbia University: Highest distinction for the doctoral dissertation
- 1971-1972 Columbia University: Honorary President's Fellow
- 1969-1971 Columbia University: President's Fellow
- 1967-1968 McGill University: Honors Student
- 1964, 1965 Warsaw University: Award for Academic Achievement, Department of Political Economy
- Who's Who in the World
Who's Who in America
Who's Who in the East

PROFESSIONAL EXPERIENCE

- June 1982 - Professor of Economics
present Department of Economics, New York University, New York, New York

Sept. 1996 - Aug. 2001	Director of Masters in Economics Program Department of Economics, New York University, New York, New York
Summer 1996- 2000	Lecturer International Program on Privatization and Reform Institute for International Development, Harvard University, Cambridge, Massachusetts
Aug. 1991 - Oct. 1992	Deputy Assistant Attorney General for Economics Antitrust Division United States Department of Justice, Washington, D.C.
Sept. 1989 - July 1990	Visiting Professor of Economics School of Management, Yale University, New Haven, Connecticut
	Lecturer in Law Yale Law School
Mar. 1984 - June 1988	Visiting Professor of Economics Universita Commerciale "Luigi Bocconi", Milan, Italy
June 1982 - Feb. 1985	Director of Graduate Studies Department of Economics, New York University
Sept. 1982 - June 1986	Adjunct Professor of Law (part-time) Columbia University Law School, New York, New York
Feb. 1982 - June 1982	Acting Director of Graduate Studies Department of Economics, New York University
June 1978 - June 1982	Associate Professor of Economics Department of Economics, New York University
Sept. 1979 - May 1990	Lecturer in Economics and Antitrust New York University Law School
Sept. 1977 - June 1978	Member, Technical Staff Bell Laboratories, Holmdel, New Jersey
	Associate Professor of Economics Columbia University
	Visiting Research Scholar Center for Law and Economics, University of Miami, Miami, Florida
Sept. 1973 - Aug. 1977	Assistant Professor of Economics New York University
Summer 1976	Fellow, Legal Institute for Economists, Center for Law and Economics, University of Miami
Summer 1976	Visiting Researcher Bell Laboratories, Holmdel, New Jersey

OTHER PROFESSIONAL ACTIVITIES

2011	Organizer, Session on the 2010 Agencies Horizontal Merger Guidelines, 2011 Spring Meetings, Antitrust Section, American Bar Association, Washington DC
2010 – present	Member, ABA Section of Antitrust Law, Economics Task Force
2006 - present	Special Consultant, Compass Lexecon (formerly Compass)/FTI Company, Washington, D.C.
2003 - 2006	Director, Competition Policy Associates, Inc. (“Compass”), Washington, D.C.
1997 – 1999	Consultant, Inter-American Development Bank, Washington, D.C.
1997 – 2009	Board of Editors, <i>Antitrust Report</i>
1995 – 2001	Consultant, The World Bank, Washington, D.C.
1998 – 2004	Senior Consultant Applied Economic Solutions, Inc., San Francisco, California
1995 - 2000	Senior Affiliate Cornerstone Research, Inc., Palo Alto, California
various	Testimony at Hearings of the Federal Trade Commission
1994 - 1996	Senior Affiliate Law and Economics Consulting Group, Emoryville, California
1994 - 2000	Senior Affiliate Consultants in Industry Economics, LLC, Princeton, New Jersey
1993 - 1994	Director Consultants in Industry Economics, Inc., Princeton, New Jersey
1992 - 1993	Vice-Chair (<i>pro tempore</i>) Economics Committee, American Bar Association, Chicago, Illinois
1990 - 1991	Senior Consultant
1992 - 1995	Organization for Economic Cooperation and Development, Paris, France
1991	Member <i>Ad hoc</i> Working Group on Bulgaria's Draft Antitrust Law The Central and East European Law Initiative American Bar Association
1990 - 1991	Advisor Polish Ministry of Finance and Anti-Monopoly Office Warsaw, Poland
1990 - 1991	Member

