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Phoenix Center Policy Paper Number 41:

***Wobbling Back to the Fire: Economic Efficiency and the
Creation of a Retail Market for Set-Top Boxes***

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Abstract: Under Section 629 of the Communications Act, Congress directed the FCC to adopt regulations to promote a retail market for set-top boxes. The Commission's first attempt was the ill-fated CableCard experiment, which—by the Commission's own admission—was a dismal failure. In response, the Commission is now contemplating an aggressive new "AllVid" regime, whereby the agency would mandate multichannel video program distributors ("MVPDs") to provide an adapter to serve as a "common interface for connection to televisions, DVRs, and other smart video devices." Because the FCC is again proceeding without any formal economic analysis of the nature of the service-equipment relationship in the MVPD market, we do so here and our findings are significant. First, our theoretical analysis reveals that the set-top box conveys no additional market power to the MVPD. Second, our analysis indicates that the MVPD has no anticompetitive preference for self-supply. If the equipment can be produced more efficiently and sold at a lower price in a competitive retail market, then the provider will embrace such a market. Third, we show that a government-directed commercial market for set-top boxes is unlikely to provide substantial gains in terms of lower costs, lower prices, or increased innovation. If the set-top box can be made cheaper and sold at a lower price, or made better and sold at the same price, then the MVPD will embrace these changes. In sum, MVPD profits and consumer surplus are aligned. Accordingly, our analysis indicates that until the underlying economic reality changes, perhaps due to some technological innovation, the FCC's anticipated aggressive AllVid approach towards set-top boxes is likely—as FCC Commissioner Robert McDowell notes—to keep the agency in "the Valley of Unattained Goals."

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I. Introduction

As part of the sweeping Telecommunications Act of 1996, Congress directed the Federal Communications Commission to adopt regulations “to assure the commercial availability ... of converter boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming ... from manufacturers, retailers, and other vendors...”¹ Yet, despite considerable effort and at least a billion dollars (if not more) spent to implement the agency’s CableCard regime,² the FCC recently conceded that its

¹ Communications Act Section 629, 47 U.S.C. § 549(a).

² *Infra* Section III.

“efforts [to implement Section 629] to date have not led to a robustly competitive retail market for navigation devices that connect to subscription video services.”³ Indeed, only about one percent of navigation devices are purchased at retail.⁴ This profound lack of interest in such devices, which are available at big-box electronic stores, is a significant indictment of the agency’s implementation of Section 629. If the acquisition of set-top boxes in a commercial market had even a moderate consumer interest, then it seems reasonable to assume that the share of the market for such devices would be higher than one percent.⁵

Frustrated by its billion-dollar policy dud, the agency has recently expressed a renewed interest in Section 629.⁶ In its *National Broadband Plan*,⁷ and then in a subsequent *Notice of Inquiry*,⁸ the agency contemplates a do-over for Section 629, hoping that another hard-line regulatory approach will succeed where the CableCard paradigm has failed. The Commission’s new “AllVid” proposal

³ *In re Video Device Competition*, FCC 10-60, NOTICE OF INQUIRY, ___ FCC Rcd ___ (rel. April 21, 2010) at ¶10 (hereinafter “AllVid NOI”); See also *In re Implementation of Section 304 of the Telecommunications of 1996*, FCC 10-181, THIRD REPORT AND ORDER AND ORDER ON RECONSIDERATION, ___ FCC Rcd ___ (rel. October 14, 2010) (hereinafter *Third Report*) at ¶ 4 (“Unfortunately, the Commission’s efforts to date have not developed a vigorous competitive market for retail navigation devices that connect to subscription video services.”); CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*) at Chapter 4, p. 52 (“Despite Congressional and FCC intentions, CableCards have failed to stimulate a competitive retail market for set-top boxes.”)

⁴ *Third Report*, *id.* at ¶ 4.

⁵ Even where consumers do have the option to buy equipment rather than lease (e.g., the cable broadband modem), the demand is low. See, e.g., Letter to C. Kirjner and W. Lake from NCTA, GN Docket Nos. 09-47, 09-51, 09-137; CS Docket 97-80 (December 4, 2009).

⁶ Indeed, in the *National Broadband Plan*, the Commission expressed its exasperation about the failed CableCard experiment, lamenting that a “national or global market with relatively low costs for entry, like that for many consumer electronic markets, should support more than two competitors [i.e., manufacturers of set-top boxes] over time.” *National Broadband Plan*, *supra* n. 3 at p. 52. According to the Commission, this is because “retail set-top boxes have been competing on an uneven playing field” that has “prompted some companies not to enter the market at all.” *Id.* at p. 53 and n. 115 (citing a news article reporting on Steve Job’s reluctance to produce Apple TV as a set-top box with access to traditional TV content through MVPDs).

