Vertical Separation of Telecommunications Networks: Evidence from Five Countries

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The widespread adoption of mandatory unbundling in telecommunications markets has led to growing interest in mandatory "functional separation" i.e., separation of upstream network operations from downstream retail operations. Since 2002, vertical separation has been implemented in five OECD countries: Australia, Italy, New Zealand, Sweden, and the United Kingdom. In 2008, the International Telecommunications Union noted "a tremendous amount of interest" in functional separation around the world; and, in April 2009, the European Parliament held its second reading on a new regulatory framework that embraces functional separation as an "exceptional measure." While the U.S. does not currently require unbundling of broadband telecommunications networks, at least one influential group is advocating both unbundling and vertical separation for U.S. network operators. In this context, this study examines mandatory vertical separation in telecommunications markets from both a theoretical and an empirical perspective. The theoretical case against vertical separation is very strong, predicting in particular that mandated separation will discourage innovation and investment in new technologies. The empirical evidence tends to confirm these predictions, suggesting that overall, vertical separation is likely to impose significant costs without measurably increasing broadband penetration.

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I. INTRODUCTION

Regulatory regimes that require vertically integrated firms to share hard-to-replicate infrastructures – such as electricity transmission lines, railroad tracks, or the last-mile connections in telecommunications networks – create potential incentive problems, as vertically integrated firms may be induced to discriminate against upstream or downstream competitors. For example, electricity firms might discriminate in favor of their own generation plants against independent generators; railroad track owners might discriminate against competing owners of rolling stock; or, telecommunications network operators might discriminate against competing service providers.

To prevent such discrimination, regulators sometimes adopt rules requiring equal treatment or "non-discriminatory access" to bottleneck facilities – for example, requiring telephone companies to provision lines for competitors' retail customers as quickly and reliably as for their own. Such regulations are subject to the limitations inherent in all such principal-agent relationships: Regulators typically have incomplete information, monitoring and policing compliance is costly, and the results are likely to be imperfect.

One approach to preventing discrimination is to require some form of vertical dis-integration, or "separation," by the regulated firm. In their mildest forms, mandates for "accounting separation" may simply require the firm to maintain separate records for its upstream and downstream divisions, thus facilitating regulators' efforts to monitor compliance. At the opposite end of the spectrum, regulators may force full structural separation, or complete divestiture of the bottleneck facilities into a separate firm. In between, there is a potentially infinite range of "operational" or "functional" separation alternatives which impose various requirements for "arms length" dealing, while stopping short of complete divestiture.

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Current proposals for vertical separation are motivated primarily by perceived problems in implementing mandatory access (or "unbundling") regimes, which force incumbents to lease portions of their "last mile" networks to competitors at regulated prices. While mandatory unbundling has been substantially scaled back in the U.S. (and was only briefly applied to broadband services in the form of line sharing), it remains a regulatory staple in much of the rest of the world, including the European Union and several Pacific Basin nations.

By its very nature, mandated vertical separation involves a regulatory decision to alter the degree of vertical integration that market forces have otherwise developed. In telecommunications markets, it is commonplace for network infrastructures to be owned and operated by the same firms that provide retail services directly to subscribers. Economic theory posits that vertical integration is most likely to be economically efficient in industries where there are significant sunk costs (i.e., "asset specificity"), and where there are high levels of complexity or uncertainty – all characteristics associated with the modern telecommunications industry. To the extent mandated vertical separation disrupts or reduces these efficiencies, it may discourage the introduction of new networks, thereby reducing economic welfare and harming consumers. Concerns about the potential for such disruptions – combined with recognition that the more extreme forms of separation potentially are irreversible – have led most regulators to back away from mandatory separation, or to view it as a "last resort," to be used only in cases of extreme and otherwise irremediable discrimination.[1]

Nevertheless, since 2002, five nations – Australia (2005), Italy (2002, 2008), New Zealand (2007), Sweden (2008), and the United Kingdom (2005) – have adopted some form of mandatory vertical separation,[2] and the European Parliament is on the verge of embracing functional separation as a potential remedy for use by European Union (EU) national regulators (albeit only as an "exceptional measure").[3] As the International Telecommunications Union (ITU)

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[1] *See*, e.g., International Telecommunication Union, *Trends in Telecommunication Reform 2008: Six Degrees of Sharing* (2008) at 146. (Hereafter, *ITU Report 2008*).

[2] In addition, in 2007 Mongolia nationalized the infrastructure assets of its incumbent telecommunications company, thus effectively separating them from the retail operations, which continue to be private. Certain other countries, including France, have implemented less stringent separation requirements (i.e., accounting separation).

[3] *See Review of the EU regulatory framework for electronic communications networks and services: Proposal for a Directive of the European Parliament and of the Council amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to and interconnection of electronic communications networks and services, and 2002/20/EC on the authorisation of electronic communications networks and services*, TELECOM 194, MI 441, COMPET 473, CONSOM 174, CODEC 1543, Doc. No. 15965/08 (November 20, 2008), ("In case all other measures fail, NRAs will have, in exceptional circumstances of a serious market disturbance, the possibility to force major telecoms operators to separate the day-to-day running of their networks from services. … Such a step can only

noted in 2008, "There has been a tremendous amount of interest around the world recently in functional separation as a regulatory remedy in the telecommunication sector."[4]

In this essay, we examine the arguments for and against mandated vertical separation in telecommunications. Section II discusses the regulatory case for mandatory separation in telecommunications markets, and describes the types of separation regimes typically advanced. Section III explains relevant economic theories of vertical integration and their application to telecommunications markets, concluding that telecommunications possesses many of the characteristics economists associate with the presence of strong efficiency effects of vertical integration. Section IV describes the separation regimes that have been adopted to date, in Australia, Italy, New Zealand, Sweden and the U.K. and briefly summarizes the market circumstances in each country at the time of separation was implemented. Section V presents the available empirical evidence on the impact of mandatory separation in each of these countries, focusing specifically on broadband adoption and infrastructure investment. Section VI briefly examines the appropriateness of mandatory separation for the U.S. We conclude in Section VII that the experience to date fails to support the proposition that mandatory separation improves market performance, but does suggest that it leads to reduced levels of innovation and investment. Adoption of mandatory separation in the U.S. would represent a radical departure from current policies which would be extremely disruptive and likely to produce few if any benefits while imposing extremely large costs.

II. UNBUNDLING AND DISCRIMINATION IN TELECOMS MARKETS: THE REGULATORY CASE FOR SEPARATION

Mandatory unbundling policies for telecommunications networks were first adopted in Hong Kong in 1995, rolled out aggressively in the United States after passage of the 1996 Telecommunications Act, and adopted in most other OECD countries between 1999 and 2001.[5] Beginning in 2003, the Federal Communications Commission (FCC) – prompted by the courts – began reversing

be taken as a last resort and will be subject to stringent conditions.") (available at http://register.consilium.europa.eu/pdf/en/08/st15/st15695.en08.pdf); *See also* European Parliament, Press Release, "Telecom Markets: Still No Overall Agreement with Council Presidency" (April 21, 2009) (available at http://www.europarl.europa.eu/news/expert/infopress_page/058-54125-111-04-17-909-20090421IPR54124-21-04-2009-2009-false/default_en.htm).

[4] *ITU Report 2008* at 139. Australia is actively considering a more stringent "functional" separation proposal. *See* Department of Broadband, Communications and the Digital Economy, *National Broadband Network: Regulatory Reform for 21st Century Broadband Discussion Paper* (April 2009) (hereafter *DBCDE Discussion Paper*).

[5] *See* OECD, Working Party on Communication Infrastructures and Services Policy, *The Influence of Market Developments and Policies On Telecommunication Investment* (2009) at 14 (hereafter *OECD 2009*); for a more complete history of unbundling in the EU, *see also* Paul W.J. de Bijl and Martin Peitz, "Local Loop Unbundling in Europe: Experience, Prospects and Policy Challenges," *Communications and Strategies* 57 (2005) 33-57 (available at http://mpra.ub.uni-muenchen.de/2441/1/MPRA_paper_2441.pdf.).

course, initially by forbearing from imposing unbundling for broadband services delivered over optical fiber, hybrid-fiber-coax (HFC) and through line sharing over traditional copper networks.[6] In 2004, it eliminated the so-called "UNE-Platform (UNE-P)," a requirement that incumbents offer the entire local telecommunications platform at low, wholesale rates.[7] In 2005, the FCC essentially deregulated the telephone companies DSL services by declaring them to be "information services."[8]

In contrast to the U.S., most OECD nations have continued to pursue mandatory unbundling of local loops for both voice and broadband services.[9] Hence, regulators in these countries continue to grapple with the incentive problems created when mandatory unbundling regimes are imposed on incumbent carriers, and to explore the role of vertical separation requirements in addressing those problems.

A. Mandatory Unbundling and the Incentive Problem

When regulators force vertically integrated incumbents to lease access to their networks to competitors at binding maximum prices, incumbents may have incentives to engage in non-price discrimination in favor of their own retail services.[10] Such discrimination, in principle, could take any number of forms, from providing competitors with slower installation times to failing to provide

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[6] Federal Communications Commission, *Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, CC Docket Nos. 01-338 *et al.* (released August 21, 2003)

[7] Federal Communications Commission, *Order on Remand, Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers,* CC Docket No. 01-338 (released February 4, 2005). UNE-P was the most aggressive form of network unbundling for traditional voice services, as it allowed entrants to offer local services without investing in any of their own facilities. Despite the repeal of the UNE-P requirement, however, the entrants continue to have access to the incumbents' unbundled loops, using them for more than 36 percent of their local connections as of the end of 2007, according to the FCC's latest report. *See* Federal Communications Commission, *Local Telephone Competition: Status as of December 31, 2007*, Table 3

[8] Federal Communications Commission, *Report and Order and Notice of Proposed Rulemaking, Appropriate Framework for Broadband Access to the Internet over Wireline Facilities; Universal Service Obligations of Broadband Providers; and Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services* CC Docket 02-33 et al (Released September 23, 2005).

[9] *See* Organisation for Economic Cooperation and Development, *Communications Outlook 2009* (2007) at Table 2.8.

[10] Note that the dominant firm's incentive to discriminate is largely a function of wholesale price controls. *See*, e.g., George Yarrow and Christopher Decker, "Reflections on Policy Issues Raised by Next-Generation Access Networks in Communications," Regulatory Policy Institute (June 2008) at 3 (available at http://www.rpieurope.org/Research/Yarrow%20Decker%20NGAN%20Report.pdf) ("Strong incentives to abuse dominant positions characterised by vertical integration are caused chiefly by price regulation, which heavily constrains profits at a particular point in the vertical chain. Structural separation is, in effect, usually a remedy for incentive distortions that would not exist but for tight price controls.").

adequate interfaces for operations support systems (OSS) necessary to coordinate the ordering and billing of services. As the FCC explained in its 1996 Order implementing the unbundling provisions of the Telecommunications Act,

> We are also cognizant of the fact that incumbent LECs have the incentive and the ability to engage in many kinds of discrimination. For example, incumbent LECs could potentially delay providing access to unbundled network elements, or they could provide them to new entrants at a degraded level of quality.[11]

In this context, the challenge for regulators is to devise mechanisms for detecting and policing potential discrimination. In principle, regulators have two choices: They can impose behavioral rules on incumbents, requiring them to meet various regulatory metrics for providing service on a non-discriminatory basis, backed up by some form of case-by-case enforcement mechanism and penalties; or, they can attempt to alter incumbents' incentives by imposing some form of mandatory separation.

The primary argument for mandated separation is that it reduces or (in the extreme) eliminates the incentive of the incumbent network operator to engage in non-price discrimination in favor of its own retail operations.[12] Simply put, in the absence of mandatory separation, the incumbent has incentives to maximize the *joint* profits of its upstream network operations and its downstream retail affiliate; and, to the extent it has or reasonably believes it can acquire market power in the downstream market, joint profit maximization may entail raising the costs of its upstream facilities to its downstream rivals (and thus deterring or slowing their entry), even at the cost of reduced sales, and thus reduced profits, in its upstream division. If the upstream unit can be forced to maximize profits independent of the interests of its retail affiliate, it will no longer have an incentive – in theory – to discriminate.[13]

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[11] *See* Federal Communications Commission, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, First Report and Order*, CC Docket 96-98 (released August 8, 1996) at ¶307 ff (hereafter *First Report and Order*). *See also ITU Report 2008* at 141 (listing various forms of non-price discrimination).