	Special Committee on Antitrust Section of Antitrust Law, American Bar Association
1990 - 1991	Director and Senior Advisor Putnam, Hayes & Bartlett, Inc., Washington, D.C.
1990 - 1996	Member Predatory Pricing Monograph Task Force Section of Antitrust Law, American Bar Association
1989	Hearings on Competitive Issues in the Cable TV Industry Subcommittee on Monopolies and Business Rights of the Senate Judiciary Committee Washington, D.C.
1989	Member EEC Merger Control Task Force, American Bar Association
1988 - present	Associate Member American Bar Association
1987 - 1989	Adjunct Member Antitrust and Trade Regulation Committee, The Association of the Bar of the City of New York
1984	Speaker, "Industrial and Intellectual Property: The Antitrust Interface" National Institutes, American Bar Association, Philadelphia, Pennsylvania
1983 - 1990	Director Consultants in Industry Economics, Inc
1982	Member Organizing Committee Tenth Annual Telecommunications Policy Research Conference, Annapolis, Maryland
1981	Member Section 7 Clayton Act Committee, Project on Revising Merger Guidelines American Bar Association
1980	Organizer Invited Session on Law and Economics American Economic Association Meetings, Denver, Colorado
1978 - 1979	Member Department of Commerce Technical Advisory Board Scientific and Technical Information Economics and Pricing Subgroup
1978 – present	Referee for numerous scholarly journals, publishers, and the National Science Foundation

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Economic Association
American Bar Association

PUBLICATIONS

A. Journal Articles

"Coordinated Effects in Merger Analysis: An Introduction," *Columbia Bus. Law Review*, No. 2, 2007, 411-36.

"Wholesale access in multi-firm markets: When is it profitable to supply a competitor?" with Greg Shaffer, *International Journal of Industrial Organization*, vol. 25 (5), October 2007, 1026-45.

"Merchant Benefits and Public Policy towards Interchange: An Economic Assessment," with M. Guerin-Calvert, *Review of Network Economics: Special Issue*, vol. 4 (4), December 2005, 381-414.

"All-Units Discounts in Retail Contracts," with S. Kolay and G. Shaffer, *J. of Economics and Management Strategy*, vol. 13 (3), September 2004, 429-59.

"Archimedean Leveraging and the GE/Honeywell Transaction," with R. J. Reynolds, *Antitrust Law Journal*, vol. 70, no. 1, 2002, 171-98.

"Entrepreneurship, Access Policy and Economic Development: Lessons from Industrial Organizations," with M. A. Dutz and R. D. Willig, *European Economic Review*, vol. 4, no. 4-6, May 2000.

"Parity Pricing and its Critics: Necessary Condition for Efficiency in Provision of Bottleneck Services to Competitors," with W. J. Baumol and R. D. Willig, *Yale Journal on Regulation*, vol. 14, Winter 1997, 146-63.

"Competition and Trade Law and the Case for a Modest Linkage," with E. Fox, *World Competition, Law and Economics Review*, vol. 19, December 1995, 5-34.

"On the Perils of Vertical Control by a Partial Owner of Downstream Enterprise," with W.J. Baumol, *Revue D'économie industrielle*, No. 69, 3^e trimestre 1994, 7-20.

"Competition Policy for Natural Monopolies in Developing Market Economy," with R.W. Pittman and P. Clyde, *Economics of Transition*, vol. 2, no. 3, September 1994, 317-343. Reprinted in B. Clay (ed), *De-monopolization and Competition Policy in Post-Communist Economies*, Westview Press 1996, 159-193.

"The 1992 Agency Horizontal Merger Guidelines and the Department of Justice's Approach to Bank Merger Analysis," with M. Guerin-Calvert, *Antitrust Bulletin*, vol. 37, no. 3, 667-688. Reprinted in *Proceedings of the 1992 Conference on Bank Structure and Competition: Credit Markets in Transition*, Federal Reserve Bank of Chicago, 1992, 541-560.

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Regulation and Policy Analysis Program, National Science Foundation, Collaborative Research on Antitrust Policy, Principal Investigator, July 15, 1985 - December 31, 1986.