[12] *See* e.g., Paul W. J. de Bijl, "Structural Separation and Access in Telecommunications Markets," CESifo Working Paper No. 1554 (September 2005) at 6 ("Separation eliminates the incumbent's retail operation's ability and incentives to discriminate in the downstream market. In particular, it eliminates the incumbent's incentives and possibilities, whether legal, economic or technical, to raise the costs of its rival firms by reducing quality or increasing the cost of access, which would lead to 'double marginalization' and hence an inefficiency."). *See also* OECD, Working Party on Telecommunication and Information Services Policies, *The Benefits and Costs of Structural Separation of the Local Loop* (2003) at 9 and *ITU Report 2008* at 142-3.

[13] Vertical separation may also facilitate the regulator's ability to impose an "equivalence of input" (EOI) non-discrimination standard. Under an EOI standard, the network operator is required to provide its affiliated retailer with precisely the same services as its competitors. Under an "equivalence of outputs" standard, on the other hand, the unaffiliated retailers may be offered different but equivalent services. *See* e.g., *ITU Report 2008* at 143. *See also DBCDE Discussion Paper* at 19.

B. Forms of Separation

The terms "accounting," "operational," "functional" and "structural" typically are used to describe different types of separation mandates. At the extremes – accounting separation and structural separation – the terms are relatively unambiguous. Under accounting separation, the vertically integrated firm is required to follow specified accounting conventions for allocating the costs and revenues of upstream and downstream services into separate baskets, thus allowing regulators set wholesale prices for the upstream service; however, the firm continues to operate as a vertically integrated whole, thereby preventing the loss of vertical efficiencies. Under full structural separation, on the other hand, the upstream and downstream portions of the firm are literally divided into separate companies, with different ownership, management, etc. Under structural separation, all vertical efficiencies that depend upon joint ownership and control are eliminated.

Between the two extremes, there is a wide variety of options, typically categorized as "operational" or "functional" separation. In general, operational separation refers to the creation of a separate division within the firm whose mission is to service wholesale customers, while the firm's retail operations are essentially unaffected – i.e., they continue to operate as an integrated part of the firm. Under functional separation, on the other hand, the firm's retail operations are to one degree or another set apart – legally, organizationally, and/or physically – from its upstream network operations. The greater the separation, the greater the independence between the network and retail operations and, at least in theory, the less incentive the network operator has to discriminate in favor of its affiliated retail arm. By the same token, of course, increased separation reduces the ability to capture vertical economies.

In practice, both operational and functional separation involve dozens of granular decisions about precisely how the "separated" firm is to operate. Who is to report to whom? Who is permitted to talk with whom, and about what topics? What systems can be shared between the regulated network operator and its retail affiliate, and which ones must be duplicated? And, perhaps most important, who is compensated for what – that is, to what extent are the operators of the upstream and downstream divisions incentivized to maximize the performance of their own divisions versus the performance of the firm as a whole?[14] How these questions are answered determines the extent to which mandated separation affects both managers' incentives to discriminate in the provision of services to competitors, and their ability (and desire) to capture vertical economies.

[14] For useful discussion of the various forms of separation, *See* Martin Cave, "Six Degrees of Separation: Operational Separation as a Remedy in European Telecommunications Regulation," *Communications and Strategies* 64 (2006) at 1-15.

III. MANDATORY SEPARATION AND THE ECONOMICS OF VERTICAL INTEGRATION

While it is fairly commonplace for telecommunications providers to offer services on both a wholesale and retail basis, we are aware of few examples of market forces inducing incumbent carriers to forego the provision of retail services altogether, i.e., to engage voluntarily in structural separation. Nor do profit-maximizing firms, as a general matter, erect organizational or other barriers to internal coordination, as is the case with functional separation. Vertical integration, in other words, is a reflection of market forces.

Economists have developed several theories which explain the efficiency rationale for vertical integration, beginning with Ronald Coase's classic formulation of "The Nature of the Firm" in 1937.[15] These theories, stressing the efficiency effects of combining vertically related activities within a single firm, have received substantial empirical support, and they can be utilized to explain why vertical integration of telecommunications continues into the modern competitive era, and why any policy that alters the degree of integration runs the risk of reducing efficiency and investment in telecommunications.

A. The Economics of Vertical Integration

Economic theories of vertical integration focus on the relative merits of firms (i.e., vertical integration) as compared with the market (i.e., contracts) as mechanisms for organizing economic endeavors in the presence of risk, uncertainty, and transactions costs.

When multiple economic actors are required to make sunk cost investments in some joint activity, the returns to which are contingent on unknown or unpredictable future events, it becomes costly (if not impossible) to write contracts among them that completely capture all of the possible future states of the world, and allocate responsibilities and payoffs (i.e., profits) appropriately.[16] Furthermore, the presence of incomplete contracts creates the potential for both moral hazard (i.e., underperformance or shirking on contractual obligations) as well as for opportunistic *ex post* behavior, especially when the assets involved are specific to the economic activity at hand and cannot easily be put to

[15] Ronald H. Coase, "The Nature of the Firm," *Economica*, 16;4 (1937) 386-405.

[16] *See* e.g., Oliver E. Williamson, "The Economics of Antitrust: Transaction Cost Considerations," *University of Pennsylvania Law Review* 122;6 (June 1974) 1439-1496, at 1443 ("[T]he transaction cost approach attempts to identify a set of market or transactional factors which together with a related set of human factors explain the circumstances under which complex contracts involving contingent claims will be costly to write, execute, and enforce. Faced with such difficulties, and considering the risks that simple, and therefore incomplete, contingent claims contracts pose, the firm may decide to bypass the market and resort to hierarchical modes of organization. Transactions that might otherwise be handled in the market would then be performed internally and governed by administrative processes.")

alternative use.[17] The results are to increase the costs and risks of investment, and to reduce the level of investment below the otherwise-optimal level.

Vertical integration addresses these problems by internalizing the payouts among the (otherwise) contracting parties and by limiting the potential for shirking. Rather than trying to write contingent contracts that specify each and every possible future state of the world and allocate responsibilities and consequences for each of the parties, the parties simply agree *ex ante* to combine their efforts, to be directed within wide bounds by a central authority, and to share according to some pre-agreed (and non-negotiable) formula in the results: That is, they agree to create a firm.

In terms of testable propositions, these theories predict that the economic efficiency gains from vertical integration will be greatest in the presence of asset specificity (i.e., the need to invest in assets which cannot easily be moved to an alternative use) and high levels of complexity or uncertainty in production processes or market conditions. As a recent survey of the economics literature on vertical integration by Francine Lafontaine and Margaret Slade explains, "asset specificity generates a flow of quasi rents that are associated with *ex post* haggling and opportunism, whereas complexity and uncertainty lead to contractual incompleteness."[18]

B. Empirical Evidence Relating to Vertical Integration

Lafontaine and Slade present an extensive review of the empirical literature on the effects of vertical integration, summarizing the results of economic studies that focus on both the motivations for vertical integration and the results of such integration, and conclude that numerous empirical studies support both the transactions cost and moral hazard models for vertical integration.[19] Specifically, they find that the empirical evidence supports the theoretical predictions that vertical integration is more likely in markets where various forms of asset specificity (e.g., physical capital specificity) are present and where uncertainty (e.g., the inability accurately to predict future sales) and complexity (e.g., complicated product design) are present. Overall, they conclude, "The weight of

[17] *See*, e.g., Benjamin Klein, Robert G. Crawford, Armen A. Alchian, "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," *Journal of Law and Economics*. 21;2 (October 1978) 297-326 at 298 ("The crucial assumption underlying the analysis of this paper is that, as assets become more specific and more appropriable quasi rents are created (and therefore the possible gains from opportunistic behavior increases), the costs of contracting will generally increase more than the costs of vertical integration. Hence, *ceteris paribus*, we are more likely to observe vertical integration.")

[18] Francine LaFontaine and Margaret Slade (2007), "Vertical Integration and Firm Boundaries: The Evidence," *Journal of Economic Literature* 45;3, 629-685 at 653. In addition to the "moral hazard" and "transactions cost" theories of vertical integration discussed herein, LaFontaine and Slade also discuss the "property rights" theory, but find little empirical support for it.

[19] *See* Lafontaine and Slade at 631-660.

the evidence is overwhelming. Indeed, virtually all predictions from transactions cost analysis appear to be borne out by the data."[20]

Perhaps even more important, the empirical evidence also supports the proposition that vertical integration is more likely to promote efficiency and benefit consumers than to facilitate market foreclosure or other anticompetitive outcomes, even in highly concentrated industries. Based on a review of ten empirical studies that evaluate whether vertical integration resulted in foreclosure or raising rivals costs, Lafontaine and Slade conclude that "the evidence in favor of anticompetitive foreclosure is therefore, at best, weak, particularly when one considers that the industries studied were chosen because their vertical practices have been the subject of antitrust investigations."[21] On the other hand, of 16 studies that assess the ultimate effect of vertical integration on consumer welfare, 13 find consumer welfare is increased, with the remaining three finding the effect to be ambiguous. On the basis of their review, Lafontaine and Slade conclude:

> [U]nder most circumstances, profit-maximizing vertical integration decisions are efficient, not just from the firms' but also from the consumers' points of view. Although there are isolated studies that contradict this claim, the vast majority support it. Moreover, even in industries that are highly concentrated so that horizontal considerations assume substantial importance, the net effect of vertical integration appears to be positive in many instances…. Furthermore, we have found clear evidence that restrictions on vertical integration that are imposed … on owners of retail networks are usually detrimental to consumers. [22]

In short, the economics literature provides strong support, from both a theoretical and an empirical perspective, for the proposition that – as a general matter – mandatory vertical separation is likely to reduce efficiency and, on net, harm consumer welfare.

C. Vertical Integration in Telecommunications Markets

Telecommunications networks display virtually all of the characteristics economists associate with strong vertical efficiencies. First, the construction and operation of telecommunications networks requires the commitment of billions

[20] *See* Lafontaine and Slade at 658. Lafontaine and Slade's findings are consistent with those of other reviews. *See*, e.g., Howard A. Shelanski and Peter G. Klein, "Empirical Research in Transaction Cost Economics: A Review and Assessment," *Journal of Law, Economics and Organization* 11;2 (October 1995) 335-361 at 342-3 ("To sum up, the evidence on the transactional determinants of vertical integration seems quite striking. Asset specificity and uncertainty appear to have significant effects on the vertical structure of production. This is especially remarkable when compared with the relative dearth of evidence on market-power explanations for integration….") *See also* Paul L. Joskow, "Vertical Integration" in American Bar Association, *Issues in Competition Law and Policy* (2008) 273-292.

[21] *See* Lafontaine and Slade at 673.

[22] *See* Lafontaine and Slade at 680.

of dollars in assets that are highly specific to the operations of the carrier. These assets are located and designed specifically to serve that carrier's network needs in its service area: They cannot be used for other purposes, and most of them cannot be moved economically to other locations. Once deployed, they must be used to deliver telecommunications services in that area. In short, telecommunications networks display an extremely high level of asset specificity.

Second, modern telecommunications networks also display high levels of complexity and uncertainty. Broadband technologies have changed dramatically (for example, fiber-to-the-home deployment in the U.S. began in earnest less than five years ago, after advances in passive optical networking – PON – technology made it economically feasible) and are expected to continue to change (Fixed-wireless Wi-Max networks are now being deployed for the first time, and 4-G LTE wireless networks are expected to be deployed beginning in 2009). Similarly, market conditions are subject to high degrees of uncertainty, as market demand for broadband and related services (voice, video) is constantly shifting and evolving.

Under these circumstances, the costs of coordinating upstream and downstream activities through contracts are likely to be high, and the case for vertical integration especially strong.[23]

Consider why it would ever make sense for the ownership of the core network assets to be separate from the delivery of downstream services over that network. Specifically, envision a situation in which company N owned the basic feeder and distribution network and another company, S, offered telecommunications services by connecting its own equipment to N's networks in order to connect with final subscribers. Indeed, one could even contemplate several such service companies (S companies) connected to N's core network, i.e., the current situation under network unbundling arrangements in most jurisdictions. Such a market structure would only develop in the presence of diseconomies of scope or scale, e.g., if the specialized knowledge or abilities required for each task made joint ownership and operation of these two stages of telecommunications uneconomic. For example, the design, construction, and operation of the core network could conceivably be so alien to the service company that the latter would choose not to build its own network, much as it avoids producing its own copper wire or terminal equipment.

The existence of diseconomies of scale or scope is not, however, a sufficient condition for vertical dis-integration. Instead, for separation to be economically

[23] The fact that vertical integration is *generally* preferred does not mean that contracting out or reselling can *never* be efficient. For example, despite the repeal of the most aggressive mandatory unbundling rules, U.S. CLECs continue to provide telecommunications services, primarily to small and medium-sized businesses, indicating that single-purpose (vertically dis-integrated) entities may have some efficiency advantages in this portion of the market.

efficient, such diseconomies must exceed the costs of the alternative: using contracts to organize the same activities.

N and S face a number of problems as they seek to negotiate such a contract. First, the services involved are inherently complex. A contract would need to address such issues as the prices for maintaining the network, delivering network services, connecting subscriber lines, and replacing network elements as they depreciate. It would need to specify how S would compensate N for deploying its network to new subdivisions, how its fees would change with inflation, and dozens of other factors relating to marketing, service quality, prices, coordination, and so forth.

Second, the rapid pace of technological and market change would make such a contract even more difficult to negotiate, and perhaps still more difficult to enforce. In the case of telecommunications, network design is critically related to the services to be offered. As the market shifts from simple analogue voice services to low-speed data services to higher-speed data services to still higher-speed advanced services and, ultimately, to one-way or two-way video services, the network must continually be altered.

Third, the network design must be adjusted to competitive conditions in the downstream marketplace. For instance, as voice services shift to wireless and VoIP, or high-speed data services gravitate to fixed or mobile wireless, the fixed-wire network must be adjusted to deliver a larger share of video services, perhaps in high definition. The marketing of these services may require the offering of both wireless and fixed-wire voice, data, and video services in bundled packages that are constantly adapting to competitive conditions and new technologies.

Under these dynamic conditions, it is unlikely that vertically-fragmented network owners and service providers would have as strong incentives to invest as would a vertically-integrated service provider. The knowledge and coordination required for network design and service offerings point strongly towards vertical integration in the highly dynamic modern telecommunications environment.[24]

[24] The FCC has repeatedly recognized the costs of vertical separation requirements. *See* e.g., Federal Communications Commission, *Memorandum Opinion and Order, In the Matters of Section 272(f)(1) Sunset of BOC Separate Affiliate and Related Requirements, 2000 Biennial Regulatory Review Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules, Petition of AT&T Inc. for Forbearance Under 47 U.S.C. Sec. 160(c) with Regard to Certain Dominant Carrier Regulations for In-Region, Interexchange Service,* FCC 07-159 (August 31, 2007) at ¶82 ("[Separate affiliate] restrictions not only impose additional costs, but also prevent BOCs from taking advantage of the economies of scope and scale associated with integrated operation that their competitors are able to realize."); ¶83 ("These restrictions may also prevent the BOCs and their affiliates from quickly responding to technological and marketplace developments…. The required duplicative management of the two affiliated companies creates unnecessary inefficiencies in decision making and may therefore increase the

In a similarly dynamic period of the history of automobiles, Henry Ford integrated backward into glass and steel manufacture because the market was gravitating from wooden automobile bodies to much more sophisticated welded bodies with glass windows and windshields. Ford was an innovator in materials supply as well as materials production. Once the market for automobiles settled down into one of steel body construction and annual volumes grew substantially, vertical integration became less important. Over time, the Ford Motor Company – and other motor vehicle companies – became less vertically integrated, acquiring its materials from independent companies that were not owned by Ford or any other vehicle producer.

As long as telecommunications technology and market demand for communications services continue to change rapidly, creating the opportunity for new and improved services, it is likely that the integration of network owners and service providers will be required to coordinate investment decisions. These investment decisions involve billions of dollars and substantial risk that non-vertically-integrated entities would be less likely to undertake – and investors would be less likely to reward.

The imposition of functional or operational separation is likely to be especially problematic when it comes time to make major investments in new infrastructures, such as the NGN investments now underway in many countries to deploy fiber-to-the-node (FTTN) or fiber-to-the-home (FTTH) infrastructures, for three reasons.[25] First, the challenges and costs of writing contingent contracts that efficiently share the risks and rewards of such investments are magnified by both the size and the uncertainty of such investments.

Second, when several competitors are attached to a given incumbent network, each is likely to have a business plan that differs from its competitors. For example, some competitors may choose to offer only high-speed internet and voice services while the incumbent prepares to offer video services in addition to these other services. The optimal network design for the incumbent may thus begin to differ from that desired by these competitors. Indeed, if the incumbent changes the network by deploying FTTH or FTTN, competitors relying more heavily on co-locations at traditional telephone-network wire centers may be faced with large new investments – or, as discussed below, find it uneconomical to continue competing at all. In such an environment, each competitor has strong

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costs and delay deployment of new services."); and, n. 238 (citing previous decisions in which the FCC has reached similar conclusions).

[25] Among those sharing this view is former Ofcom Commissioner Kip Meek (who negotiated the functional separation agreement between BT and Ofcom). *See* Kip Meek, *Operational Separation in Australia and the UK* (June 24, 2008) at 24 ("The demand risks and uncertainties associated with building an NGN, especially where it is intended to replace the PSTN, seem to me to raise doubts about whether a non-vertically integrated approach would be able to achieve the necessary level of investment co-ordination.") (available at http://www.nowwearetalking.com.au/library/pdf/feature/appendix_fttn-kip-meek-vertical-integration-separation.pdf) (hereafter *Meek 2008*).

incentives to influence the network operator's decisions through any and all means, including political lobbying.

Third, one of the key benefits of vertical integration is the ability to share knowledge between the downstream and upstream divisions – for example, the upstream division is likely to have unique insight into the costs of constructing an NGN, while the downstream (retail) division is likely to have better information on the types of services consumers may demand from the network (and their willingness to pay). So long as the upstream and downstream functions are vertically integrated, they have strong incentives to share this knowledge in order to achieve collective success. Mandated separation destroys these incentives: Rather than sharing information candidly, each downstream firm instead has an incentive to share only that information that supports its preferred outcome.

In sum, economic theory, supported by empirical evidence from a variety of industries, suggests vertical separation in the telecommunications sector separation risks creating substantial problems for innovation and investment, especially when major new infrastructure investments are involved. The evidence presented below suggests these problems are in fact presenting themselves in countries that have imposed vertical separation requirements.

IV. MANDATORY SEPARATION IN FIVE COUNTRIES

In this section, we examine the experience to date of the five nations that have adopted some form of forced separation in association with mandatory unbundling of telecommunications networks. We begin with the United Kingdom, which adopted a strong form of functional separation in 2005 and is thus widely (and correctly) regarded as the most important test case to date. Next we review the experiences in four other countries that have lately adopted some form of vertical separation, Australia, Italy, New Zealand, and Sweden.

A The United Kingdom

Functional separation in the United Kingdom occurred in late 2005, when British Telecommunications (BT) agreed to the establishment of a new and operationally distinct business division responsible for the operation and development of BT's local access networks after a June 2005 report by independent regulator Ofcom.[26] To avoid referral by Ofcom to the British High Court, BT consented to create and staff Openreach, a new business division to operate its local access networks and to make universally available such products as local loop unbundling and shared loops, wholesale line rental and backhaul

[26] Ofcom, *A New Regulatory Approach for Fixed Telecommunications* (June 26, 2005) ("Ofcom has concluded that a new approach is necessary for the longer term, based on real equality of access to those parts of the fixed telecoms network which BT's competitors cannot fairly replicate.") (available at: http://www.ofcom.org.uk/media/news/2005/06/nr_20050623) (hereafter *Ofcom Report 2005*).

products.[27] In addition, Openreach adopted a policy of "product equivalence," requiring that it support all providers' retail activities on a non-discriminatory basis.[28]

1. A New Regulator

Britain's independent telecoms regulator, Ofcom, was created in 2003 to replace the former regulator, OfTel. The new regulatory commission quickly launched a review of the telecommunications sector and the regulatory options before it. This review, the "Strategic Review of Telecommunications," provided the basis for the new regulatory approach that was launched in 2005.

The telecommunications sector that Ofcom reviewed in 2003-05 was very different from the U.S. telecom sector. First, fixed-wire telecommunications was dominated by a single company, British Telecom (BT), which had limited fixed-wire competition from non-cable companies. The early entry by cable television companies into narrowband, voice services had stalled because of the financial difficulties of the cable companies, which had slowly been reorganized into two national companies, NTL and Telewest. Eventually, these two cable companies merged into one national cable firm, now called Virgin Media. There were no other major incumbent local exchange carriers that could have contemplated entry into BT's local-exchange territories. The cable companies were so weak financially that they had been unable to launch a major assault on the broadband market. By the middle of 2003, the cable companies had only 1.8 subscribers per 100 UK residents, compared with 4.8 cable modem subscribers per 100 residents in the U.S. at that time.[29]

2. A New Policy: Functional Separation

While the structural conditions in the United Kingdom's telecom markets in 2003-05 were less conducive to competition than those in the United States, Ofcom's basis for its decision to dramatically alter the UK's regulatory paradigm was surprisingly weak. In the Phase 2 Consultation Document of the Strategic

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[27] *Ofcom Report 2005* at 1 ("The proposed undertakings offered by BT will stipulate the setting up of a new - and operationally separate – business unit, provisionally entitled Access Services, but with a distinct new brand and identity to be devised in the coming weeks. The new business unit will be staffed by around 30,000 employees presently responsible for the operation and development of BT's local access networks.") *See also*, *ITU Report 2008*, p. 144.

[28] *Ofcom Report 2005* at 1 ("The new business unit will be required, through a set of formal rules on governance and separation, to support all providers' retail activities (including those of BT retail) on a precisely equivalent basis, which Ofcom terms "Equivalence of Input." Equivalence of input will mean that all providers will benefit from: the same products, with equal opportunity to contribute to the development of new products; the same prices, offered to all providers equally; and the same processes, to ensure all providers are able to order, install, maintain and migrate connections for their customers on equal terms.")

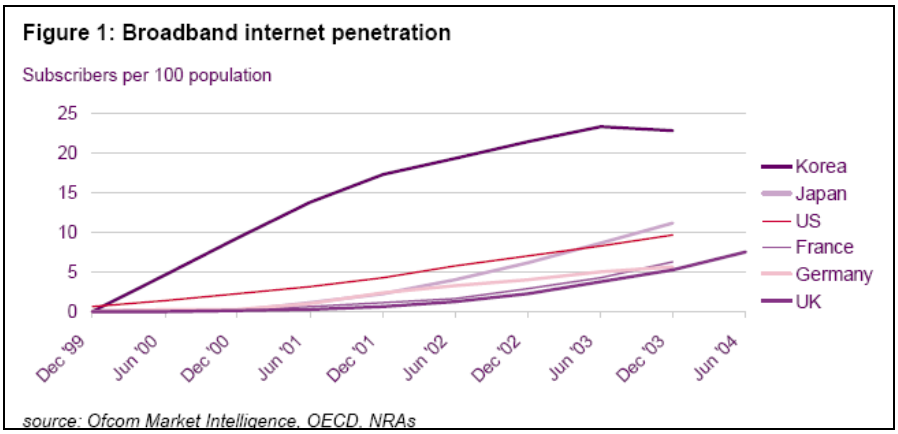
[29] OECD, Broadband Statistics; *See also* Jason Whalley and Peter Curwen, "Is Functional Separation BT-Style the Answer?" *Communications & Strategies* 71 (2008) 145-165, at 147-8.

Telecommunications Policy Review, released in late 2004, Ofcom focused almost entirely on the broadband market. Its clear conclusion was that there was insufficient intra-platform and inter-platform competition in the United Kingdom, and that Ofcom could not effectively address the latter problem.[30] Therefore, it would be forced to construct a more aggressive policy of mandating equal access to BT's broadband facilities through wholesale unbundling regulation. Ofcom felt that the only other alternative was a full structural separation of BT's wholesale and retail activities.