Regulation of Economic Activity Program, National Science Foundation, Microeconomic Analysis of Antitrust Policy, Principal Investigator, April 1, 1983 - March 31, 1984.

Economics Division of the National Science Foundation, "Political Economy of Taxation," Principal Investigator, Summer 1982.

Sloan Workshop in Applied Microeconomics (coordinator), with W.J. Baumol (Principal Coordinator), September 1977 - August 1982.

Economics Division of the National Science Foundation, "Collaborative Research on the Theory of Optimal Taxation and Tax Reform," July 1979 to September 1980, with E.S. Phelps.

Division of Science Information of the National Science Foundation for Research on "Scale Economies and Public Goods Properties of Information," W.J. Baumol, Y.M. Braundstein, M.I. Nadiri, Fall 1974 to Fall 1977.

National Science Foundation Institutional Grant to New York University for Research on Taxation and Distribution of Income, Summer 1974.

EXHIBIT 2

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EDUCATION

- Ph.D. UNIVERSITY OF CHICAGO: Economics, 1996
(Full scholarship from the University)
(Thesis: *An Evaluation of Technology Diffusion Models and Their Implications*)
(Field specializations: urban economics, agricultural economics)
- M.A. UNIVERSITY OF CHICAGO: Economics, 1993
(Full scholarship from the University)
- B.S. SOUTHERN METHODIST UNIVERSITY: Economics and Systems Analysis,
Mathematics Minor, 1991
(Summa Cum Laude, Honors, Departmental Distinction)

PROFESSIONAL EXPERIENCE

Compass Lexecon (formerly Lexecon), Chicago, Illinois: Senior Vice President (2012 – Present)
Vice President (2003 – 2012), Economist (1996 – 2003)

Editor for *The Antitrust Source*, American Bar Association (2011 – Present)

PUBLICATIONS

BOOKS

Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications

Technologies, (Editor) Nova Science Press (2003).

(Contributors include Debra Aron, Johannes Bauer, Peter Bernstein, David Burnstein, Robert Crandall, Nicholas Economides, Wayne Fu, Shane Greenstein, Charles Jackson, Junghyun Kim, Donald Kridel, Mercedes Lizardo, Paul Rappoport, Pablo Spiller, Lester Taylor and Steven Wildman)

ARTICLES

“Testing Interchange Fee Models Using the Australian Experience,” proceedings of the Bank of Canada Economics of Payments VI conference, May 24, 2012

Paper Trail: Working Papers and Recent Scholarship - review of “Why (Ever) Define Markets? An Answer to Professor Kaplow,” (by Gregory Werden), *Antitrust Source*, April 2012.

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“Credit Cards in Context: Framing the Discussion” and “Assessing the Social Effects of the Use of Credit Cards” in The Law and Economics of Interchange Fees and Credit Card Markets, International Center for Law & Economics, December 8-9, 2009.

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“The Impact of Technology on the Modern Labor Market,” 11 *Southwestern Journal of Economic Abstracts* 1 (1990).

RESEARCH PAPERS

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“Testing Interchange Fee Models Using the Australian Experience” (2012 – SSRN)

“An Evaluation of Online Investment Bank Research,” with Rajiv Gokhale (2011).

“A New Direction in Mixed Income Housing,” submitted to Chicago Housing Authority (1993).

“A Survey of the Economics of Information, Focusing on Water” (1992).

“Petroleum Price Shocks and Rationality,” B.S. Honors Paper (1991).

OTHER PROFESSIONAL EXPERIENCE

Interviewed by *IEEE Spectrum* for “The High Cost of Taking Your Money” (June 2012).

“Testing Interchange Fee Models Using the Australian Experience,” presented as part of a special session “Interchange Fees: Regulation and Implications” at Economics of Payments VI conference, Bank of Canada, May 24, 2012.

Interviewed by *The Oregonian* for “Those credit card rewards cost us a lot of cash” (July 31, 2010).

Participant in “The Law and Economics of Interchange Fees and Credit Card Markets” symposium sponsored by International Center for Law & Economics (December 8-9, 2009).

“The Evaluation of Social Welfare for Payment Methods,” 2009 Oxford Business & Economics Conference (June 24-26, 2009).