Ultimately, Ofcom pressed BT to guarantee competitors access to its network facilities on an Equivalence of Inputs basis. In June 2005, BT announced that it would agree to provide such a guarantee. After further negotiations with Ofcom, BT agreed to institute a functional separation of its facilities into separate wholesale and retail divisions, and to guarantee that it would provide entrants with access to services or inputs in which it had significant market power that would be the same as that provided to its own retail operations. As a result of this agreement, BT established Openreach, which provides these wholesale services to entrants and to its own retail operations.

There was very little analysis of the development of broadband in the UK through 2004 in the Ofcom documents. Ofcom's decision instead was based largely on a comparison of broadband penetration across a few countries, as portrayed in Figure 1 of Annex O of its Report:[31]

FIGURE 1:
OFCOM'S BROADBAND PENETRATION CHART



From this crude graph, Ofcom was able to opine that:

[30] Meek indicates that unique aspects of Ofcom's statutory authority made it "at a minimum cumbersome" for Ofcom to impose behavioral regulation, thus making vertical separation a relatively more attractive option. *See Meek 2008* at 8.

[31] Ofcom, *Strategic Review of Telecommunications, Phase 2 Consultation Document, Annex O: Telecommunications Regulation in Other Countries: Case Studies* (November 18, 2004) (hereafter *Ofcom Report 2004*).

> Of the countries under consideration, Japan and the US can be considered in being in (sic.) the 'second tier' in terms of broadband penetration with take-up in the UK similar to that in France and Germany. More recent data for Europe show that the UK now ranks above Germany in terms of penetration but remains slightly below France where growth in the number of unbundled local loops and improved availability of lower speed entry level products has helped boost penetration.[32]

Ofcom provided no analysis of the recent trajectory of broadband in the UK, nor did it undertake to analyze the sources of its growth. Had Ofcom looked more closely, it would have discovered that broadband was growing more rapidly in the UK than in France or in the EU-15 in general, and that much of this growth was coming from DSL services based on BT's existing wholesale offerings. At the end of 2005, only five EU countries were measurably ahead of the UK in broadband penetration: Belgium, Denmark, Finland, Netherlands, and Sweden.[33] Thus, whatever problems Ofcom's new policy sought to address, there certainly was no evidence that the U.K. was falling measurably behind with respect to Internet availability or uptake.

B. Australia

In September 2005, as part of a broader effort to increase competition based on unbundled loops, the Australian government ordered incumbent telecommunications carrier Telstra to submit a plan for operational separation to be approved by the Communication Minister.[34] Government officials sought separation as a remedy to the operation of Telstra's wholesale division in a manner that allegedly favored Telstra's retail business at the expense of wholesale customers.[35] On June 23, 2006, the Minister approved a plan which called for the company to maintain separate retail, wholesale and network service business units. Employees working in Telstra's retail division were specifically barred from working in its wholesale unit, and vice versa,[36] and Telstra's retail

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[32] *Ofcom Report 2004* at 2.

[33] Based on data compiled by the European Competitive Telecommunications Association (ECTA) (available at www.ectaportal.com/en/basic650.html).

[34] Telecommunications Legislation Amendment (Competition and Consumer Issues) Act 2005 (available at: http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/EF7D9BB244FFE2F6CA25713A001E26C8/$file/119-2005.pdf).

[35] Media Release, Minister for Communications, Information Technology, and the Arts (June 23, 2006) ("Telstra is required to establish and maintain within the company separate wholesale, retail and key network services business units. This is designed to prevent the internal functions that Telstra's wholesale customers rely upon to compete effectively with Telstra from being operated in a way that systematically advantages Telstra's retail business.") (hereafter *June 23 Release*) (available at: http://www.minister.dcita.gov.au/coonan/media/media_releases/telstras_operational_separation_plan_approved).

[36] *See June 23 Release* ("In fact, Telstra is now required to have separate staff and separate premises for the Telstra wholesale and Telstra retail business units. Anyone who works for Telstra retail unit can no longer work for the wholesale unit.")

business units were prohibited from exercising control over the marketing, contracting or supply of services to wholesale customers.[37] However, although a separate wholesale division was created to serve competitors, the rest of Telstra was left intact as an integrated wholesale and retail operator, and Telstra's non-discrimination obligations were defined on an equivalence of outputs basis.[38]

C. Italy

Vertical separation in Italy began in 2002 with the release of Resolution no. 152/02/CONS, by AGCOM, the independent Italian Communications Regulatory Authority.[39] AGCOM identified incumbent Telecom Italia (TI) as an operator with significant market power in fixed telephony,[40] and sought to grant equivalency of access of its network services to competitors.[41] AGCOM directed Telecom Italia to implement "administrative separation," which resulted in the creation of TI Retail and TI Wholesale as distinct business units.[42] TI Wholesale was responsible for the provision of network access and services to competitors. Unlike models of functional separation in other countries, the Italian model allowed TI to retain core network and access services within the same operational division.[43]

In May 2007, AGCOM undertook a public consultation on functional separation, and also proposed legislation that would allow it to impose functional separation on firms with significant market power. TI, in what the ITU labeled

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[37] Australian Government, Department of Communications, Information Technology and the Arts. "Operational Separation." ("Telstra's retail business units must have no control over, or responsibility for, the marketing, contracting or supply of services to wholesale customers.") (available at: http://www.archive.dcita.gov.au/2007/11/connect_australia/operational_separation).

[38] *ITU Report 2008* at 145.

[39] See *Introduction to the Agcom* ("The Communications Regulatory Authority (Agcom) is an independent authority, established by Law n. 249 of July 31, 1997… to ensure equitable conditions for fair market competition.") (available at: http://www2.agcom.it/eng/eng_intro.htm).

[40] Resolution no. 152/02/CONS: Measures to ensure the full application of the principle of internal and external equal treatment by operators with significant market power in fixed telephony. ("Telecom Italia currently is an operator with significant market power in the market for fixed public telephony network and services, in the market for leased lines systems, in the national interconnection market.") (available at: http://www2.agcom.it/eng/resolutions/2002/d152_02_CONS.pdf).

[41] Resolution no. 152/02/CONS. "The Authority started a preliminary investigation to assess the opportunity to take steps to ensure compliance with the requirement of internal and external equal treatment, more specifically in relation to the provision of intermediate services to Telecom Italia's competitors and the concurrent presence of the latter company in the market for finished products developed by Telecom Italia's competitors purchasing the foregoing intermediate services (i.e. licensee operators, hereinafter referred to as OLOs)."

[42] *ITU Report 2008* at 145.

[43] *ITU Report 2008* at 145. *See also* Barbara Esbin, "Functional Separation, Italian Style," Progress on Point 16.9, *The Progress & Freedom Foundation* (March 2009).

"an apparent attempt to appease AGCOM,"[44] responded by creating a new and completely autonomous business unit, called Open Access, which was announced in February 2008[45] and approved by AGCOM in December 2008.[46] While Telecom Italia has characterized Open Access as "operational" separation, it is in many respects similar in structure BT's OpenReach, including the creation of an "Equal Access Board" to oversee compliance with non-discrimination. Unlike OpenReach, however, Open Access does not have a separate board of directors.

D. New Zealand

Functional separation in New Zealand came quickly on the heels of BT's reorganization in the United Kingdom. In 2006, New Zealand's parliament passed into law the Telecommunications Amendment Act (No. 2) 2006, in which the Minister of Communications ordered the reorganization of Telecom New Zealand (TNZ).[47] TNZ agreed to split into three separate divisions – retail, network and wholesale – that would operate at arm's-length from one another.[48] "Separation Day" for TNZ occurred on March 31, 2008,[49] and the process is set to be completed formally by 2012. As in the UK, the primary thrust of the functional separation of TNZ was to impose non-discriminatory access to wholesale telecommunications services for TNZ's competitors.[50]

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[44] *ITU Report 2008* at 145.

[45] *See* Global Insight, "Telecom Italia Caves In to Functional Separation" (February 14, 2008) (available at http://www.globalinsight.com/SDA/SDADetail11538.htm)...

[46] *See* Telecom Italia, *14 Groups of Undertakings: An Overview* (March 27, 2009) (available at http://cfp.mit.edu/groups/INTERCONNECTIONWG_DOCS/March-27-2009/Amendola%20MIT_%20Operational_Separation_Final.PPT#395,10,14 Groups of undertakings: an overview).

[47] New Zealand Legislation: Acts. Telecommunications Amendment Act (No 2) 2006 No 83, Public Act. Part 2A: Operational Separation of Telecom." (hereafter *NZ Telecom Act 2006*). (available at www.legislation.govt.nz/act/public/2006/0083/latest/DLM402651.html?search=ts_act_Telecommunications+Act+2001_resel#DLM402651).

[48] Cath Hart, "Telecom NZ in Three Degrees of Separation." *The Australian*, April 1, 2008. (available at www.theaustralian.news.com.au/story/0,25197,23462905-20142,00.html) ("Under the new arrangements, TNZ will keep its retail, network and wholesale operations at arm's-length from one another, in a model similar to that used by British Telecom when it separated its network and wholesale operations in 2005.")

[49] Ministry of Economic Development, New Zealand, *Operational Separation of Telecom* (available at www.med.govt.nz/templates/ContentTopicSummary____26310.aspx).

[50] *NZ Telecom Act 2006* ("Section 69D(1)(f) requires equivalence of supply of wholesale telecommunications services and access to Telecom's network so that third party access seekers are treated in the same or an equivalent way to Telecom's own business operations, including in relation to pricing, procedures, operational support, supply of information, and other relevant matters.")

E. Sweden

In 2007, the Swedish Post and Telecom Agency (PTS) proposed legislation that would give it the authority to impose functional separation on incumbent TeliaSonera. The agency justified the proposal on the basis that there was "deep mistrust" between TeliaSonera and its wholesale customers, "repeated disputes and long court proceedings," and various forms of alleged discrimination.[51] Despite these problems, however, TeliaSonera had a retail market share of only 57 percent of DSL connections (the remainder being served by its wholesale customers); and, its overall market share was only 36 percent, since DSL represented only 63 percent of broadband connections, with the remainder being supplied by cable (21 percent) and municipal fiber (16 percent). In terms of availability, the cable infrastructure reached 60 percent of premises, and FTTH networks reached approximately 30 percent.[52]

PTS' proposed legislation was adopted by the Swedish Parliament in June 2008, and took effect on July 1, 2008.[53] To date, PTS has not formally imposed a functional separation requirement on TeliaSonera, but it has undertaken analyses of access network markets, and indicated its intention to impose some form of obligation during 2009.[54]

Even before passage of the legislation, however, TeliaSonera "voluntarily" created a functionally separated access company, TeliaSonera Skanova Access AB ("Skanova"), which began operations on January 1, 2008. Skanova is a wholly owned but independently operated network infrastructure company, which leases access to TeliaSonera's network assets on equal terms to both TeliaSonera's retail operations and to its wholesale customers, under the oversight of an "Equality Access Board" which is tasked with ensuring equal treatment and independence.[55] Thus, while the PTS has yet to formally impose a functional separation requirement, as a practical matter, functional separation was adopted in January 2008.

V. EARLY EVIDENCE: THE EFFECTS OF VERTICAL SEPARATION ON BROADBAND PENETRATION AND INVESTMENT

While it may be too early to provide a comprehensive evaluation of the experience of these five countries with functional/operational separation, we can provide some evidence on two important metrics: (1) the growth of broadband penetration; and, (2) network investment and fiber deployment. We find that

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[51] *See* Bo Andersson, *Functional Separation in Sweden – New Remedy in the Electronic Communications Act* (PTS, June 7, 2008) at 5-7 (available at www.eett.gr/conference2008/pdf/Andersson.pdf).

[52] *See* Andersson at 3-4.

[53] *See* PTS, *Strategic Agenda 2009* (September 30, 2008) at 28 (available at www.pts.se/upload/Rapporter/Om-PTS/Strategisk%20Agenda%202009_eng.pdf).

[54] *Strategic Agenda 2009* at 42.

[55] *See* Andersson at 13. *See also* http://www.cisionwire.com/teliasonera/skanova-access-meets-swedish-telecom-operators--infrastructure-needs-on-equal-terms- and www.skanova.com/start/.

vertical separation has not had measurable positive effects on either metric; to the contrary, the early evidence suggests the growth of broadband penetration has slowed in countries which have adopted vertical separation, and that investment, especially with respect to NGN fiber networks, has been deterred.

A. Broadband Growth

The most obvious indicator of the success or failure of a policy designed to provide broadband competitors with access to the incumbent's facilities at nondiscriminatory rates would be a surge in broadband subscription growth due to the increase in competition. Because the UK policy has been in effect longer than the separation policies of the other four countries, we can provide greater detail on its effect. We therefore begin with the UK and then turn to a necessarily more cursory analysis of the other four countries' experience.[56]

1. Broadband Growth in the United Kingdom

If broadband had been languishing in the UK because of a lack of competition from resellers or other DSL providers using BT loops, one might expect the change in policy in the 3rd quarter of 2005 to correct this deficiency. As entrants took advantage of the availability of BT's new wholesale offerings and BT's mandated non-discrimination against competitors, entrant-supplied broadband lines should have increased according to the Ofcom theory, perhaps dramatically. But no such event occurred.

To the contrary, broadband line growth actually decelerated after the adoption of functional separation. Between 3Q 2005 and 3Q 2008, according to ECTA data, UK broadband lines increased from 8.9 million to 16.9 million, an annual rate of increase of 21 percent. However, broadband lines had been increasing by more than 50 percent per year before 3Q 2005. Moreover, BT's retail lines have been growing more rapidly than its competitors' lines since 3Q 2005, despite the new liberalized wholesale regime.[57]

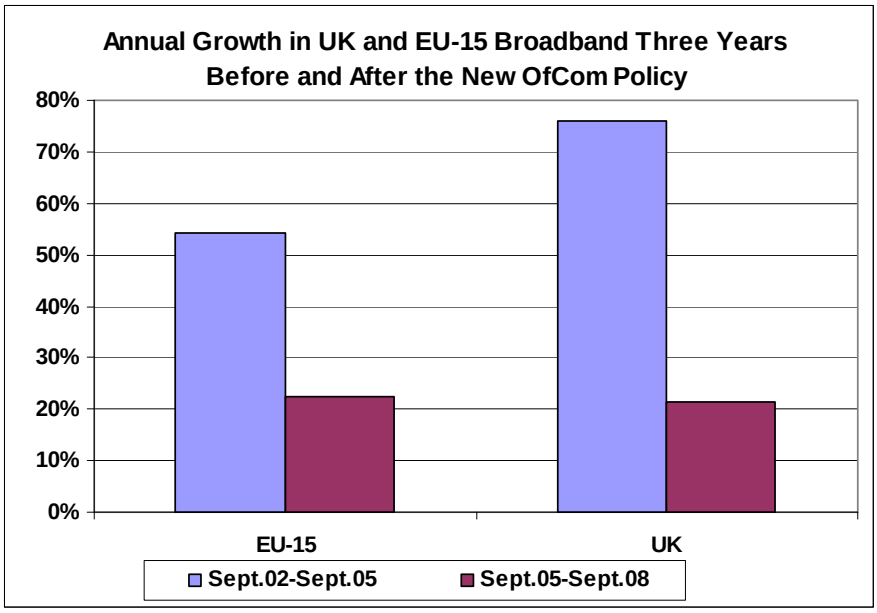
A comparison of UK broadband growth with growth in the EU-15 yields a similarly bleak conclusion about the effects of functional separation. According to ECTA data, between September 2002 and September 2005, when the new Ofcom policy went into effect, UK broadband lines increased at an annual rate of 76 percent while EU-15 broadband lines rose at a rate of 54 percent. Thus, prior

[56] Our analysis obviously is qualitative and does not formally correct for exogenous policy or other factors that may have affected outcomes, such as changes in the terms and rates for leasing of wholesale services. For example, the 2009 decision by BT to announce accelerated deployment of its FTTC product is attributed by most analysts to more favorable wholesale terms granted by Ofcom.

[57] Data available at www.ectaportal.com. Similar data may be obtained from the European Commission's Information Society annual regulatory "implementation" reports (available at http://ec.europa.eu/information_society/policy/ecomm/implementation_enforcement/index_en.htm). These data are virtually identical to the ECTA data, differing only slightly because the months used for reporting are slightly different, *i.e.*, September vs. October.

to the change in policy, the rate of increase in UK broadband lines was 41 percent greater than the rate of increase in the EU-15. In the three years following the implementation of the new Ofcom policy, UK broadband line growth fell to 21 percent, and EU-15 broadband line growth fell to 23 percent.[58] (See Figure 2.) Thus, the new policy has been associated with a severe decline in UK growth relative to the growth in the EU-15. Indeed, the UK broadband growth rate is now less than the average rate for the entire EU-15, and broadband penetration in the UK has fallen relative to EU-15 penetration in the three years that the policy has been in place.

FIGURE 2



2. Broadband Growth in Australia, Italy, New Zealand and Sweden

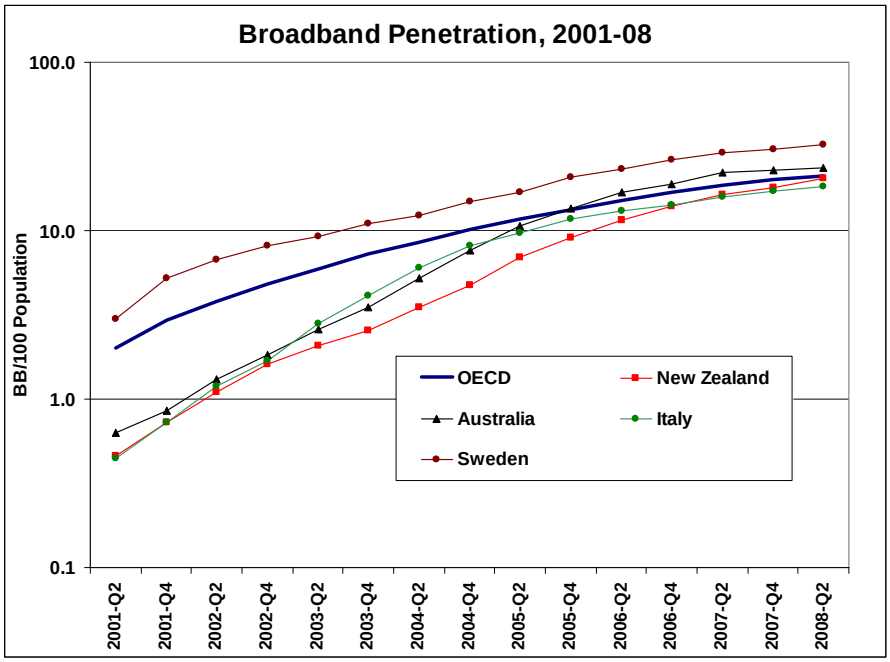
In three of the four other countries where vertical separation has been implemented – Australia, Italy, and New Zealand – broadband growth was greater than the OECD average at the time the new policy was under discussion and ultimately implemented, but subsequently subsided to be approximately equal to or even somewhat below the OECD average. In the other country, Sweden, broadband penetration has been consistently above the OECD average and continues to grow as rapidly as the OECD average, despite the maturity of the Swedish market.

Figure 3 shows the broadband penetration in each country using a logarithmic scale on the vertical axis; the slope of each curve thus reflects the growth rate in broadband penetration. As shown by the fact that the lines become flatter over time, each country's growth rate slowed in recent years despite (or perhaps because of) the threat or reality of vertical separation.

[58] The most recent ECTA data are for the third quarter of 2008.

Sweden, on the other hand, remains substantially above the OECD average, but the growth of Swedish broadband appears to have been unaffected by policy changes.

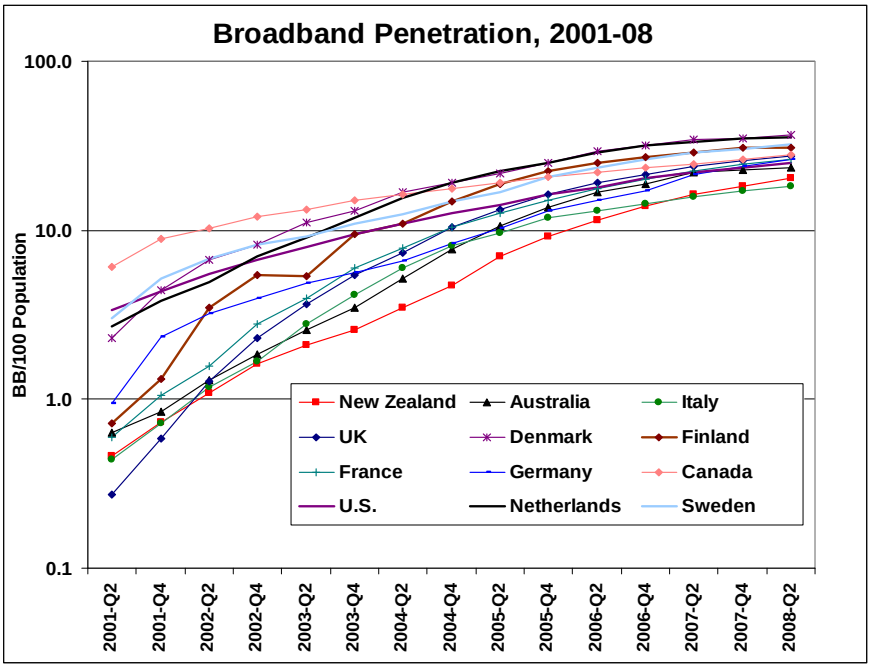
FIGURE 3



Source: OECD

In fact, if one plots the growth of broadband across most of the major OECD countries, one observes a convergence in both the level and the rate of growth of broadband penetration, as shown in Figure 4. Still, however, four of the five countries with vertical separation – Australia, Italy, New Zealand, and the UK – remain at or near the bottom in terms of broadband penetration. Their new vertical separation policies have not resulted in more rapid broadband growth.

FIGURE 4



Source: OECD

B. *Network Investment and Fiber Deployment*

In recent years, incumbents in Japan, Korea and the United States have embarked on major programs to deploy fiber to the home (FTTH) so as to be able to offer video and super-fast broadband connections, and significant fiber deployments are also underway in a handful of European countries. However, incumbent carriers generally are not deploying FTTH infrastructures, especially in countries that have imposed mandatory vertical separation, suggesting that such deployments are indeed being hampered by mandatory separation. Moreover, the governments of three of the five countries (the U.K., Australia, and New Zealand) recently have announced plans to spend billions of public dollars to subsidize deployment of NGN broadband infrastructures, even in non-rural areas, suggesting that mandatory separation has reduced private incentives to invest in NGN infrastructure sufficiently to require large public subsidies.

1. *Network Investment and Fiber Deployment in the United Kingdom*

In public presentations, Ofcom officials often claim that capital spending by British Telecom is greater than that of all other EU-15 incumbent telephone companies, thereby suggesting that Ofcom's policy has actually encouraged capital spending by BT. While this assertion is not quite correct, it is indeed true that BT's capital expenditures per line or per unit revenue are among the highest in the EU-15, though they are substantially below those of the two large U.S. incumbent carriers. In its latest annual report, BT reported that its capital expenditures were 15.7 percent of revenues for the fiscal year ending March 31,

2008. By contrast, in 2007, Verizon and AT&T invested more than 20 percent of revenues in their fixed-wire operations.[59]

Among the eleven EU-15 incumbents that break out their fixed-wire and wireless spending, BT ranks second in capital spending per dollar of revenues. Much of this expenditure may simply reflect the dreadful condition of BT's network at the end of the 20th century. Capital spending by all carriers declined substantially after the telecom stock market bubble burst in 2000-01. Since 2003, when telecom capital expenditures reached their recent nadir, BT's capital spending has risen by 33 percent and by 28 percent in U.S.$ (PPP).[60] By contrast, the average spending by 12 EU-15 incumbent carriers for which data are available rose by 49 percent in U.S.$ (PPP).

Recent data for EU carriers' fixed-wire operations are often not reported, but BT's capital spending growth since 2005 is not generally above that of the largest carriers for which data are available. Between 2005 and 2007, BT's capital spending rose by 10 percent. By contrast, between 2005 and 2007 fixed-wire capital expenditures rose by 18 percent at Telefonica and 17 percent at Deutsch Telekom, while declining by three percent at Telecom Italia. In short, there is no evidence that BT's capital spending has risen relative to other carriers since the change in regulatory policy in the UK.