Interviewed by *Cards Insider* for “Payments: Cash Replacement, Anonymity provides lifeline for cash over cards” (January 28, 2008).

“Boom and Bust in Network Industries: Rising from the Ashes,” 6th Global Conference on Business & Economics, Harvard University (October 15-17, 2006), with Hal S. Sider.

“House of Cards: The Economics of Interchange Fees,” Presentation to the Federal Reserve Bank of New York Conference, *Antitrust Activity in Card-Based Payment Systems: Causes and Consequences* (September 16, 2005), with Alan S. Frankel.

“The Impact of Technology on the Modern Labor Market,” 68th Annual Meeting of the Southwestern Social Science Association (March 29, 1990)

Presented papers on information externalities and technology diffusion at the *Economics and Public Policy Workshop* (3) and *Price Theory Workshop* (1), University of Chicago (1995, 1996)

Coordinated the *Conference on Valuing Non-Market Goods*, University of Chicago (July 21-22, 1995)

Assisted in coordinating the *Conference on Research in Health Economics*, University of Chicago (October 21-22, 1994)

Assisted in organizing the *Economic Policy and Public Finance Workshop*, University of Chicago (1993 - 1996)

Member of the *American Economics Association*

Associate member of the *American Bar Association*

Referee for the *Agricultural and Resource Economics Review*, *American Journal of Agricultural Economics*, *Antitrust Law Journal*, *Journal of Business* and *Journal of Evolutionary Economics*.

Finance Committee (2010 – Present), Vestry (2007-2009), Treasurer (2006), St. Mary's Episcopal Church, Park Ridge

TESTIMONY

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ACADEMIC HONORS

Undergraduate:

Graduated Summa Cum Laude, Honors, Departmental Distinction

Award for Excellence (given to the outstanding senior in the Economics Department as decided by the vote of the faculty)

Presidential Scholarship (full scholarship)

National Merit Scholar (honorary)

Hyer Society (honorary society of Southern Methodist University)

Honor Roll (1987-1991)

Phi Beta Kappa

Alpha Lambda Delta (Treasurer, honorary society recognizing academic achievement)

Phi Eta Sigma (honorary society recognizing academic achievement)

Omicron Delta Epsilon (international honor society in economics)

Kappa Mu Epsilon (honor society in mathematics)

Graduate:

Full Scholarship (tuition and stipend)

EXHIBIT 3

Materials Relied Upon

NBN Co's finalized SAU

The NBN Co Corporate Plan 2012 – 2015, dated August 6, 2012

ACCC Determination – Applications for authorisation lodged by NBN Co Limited in respect of provisions of the HFC Subscriber Agreement entered into with SingTel Optus Pty Ltd and other Optus Entities, dated July 19, 2012

A Statement of Expectations from shareholder Ministers in the Australian Government to NBN Co, dated December 17, 2010

Mark Armstrong and David Sappington, "Recent Developments in the Theory of Regulation," in *Handbook of Industrial Organization*, M. Armstrong and R. Porter (eds), 2007

Paul Levine, John Stern and Francesc Trillas, "Utility price regulation and time inconsistency: comparisons with monetary policy" *Oxford Economic Papers* 2005, 57

David Sappington, "Regulating Service Quality: A Survey," *Journal of Regulatory Economics* (2005) 27(2)

Jean-Jacques Laffont and Jean Tirole, *Competition in Telecommunications*, 2001, MIT Press

David Newbery, *Privatization, Restructuring, and Regulation of Network Utilities*, 1999, MIT Press

B. Levy and P. Spiller (eds) (1996) *Regulations, Institutions and Commitment*, Cambridge University Press, Cambridge

William Encinosa, III and David Sappington, "Toward a Benchmark for Optimal Prudency Policy," *Journal of Regulatory Economics* (1995) 7

Richard Gilbert and David Newbery, "The dynamic efficiency of regulatory constitutions," *RAND Journal of Economics* (1994) 25(4)

Bruce Greenwald, "Rate base selection and the structure of regulation," *RAND Journal of Economics* (1994) 15(1)