With respect to fiber deployment, the U.K. is lagging behind many European countries as well as leaders like Japan, Korea and the U.S., a fact which has been recognized by Ofcom since at least 2007,[61] and which was emphasized by the Brown Government's June 2009 *Digital Britain* report, which concluded:

> Policies of the last 25 years have injected competition to the market and extracted value from the infrastructure. We have over this period seen significant investments in successive generations of mobile networks and the cable network. *But in other infrastructures, and in particular the copper fixed telecoms network, the competitive market has delivered significant upgrades in performance, but not the massive investment required to redevelop the fundamentals of network infrastructure*.[62]

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[59] All data are from the companies' annual financial reports. It is necessary to eliminate Verizon's and AT&T's wireless spending in order to compare their spending with BT's capital expenditures. BT spun off its wireless operations in 2001.

[60] All BT data are for the year ending the following March 31. Thus, this calculation is based on the change in capital spending for the years ending March 31, 2004 and March 31, 2008. All other carriers' data are for calendar years.

[61] *See, e.g.,* Ofcom, *Future Broadband: Policy Approach to Next Generation Access* September 26, 2007) at 24 ("From this assessment of the UK's specific situation, it appears likely that the UK will witness later deployment of large scale next generation access networks than some other countries.") (hereafter *Ofcom September 2007 Report*).

[62] Department for Culture, Media and Sport and Department for Business, Innovation and Skills, *Digital Britain: Final Report* (June 2009) (hereafter *Digital Britain Report*) (emphasis added).

While Ofcom attributes this lag to a variety of factors – none of which implicate its mandatory separation regime[63] – two facts are unavoidable: First, the cable and wireless sectors have not been subjected to the same types of unbundling and mandatory separation regimes that have been applied to BT's fixed wireline network, and both sectors are investing heavily in infrastructure – most notably Virgin Media which, as the *Digital Britain* report notes, is in the process of rolling out 50 Mbps service throughout its national cable network, covering 50 percent of U.K. homes.[64]

Second, both Ofcom and BT have spent a tremendous amount of time and energy over the past few years grappling with precisely the sorts of issues theory suggests would prove problematic in a vertically separated environment: How to deploy a next generation network in a manner that is "competitively neutral" among the various resellers. Faced with demands from different types of resellers for different types of mandatory access, Ofcom has been decidedly indecisive. On the one hand, its most recent policy statement, in March 2009, states firmly that "We are not going to protect existing business models at the expense of future developments and new services for consumers."[65] At the same time, however, the agency promises to protect consumers from "forced migration, the removal of existing retail products and negative impact on competition" that might result from the transition to NGN networks.[66] Of course, each competitor who might potentially be harmed by a transition will argue precisely these points, i.e., the harm that would be done to *its consumers* if it were forced to alter its business plans to accommodate a new technology.

Ofcom's March 2009 report also focuses on the likelihood that, due to network architecture issues we discuss further below, network sharing arrangements in an NGN environment are likely to be "active" (i.e., involving the use of shared electronics") rather than "passive" (i.e., involving only the sharing of physical infrastructure such as the last mile loop).[67] But Ofcom concedes that active sharing poses difficult challenges associated with standardization, that negotiations among industry participants (i.e., between BT and its downstream customers) may prove unsuccessful in resolving these issues, that as a result Ofcom might be forced to set detailed technological specifications, and that, even so, "there remains a risk that active products will not satisfy competitors' requirements."[68]

In June 2009, Ofcom modified its network unbundling requirements for BT's deployment of fiber to the cabinet (FTTC) technology.[69] It will now allow

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[63] *See Ofcom September 2007 Report* at 19-21.

[64] *Digital Britain Report* at 13.

[65] *See* Ofcom, *Delivering Super-Fast Broadband in the UK: Promoting Investment and Competition* (March 3, 2009) at 64 (hereafter *Ofcom March 2009 Report*).

[66] *Ofcom March 2009 Report* at 63-64.

[67] *Ofcom March 2009 Report* at 30-36.

[68] *Ofcom March 2009 Report* at 35.

[69] *Ofcom, Variation to BT's Undertakings under the Enterprise Act 2002 related to Fibre-to-the-Cabinet* (June 11, 2009).

Openreach to control the electronic equipment required to operate the FTTC product as long as BT commits to passing 500,000 homes with FTTC by the end of 2010. In the past, Openreach simply offered passive last-mile connections, but Ofcom decided to change its rules for FTTC in order to encourage the FTTC rollout. It has also launched a new consultation on the regulation of Next Generation Networks, perhaps in response to the rather gloomy assessment of the prospects for BT's fixed network provided by the *Digital Britain Report*.[70]

In the meantime, the Government has now proposed a new 50p per line tax on fixed line telephone service in order to support a Next Generation Fund that will provide public funding for NGN deployment to as much as a third of the country. The Fund would "ensure a coherent framework for network designs, operating systems, common processes and regulatory requirements so the next generation access networks across the country work as effectively as possible for all parties."[71]

In short, while other nations are rolling out FTTH infrastructures, and its own cable operator is deploying DOCSIS 3.0, the UK's plans for upgrading the traditional wireline network are dependent on the outcome of a long and difficult negotiation between and among BT and its downstream retail customers, with Ofcom (and perhaps now the government's Next Generation Fund) serving as mediator and referee, for which there is no certainty of success, or even completion. These are precisely the sorts of "transactions costs" economists have in mind when describing the economic efficiency benefits of vertical integration, and, conversely, precisely the sorts of difficulties we would expect to find when vertical dis-integration is mandated.

2. *Network Investment and Fiber Deployment in Australia, Italy, New Zealand and Sweden*

While there are many differences between the regulatory regimes and market circumstances in Australia, Italy, New Zealand and Sweden, one thing all four countries have in common is that their incumbent, vertically separated telephone companies are not actively rolling out last-mile fiber infrastructures

To be sure, most EU incumbents are not actively deploying fiber, with the primary exceptions being Telia-Sonera (in Finland), France Telecom,[72] T-Com

[70] In July 2009, BT announced it would pass up to one million homes with FTTC or FTTH broadband by early 2010, a significant increase over its current plans. Given the "stop-start" history of BT's recent fiber deployment plans, however, it remains to be seen whether this commitment will be met. *See*, e.g., Ray Le Maistre, "BT Ramps Its FTTx Plans," *Light Reading Europe* (July 9, 2009) (available at http://www.lightreading.com/document.asp?doc_id=179019).

[71] *Digital Britain Report* at 65.

[72] France Telecom has begun a modest rollout of fiber, apparently in Paris, but the principal supplier of FTTH services in France is the cable company, Numericable, which is not subject to telecom regulation. Numericable had passed an estimated 3.4 million homes by December 2008, according to IDATE, while France Telecom had passed just 500,000.

(Slovakia), and Telefonica, but these deployments still account for less than 15 percent of the homes/buildings passed by FTTH systems in the EU. A recent tabulation of fiber deployments in Europe, by IDATE shows that the fiber deployments in the EU are generally being undertaken by public authorities, cable companies, electric utilities, or new competitive carriers, not the incumbent carriers.[73]

The two incumbents that have succumbed to functional separation – Telia-Sonera and Telecom Italia – have not yet begun to roll out fiber to the premises. While Telia-Sonera began to roll out fiber to the home in 15 major cities in Finland in 2007, it has not launched a similar program in Sweden. Nor has Telecom Italia begun to deploy fiber to the premises. In Italy, FTTH is being deployed aggressively by a non-incumbent carrier, Fastweb, which is owned by a non-EU incumbent, Swisscom, which is thus doubly insulated from the EU's penchant for promoting functional/structural separation.

In Australia, the imposition of operational separation was an integral part of what has become a four-year regulatory tug-of-war between incumbent Telstra, on the one hand, and the Australian Consumer and Competition Commission (ACCC) and Department of Broadband Communications and the Digital Economy (DBCDE), on the other. The central issue in the debate has been the ACCC's insistence on an aggressive program of local loop unbundling (ULL),[74] and its unwillingness (or inability) to credibly commit to forbearing from applying mandatory unbundling to Telstra's proposed (but thus far un-built) FTTN network.[75] As a result, Telstra has invested billions in its relatively unregulated backbone, 3.5G wireless, and HFC infrastructures, while significantly reducing investment on traditional last-mile access facilities.[76] In a tacit admission that the regulatory regime is incapable of supporting private-sector investment in a next generation network, the Australian government

[73] *See* IDATE, "Inventory of FTTH in Europe," (February 11, 2009). Notably, Telefonica decided to begin rolling out a new FTTH only when its regulator apparently provided it with assurances that Telefonica would not be subjected to intrusive regulation of its new fiber facilities. In its 2008 Annual Report, Telefonica noted that: "As for broadband, 2008 marked the definition of the regulatory framework applicable to the rollout of new generation access networks using optic fiber and the services provided over them, enabling the launch at year-end of a new family of Future services. Among the noteworthy principles established by the sector watchdog in the regulations governing the new generation networks (NGNs) is the express acknowledgement that to foster investment and innovation, NGN regulations need to differ significantly from the rules governing copper networks." *See* Telefonica, *Annual Report 2008*, at 152-3.

[74] In urban areas, ULL is offered at prices sufficiently low that Telstra's primary competitor, Optus, relies on ULL to serve new customers even when those customers are passed by Optus' own hybrid-fiber network.

[75] *See*, e.g., Jeffrey A. Eisenach and Hal J. Singer, "Irrational Expectations: Can a Regulator Credibly Commit to Removing an Unbundling Obligation?" AEI-Brookings Joint Center Working Paper No. 07-28 (December 2007) (available at: http://ssrn.com/abstract=106516).

[76] For example, Telstra's investment in fixed customer access facilities dropped by 21.4 percent in the year following imposition of operational separation, despite increased spending on its unregulated HFC network. *See* Telstra, *Annual Report 2007* at 44-45.

announced in April 2009 its intention to start a new venture, the National Broadband Network (NBN) Corporation, for the purpose of investing up to AU$43 billion (about U.S. $32 billion) in a new FTTH network.[77] At the same time, the government requested comments on a proposal to impose functional separation on Telstra.

The situation in New Zealand is similarly fluid. Telecom New Zealand committed, as part of the undertakings associated with functional separation, to invest in a FTTN network, though it is unclear how rapidly that investment is proceeding. After all, "Separation Day" occurred only slightly more than a year ago. In the meantime, as in Australia, the government has announced plans to build out an open-access fiber network through a public-private partnership, with the government investing up to NZ$1.5 billion (about U.S. $1 billion).[78] Telecom New Zealand would be prohibited from participating in the project unless it agreed to complete structural separation. As with the UK and Australia, it is difficult to interpret the government's decision except as a tacit admission that its regulatory policies have made it uneconomic for the private sector to build a fiber network without government subsidies.

VI. IS VERTICAL SEPARATION AN OPTION FOR THE U.S.?

Proposals to vertically separate telecommunications operators were advocated aggressively in the U.S. in the years immediately following passage of the Telecom Act, when mandatory unbundling played a major role in U.S. telecom policies. With the FCC's decisions (in 2003-2005) to repeal UNE-P and line sharing, and to forbear from imposing unbundling on broadband networks, the underlying rationale for vertical separation evaporated.

Now, some critics of U.S. policies are pressing policymakers to reverse course on mandatory unbundling and, having done so, to require vertical separation. For example, in a recent paper published by the New America Foundation, Marvin Ammori argues for full structural separation of copper, fiber and cable networks (as well as separation of wireline from wireless);[79] or, if structural separation were to prove politically untenable, then "functional separation [is] a necessary minimum baseline."[80] Further, Ammori concludes that "even if unbundling is not enacted, separation should be," as the network

[77] *See* Department of Broadband Communications and the Digital Economy, *National Broadband Network: Regulatory Reform for 21st Century Broadband Discussion Paper* (April 2009) at 7.

[78] Government of New Zealand, *Broadband Investment Initiative: Draft Proposal for Comment* (March 31, 2009) (available at www.med.govt.nz/upload/63958/Final-broadband-initiative-consultation-document.pdf).

[79] *See* Martin Ammori, "Competition and Investment in Wireline Broadband," in Amit M. Schejter, ed., *And Communications for All: A Policy Agenda for a New Administration* (Washington: New America Foundation/Lexington Books, 2009) 81-108, at 95-97. The full New American Foundation working group of which Ammori was a part also endorses structural separation. *See* Schejter at xii.

[80] *See* Ammori at 97.

company would then have "some incentives to deal with unaffiliated ISPs and other retail providers."[81]

For reasons we have explained elsewhere,[82] we disagree with Ammori's key premises. That is, we believe the evidence demonstrates clearly that U.S. broadband policies are working well, and, in particular, that the U.S. decision to rely on intermodal competition is producing high levels of innovation and investment compared with countries that have relied on mandatory unbundling.

Moreover, the costs associated with reversing nearly a decade of policy choices – and the business decisions and infrastructure investments that have been made on the basis those choices – would be extraordinarily high. For example, largely as a result of its pro-facilities-based competition policies, the U.S. now has widely-deployed digital cable and optical fiber infrastructures which – unlike the aging copper infrastructures of most other OECD countries – are not conducive to unbundling for technical and economic reasons. In view of these facts, and of the evidence presented above, mandatory vertical separation should not be seriously considered as a policy option in the United States.

A. Structural Separation in the U.S. Telecom Sector: A Brief History

The United States is no stranger to structural separation in the telecommunications sector. The 1984 breakup of AT&T is arguably the most famous instance of structural separation in any industry. Moreover, from 1970 until 1986, the FCC imposed structural separation requirements requiring AT&T (and, after the 1984 breakup, the Bell Operating Companies) to provide enhanced communications services (i.e., ISP services) only through structurally separate subsidiaries.

Neither experiment was successful. The breakup of AT&T into separate local and long distance companies which were prohibited from entering each others' markets slowed the development of competition while imposing significant efficiency costs.[83] Ultimately, vertical integration was re-introduced, as the RBOCs were permitted to offer long-distance services and the two major long distance firms, AT&T and MCI, were purchased by AT&T's divested local carriers, SBC and Verizon. As Alfred Kahn noted, "The twenty year experience

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[81] *See* Ammori at 97.

[82] *See*, e.g., Robert W. Crandall, Allan T. Ingraham and Hal J. Singer, "Do Unbundling Policies Discourage CLEC Facilities-Based Investment?" *Topics in Economic Analysis and Policy* 4 (2004), and Jeffrey A. Eisenach, "Broadband in the U.S. – Myths and Facts," in *Australia's Broadband Future: Four Doors to Greater Competition* (Melbourne: Committee for Economic Development of Australia, 2008) 48-59.

[83] *See*, e.g., Paul W. MacAvoy, "Testing for Competitiveness of Markets for Long Distance Telephone Services: Competition Finally?" *Review of Industrial Organization* 13: 295–319, (1998).

with AT&T's dissolution should have increased our respect for the potentially large economies of scope in telecommunications."[84]

The other major U.S. experiment with structural separation was the FCC's decision, under its *Computer I* and *Computer II* orders,[85] to require AT&T (and, after 1984, its local subsidiaries) to offer enhanced telecommunications services through a separate (wholesale) subsidiary. In its landmark 1986 *Computer III* decision,[86] the FCC reversed course, concluding that the efficiency costs of structural separation outweighed any possible benefits. Specifically, the Commission found that:

> Structural separation effectively prohibits the offering of all enhanced services that could be efficiently integrated or collocated with AT& T's basic services, but that cannot be offered on a cost-effective basis subject to structural separation. Thus, as a result of our regulatory requirements, services that would provide valuable benefits to the public may never be offered…. Structural separation for AT&T's enhanced services operations may also potentially deny it the opportunity to realize economies of scope from the commonality of inputs (such as technology and expertise) that it uses to create its different products…. The costs of foregone opportunities for new services and scope economies are supplemented by the more obvious direct costs of duplicating personnel and facilities.[87]

Accordingly, the Commission concluded that "our structural separation requirements create significant inefficiencies for AT&T and consumers in the enhanced services market and should be removed and replaced with appropriate nonstructural safeguards."[88]

The failures of these two experiments with structural separation may partially explain why – despite strong urgings from new entrants to do so – the U.S. did not adopt a structural separation mandate as part of its efforts to implement mandatory unbundling under the Telecom Act. Instead, the U.S. pursued a "behavioral" approach, imposing and enforcing a "carrot and stick" system of incentives to encourage incumbents to offer wholesale services on a non-discriminatory basis.

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[84] Alfred E. Kahn, *Lessons from Deregulation: Telecommunications and Airlines after the Crunch* (Washington, DC: AEI-Brookings Joint Centre for Regulatory Studies, 2004) at 24.

[85] Federal Communications Commission, *Regulatory and Policy Problems Presented by the Interdependence of Computer and Communications Services and Facilities, Tentative Decision*, 28 FCC 2d 291 (1970); *Final Decision and Order*, 28 FCC 2d 267 (1971); *Amendment of Section 64.702 of the Commission's Rules and Regulations (Second Computer Inquiry), Final Decision*, 77 F.C.C.2d 384 (1980).

[86] Federal Communciations Commission, *Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry), Report and Order*, 104 FCC.2d 958 (1986) (Hereafter *Computer III Order*).

[87] *Computer III Order* at ¶¶79-81.

[88] *Computer III Order* at ¶79.

The regulatory carrot was based on the government's desire to "re-integrate" local and long distance services by allowing RBOCs to enter the long distance market, which the RBOCs (recognizing that they were the low-cost providers of the service) were obviously eager to do. Thus, the 1996 Telecommunications Act conditioned RBOC entry into interLATA long-distance markets on their completing Section 271 of the Act's "14-point checklist" of market opening steps, such as creating non-discriminatory OSS systems for provisioning of services by wholesale customers.[89] The 14-point checklist was ultimately transformed by the FCC into thousands of pages of detailed performance standards, each of which had to be met by the RBOCs on a state-by-state basis before they were permitted to enter the long distance market.

The 1996 Act also provided for a robust regulatory stick. Under Section 251 of the Act, and corresponding provisions of state regulatory statutes, all incumbent local exchange carriers (ILECs, including smaller incumbent telephone companies as well as the seven RBOCs) were required to unbundle all network elements "necessary" for competitors to compete successfully or without which the competitors would be "impaired."[90] In implementing these provisions, the FCC specifically imposed non-discrimination requirements,[91] which were enforceable (and enforced) by large fines.[92]

While most of the patients ultimately died in the end, the U.S. policy was at least a therapeutic success. By the end of 2004, entrants had captured nearly 33 million lines, of which approximately 60 percent were leased from the incumbent carriers.[93] Thus, the behavioral approach to unbundling adopted by the FCC allowed entrants to obtain access to unbundled facilities with relatively little difficulty.[94] Unfortunately, few of these carriers had viable business plans, and most vanished or were acquired at pennies on the dollar. Accordingly,

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[89] *See* 47 U.S.C. § 271.

[90] *See* 47 U.S.C. § 251(d) (2).

[91] Federal Communications Commission, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, First Report and Order,* CC Docket No. 96-98 (August 1, 1996), at at ¶ 307-316 and Section V.J. (hereafter *First Report and Order*).

[92] *See* e.g., *Goldwasser v. Ameritech Corporation*, 222 F.3d 390 (7th Cir.2000) at 402 ("[T]he process established in §252 of the 1996 Act for review of negotiated [wholesale] agreements, both for substance and for implementation, provides an extra safeguard ….Furthermore, the record thus far is one of active use of these review procedures; there would be no basis at all to find that they are illusory.")

[93] *See* the FCC's semiannual *Local Competition* reports, available at http://www.fcc.gov/wcb/iatd/comp.html. The reported share of entrant lines accounted for by unbundled incumbent subscriber loops varies slightly depending on the source of the data used by the FCC. *See*, in particular, Tables 3 and 4 of recent *Local Competition* reports.

[94] For a discussion of the causes of the CLECs' demise, *see* Larry F. Darby, Jeffrey A. Eisenach and Joseph S. Kraemer, "The CLEC Experiment: Anatomy of a Meltdown," Progress on Point 9.23, *The Progress & Freedom Foundation* (September 2002).

competitors' arguments for vertical separation, though pressed aggressively at both the state and Federal levels,[95] were ultimately rejected.[96]

B. Unlike Countries That Have Adopted Functional Separation, the U.S. Has Virtually Ubiquitous Platform Competition

As noted above, the U.S. experiment with mandatory unbundling under the Telecom Act was limited primarily to voice services. By contrast, the modern debate over unbundling (and hence separation) is focused on broadband services and next generation networks. Thus, the question for policymakers is the extent to which infrastructure competition is feasible in the market for broadband communications now or in the future; and, to the extent it is not feasible, whether the benefits of unbundling (and hence allowing competition among retailer/ISPs) exceed the costs. A decision by regulators to impose mandatory unbundling is a necessary (but far from sufficient) condition for even considering a vertical separation mandate.[97]

We do not propose to fully address the nature of competition in broadband markets or the pros and cons of mandatory unbundling in this article. We do note, however, that the case for mandatory unbundling is weaker in the United States than in most other OECD countries due to the presence of multiple competing broadband infrastructures in the U.S. In contrast to most OECD countries, which rely primarily on xDSL services provided over the last-mile copper networks of telephone company incumbents, the leading broadband modality in the U.S. is cable modem service, which is available to 93 percent of U.S. households (compared with only 82 percent availability of DSL service),

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[95] *See*, e.g., T. Randolph Beard, George S. Ford and Lawrence J. Spiwak, "Why ADCO? Why Now? An Economic Exploration into the Future of Industry Structure for the 'Last Mile' in Local Telecommunications Markets," *Phoenix Center Policy Paper Number 12* (November 2001).

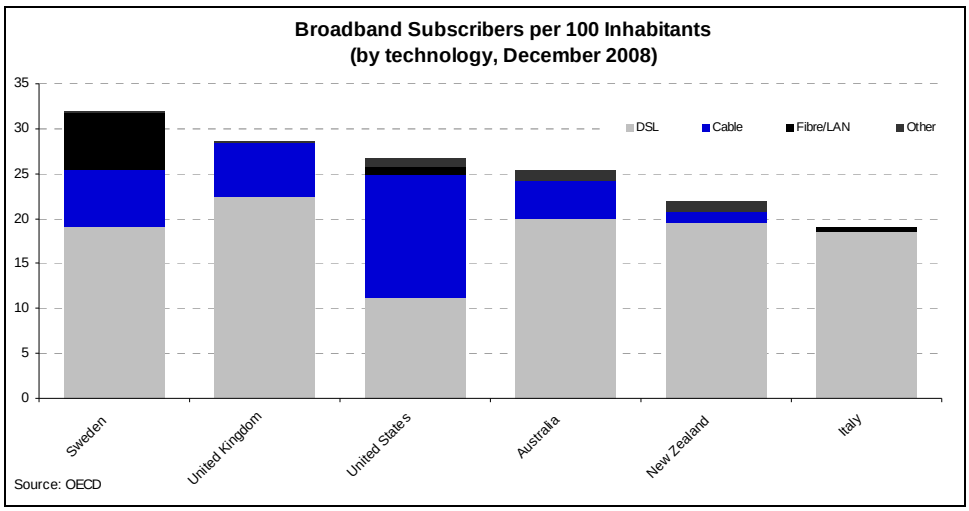
[96] The high water mark came in Pennsylvania in 2000-2001, where the Pennsylvania PUC tentatively ordered structural separation by Verizon before concluding the benefits would be *de minimus*. *See* Pa. Pub. Util. Comm'n., *Structural Separation of Bell Atlantic-Pennsylvania, Inc., Retail and Wholesale Operations (Opinion and Order*), Dkt. No. M-00001353 (March 22, 2001), n. 36 at ("[A]nything less than full structural separation would require continuing regulatory oversight, even though part of our goal in deregulating the industry is to reduce oversight. However,…even with the implementation of structural separation of Verizon's wholesale and retail arms, no less regulatory oversight than that currently prevailing will be required to ensure compliance.") For more on the U.S. debate over structural separation, see, e.g., Robert W. Crandall and J. Gregory Sidak, "Is Structural Separation of Incumbent Local Exchange Carriers Necessary for Competition?" *Yale Journal on Regulation* 19 (2002) and Jeffrey A. Eisenach, Randolph J. May, and Charles A. Eldering, "Regulatory Overkill: Pennsylvania's Proposal to Breakup Bell Atlantic," Progress-on-Point 6.13, *The Progress & Freedom Foundation* (December 1999).

[97] In this regard, we find Ammori's suggestion that structural separation be required even in the absence of mandatory unbundling to be nonsensical, since the only plausible rationale for creating two companies is to ensure that the "monopoly" network provider sells its services on a wholesale basis to multiple retailers on a non-discriminatory basis, i.e., that it unbundles.

and which accounts for over 45 percent of all broadband subscriptions (compared with 31 percent for xDSL).[98]

Figure 5 below shows broadband subscribers per 100 inhabitants, by technology (excluding mobile wireless), as reported by the OECD for the U.S. and for the five countries that have adopted some form of mandatory separation. As the figure indicates, cable modem accounts for more than 50 percent of U.S. broadband subscribers as measured by the OECD, compared with 21 percent for the UK, 19 percent for Sweden and 17 percent for Australia.[99] Simply put, the U.S. – at least in part because of its decisions to rely on infrastructure competition rather than mandatory unbundling in the past – is now blessed with two nearly ubiquitous broadband infrastructures, a fact which distinguishes it from most other OECD countries.

FIGURE 5



Moreover, competition in the U.S. is growing rapidly as new infrastructure competitors enter the market and existing competitors invest in major infrastructure upgrades. On the wireline front, both major U.S. telcos are investing heavily in fiber, AT&T with its FTTN U-Verse project and Verizon with FiOS, an FTTH network that now passes more than 13 million premises. In response, cable companies have begun upgrading their infrastructures to DOCSIS 3.0, which permits download speeds of up to 160 Mbps.

The U.S. is also well-served by mobile broadband. All four national wireless operators offer 3G services, and 92 percent of Americans live in census blocks

[98] *See* Federal Communications Commission, *High-Speed Services for Internet Access.as of December 2007*, Chart 4. Based on "advanced services lines," i.e., those providing more than 200 Kbps service in both directions.

[99] Sweden's apparently robust platform competition comes from FTTH, which has been provided by municipal governments at very high costs. It is curious that the Swedish national regulator should take such a dim view of the strength of this platform competition that it feels compelled to pursue functional separation of Telia-Sonera, the incumbent.

served by 3G wireless broadband service.[100] Looking ahead, Verizon has committed to rolling out 4G LTE wireless networks beginning in 2009,[101] with AT&T scheduled to begin deployment in 2011.[102] LTE will offer peak download speeds of 50-60 Mbps,[103] allowing it to compete directly with wireline services. At the same time, Clearwire, with $3.2 billion in financing from Google, Intel and some cable companies, already provides fixed wireless broadband services in 47 U.S. cities, and has begun rolling out a 4G Wi-Max network. Analysts now predict that wireless broadband will begin capturing share from wireline services in much the same way.[104]

In short, the U.S. broadband market is distinguished from the markets in many other developed nations by the fact that the copper telecom infrastructure is not the dominant broadband infrastructure. Hence, the case for unbundling the telcos' broadband networks (without unbundling cable as well) is extremely difficult to make on competition policy grounds (and likely also would be difficult to make in court). Moreover, with entry underway by multiple wireless providers, the U.S. market is clearly becoming more competitive, further weakening the prospects for unbundling.

Even the staunchest advocates of regulation seem to agree that infrastructure competition, when it is an option, is the most desirable approach. EU Commissioner Reding, for example, concluded in a recent speech that

> …effective infrastructure competition has been one of the main factors contributing to broadband rollout. Countries such as the Netherlands and Denmark, that have the highest broadband penetration levels in the world ahead of Korea and Japan, are those that have a real choice of infrastructures.[105]

Like Denmark and the Netherlands, the U.S. does have a "real choice of infrastructures," and it therefore seems unlikely that regulators will reverse course and impose mandatory unbundling, let along vertical separation, on the U.S. market.

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[100] Federal Communications Commission, *Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Thirteenth Report*, WT Docket 08-27 (Released January 16, 2009) at 9.

[101] Glenn Fleishman, "Verizon Ups Ante on LTE Deployment: 2009," *Ars Technica* (December 10, 2008) (available at http://arstechnica.com/old/content/2008/12/verizon-says-early-lte-deployment-in-2009.ars).

[102] "AT&T Boosts 3G Data Speeds - Outlines LTE Upgrade Path," Cellular News (May 27, 2009) (available at http://www.cellular-news.com/story/37690.php).

[103] Larry Dignan, "Verizon Wireless: 4G LTE Trials Showing 50 to 60 Mbps Download Rates," *ZDNet* (February 18, 2009) availablea t http://blogs.zdnet.com/BTL/?p=13058).

[104] *See* Nielsen Mobile, *Critical Mass: The Worldwide State of the Mobile Web* (2008).

[105] Viviane Reding, "Why Europe Needs Even More Efficient Telecommunications Markets in Order to be Competitive" (Speech to the Second Business Roundtable with the European Commission, January 2008) at 2.

C. Unbundling Existing U.S. Next Generation Networks Would Be Costly If Not Infeasible

The economic feasibility of unbundling telecommunications networks depends on the architecture of the network. In most European countries, where the rollout of next generation networks is in a very early phase, regulators are debating whether and to what extent they should dictate network architectures in order to ensure the continued viability of unbundling.[106] In the U.S., where deployment of next generation networks is well advanced, that debate is largely settled. The network architectures that have been deployed in the U.S. are not particularly conducive to unbundling, and there is no practical way of modifying them.

Figure 6 is a very simple depiction of the differences between three types of networks, VDSL (i.e., FTTN), point-to-point (also known as "passive optical network," or PON) fiber, and point-to-point (P2P) fiber. Both FTTN and PON infrastructures utilize a shared optical fiber connection from the central office to a cabinet located somewhere near the customers' premises (e.g., in a neighborhood or apartment building). The difference between the two is that, with FTTN, the last mile connection (from the cabinet to the customer) is copper, whereas with PON it is fiber. P2P fiber, on the other hand, utilizes a separate strand of fiber from the central office to each and every customer premises.

The difference between FTTN and PON, on the one hand, and P2P, on the other, has profound implications for unbundling. In a P2P architecture, competitors could install optical switching equipment in the incumbent's central office, just as they install DSLAMs today to deliver DSL services, allowing them to duplicate the entire network except for the "last mile." With FTTN or PON, on the other hand, competitors would need to deploy equipment in each neighborhood cabinet, which may not be economical due to the larger required investment and reduced economies of scale. In short, it may turn out unbundling of next generation networks is economically feasible only in a P2P infrastructure. If, as European regulators seem to believe, infrastructure-based last-mile competition is also infeasible in many situations,[107] the implication is that facilities-based competition in next generation networks will require regulators not only to mandate unbundling, but also to mandate the architecture of next generation networks so as to make unbundling workable.

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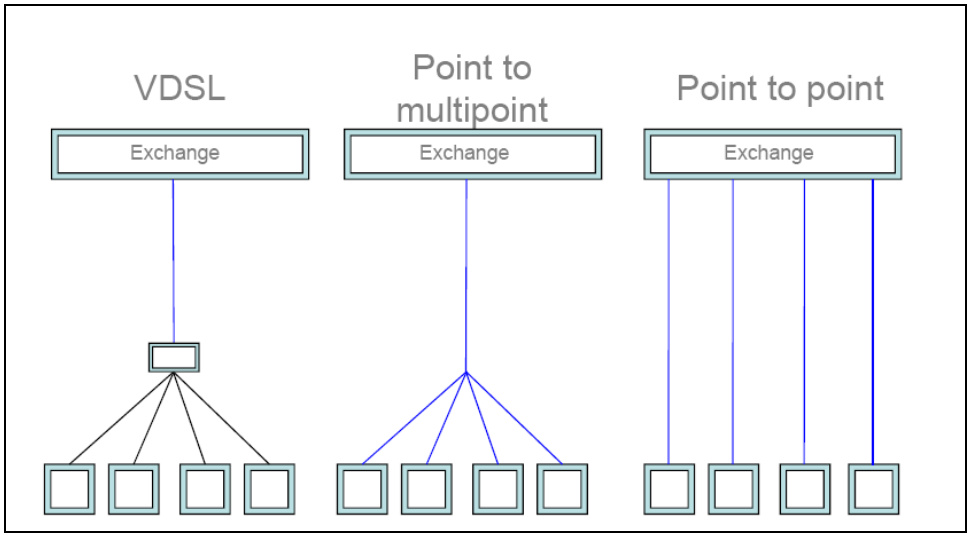
[106] *See*, e.g., European Regulators Group, *ERG Opinion on Regulatory Principles of NGA* (ERG 07-16 Rev 2) (2007) (hereafter *ERG NGA Principles*).

[107] *See*, e.g., *ERG NGA Principles* at vi (concluding that next generation network "investments are likely to reinforce the importance of scale and scope economies, thereby reducing the degree of replicability, potentially leading to an enduring economic bottleneck.")

FIGURE 6:
VDSL vs. PON vs. P2P Network Architectures[108]



While the wisdom of having regulators dictate network architectures and technologies is at best debatable,[109] in the U.S., at least, the issue would appear to be settled. Both major incumbent carriers, AT&T (FTTN) and Verizon (PON), have deployed networks that likely make unbundling economically infeasible. Short of demanding that these two firms literally dig up billions of dollars worth of modern, high-capacity broadband infrastructure, regulators likely have no practical way of imposing an unbundling network on these firms or their broadband networks.[110] And, as we have explained, there is no basis for forcing

[108] From Taylor Reynolds, *Fiber Investment Challenges and Opportunities* (Canberra, Australia, June 6, 2008) at 45.

[109] As between PON and P2P architectures for deploying FTTP, PON has significant economic advantages, and is far and away the most widely deployed. *See*, e.g., Paul Whittlesey, "PON, P2P, or Active Ethernet?" (Wave7Optics, April 2007); *See also* IDate (2009) at 3 (noting that "the momentum in last six months [of European FTTH deployments] has favored GPON.").

[110] Hybrid-fiber-coax networks utilize a fundamentally different architecture from either DSL or FTTH/FTTC. While bitstream access is technically feasible, unbundling (i.e., making available a last-mile "dumb pipe" connection) is not. *See*, e.g., Walter Ciciora, *et al*, *Modern Cable Television Technology 2d Ed.* (Amsterdam: Morgan Kaufmann, 2004) at 5-6, Emy Tseng and Sharon Eisner Gillett, "Open Access to Cable Data Networks" (Massachusetts Institute of Technology) (available at http://dspace.mit.edu/bitstream/handle/1721.1/1520/Tseng-Gillett.pdf?sequence=1), and Federal Communications Commission, *In the Matter of Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, Declaratory Order and Notice of Proposed Rulemaking* (FCC 02-77, March 15, 2002) at ¶¶ 12-19. While "cable network unbundling" is under consideration in some jurisdictions, including Canada and the Netherlands, it would consist of allowing ISPs to offer services over cable, not forced leasing of last-mile physical connections. *See* Canadian Radio and Telecommunications Commission, *Telecom Notice of Consultation: Proceeding to Consider the Appropriateness of Mandating Certain Wholesale High-Speed Access Services* CRTC 2009-261-3 (August 12, 2009) (available at

vertical separation in the absence of mandatory unbundling. Hence, we conclude that the imposition of forced vertical separation in the U.S. is a solution in search of a problem (discrimination associated with mandatory unbundling) that is unlikely to arise in the first place.

VII. CONCLUSIONS

There is both theoretical and empirical support for the proposition that forced vertical separation of telecommunications networks will reduce economic efficiency, slow innovation, and impede performance in markets where it is imposed. Similarly, mandatory unbundling, which vertical separation is supposed to facilitate, has also been shown to harm market performance. The evidence presented here is consistent with both propositions: That is, the evidence shows no increase in either investment or broadband penetration in nations that have mandated vertical separation; indeed, the evidence suggests that vertical separation has impeded the rollout of next generation networks. Despite renewed calls for separation mandates coming from some quarters in the U.S., the growing evidence of its harmful effects, the increasing competitiveness and improving performance of the U.S. market, and the large sunk costs U.S. carriers have made in difficult-to-unbundle infrastructures demonstrate that it would be unwise to impose either mandatory unbundling or vertical separation in the U.S.

http://www.crtc.gc.ca/PartVII/eng/2009/8661/c122_200904286.htm), and Emeka Obiodu, "Dutch Parliament Approves Cable Network Unbundling Bill," *CedMagazine.com* (October 25, 2006) (available at www.cedmagazine.com/dutch-parliament-approves-cable.aspx).