⁷ See *National Broadband Plan*, *id.*, at 36 (“The FCC should initiate a proceeding to ensure that all multichannel video programming distributors (MVPDs) install a gateway device or equivalent functionality in all new subscriber homes and in all homes requiring replacement set-top boxes, starting on or before Dec. 31, 2012.”)

⁸ *Supra* n. 3.

envisions a regulation whereby the FCC would require multichannel video programming distributors (“MVPDs”) “to provide a small, low-cost adapter that would connect to proprietary MVPD networks and would provide a common interface for connection to televisions, DVRs, and other smart video devices...”⁹ According to the Commission, while this adapter “would perform the conditional access functions as well as tuning, reception, and upstream communication as directed by the smart video device”¹⁰ (e.g., an “AllVid Compatible” DVR, television or home theater personal computer¹¹), the “adapter and the smart video device would communicate with each other using a standard interface, but each adapter would be system-specific to a particular MVPD in order to communicate with its network.”¹²

If this AllVid approach sounds familiar, it should. Conceptually, this scheme follows closely the CableCard idea, in that AllVid is simply a proposal to separate conditional access from other features of the set-top box in the hopes of creating a retail market for the latter. There are, however, a few notable differences between AllVid and the CableCard. First, the FCC seeks to expand the coverage of the regulations to include direct broadcast satellite (“DBS”) providers, which are presently excluded from the CableCard regulatory mandates.¹³ Consequently, the scope of the AllVid regulation is much more expansive and, therefore, will likely be more difficult to design, implement, and administer given the business models of the affected parties and the profound differences in their delivery technologies.¹⁴ Moreover, by applying Section 629 to

⁹ *AllVid NOI*, *supra* n. 3 at ¶ 16.

¹⁰ *Id.*

¹¹ *Id.* at Appendix.

¹² *Id.* at ¶ 16.

¹³ *Implementation of Section 304 of the Telecommunications Act of 1996, Commercial Availability of Navigation Devices*, FCC 98-116, REPORT AND ORDER, 13 FCC Rcd 14775 at ¶ 64 (1998) (hereinafter “*Navigation Devices Order*”), *aff’d*, *General Instrument Corp. v. FCC*, 213 F.3d 724 (D.C. Cir. 2000).

¹⁴ *AllVid NOI*, *supra* n. 3 at ¶ 12 (“most consumer electronics manufacturers acknowledge that an attempt to establish standards for navigation devices that would work with each of the different delivery technologies without some intermediation would be impractical and prohibitively expensive”). Recently, the FCC used its Section 629 authority to expressly regulate both the price of equipment and video service. See *Third Report*, *supra* n. 3 at ¶19 (“Accordingly, we also adopt a rule that requires cable operators to reduce the price of packages that include set-top box rentals by the cost of a set-top box rental for customers who use retail devices, and prohibits cable operators from assessing service fees on consumer owned devices that are not imposed on leased devices. These price reductions must reflect the portion of the package price that is reasonably allocable to the device lease fee.”)

the DBS industry, the agency would effectively impose new price regulation of equipment on satellite providers,¹⁵ thus widening the scope of price regulation overall in the communications industry. Finally, the Commission seeks not merely to make set-top boxes for MVPDs commercially available as mandated by the statute, but intends for AllVid-compatible devices to accommodate the services of non-MVPD sources such as over-the-top video services.¹⁶

As is too often the case with bold Commission policy initiatives, the agency's aggressive attempt to implement Section 629 has proceeded entirely without any formal economic analysis of the nature of the service-equipment relationship in the MVPD market. We attempt to remedy that shortcoming in this PAPER. Our findings are potentially significant in several respects.

First, in contrast to the common view that the self-supply model of set-top boxes is anticompetitive and anti-consumer, our theoretical analysis reveals that the set-top box conveys no market power to the MVPD, even under the assumption of monopoly supply for multichannel services (so that market power exists). Set-top boxes are necessary appendages (i.e., complements) to subscription video services and, as such, the provider can obtain all profits from the service itself.¹⁷

Second, our analysis indicates that the MVPD has no anticompetitive preference for self-supply. If the equipment can be produced more efficiently and sold at a lower price in a competitive retail market, then the provider will embrace such a market to the benefit of both provider and the consumer. However, if the equipment can be sold at a lower price through self-supply, then the providers prefer that option, also to the benefit of both provider and consumer.

¹⁵ According to Section 629(a), FCC "regulations shall not prohibit" any MVPD from also offering converter boxes to consumer "if the system operator's charges to consumers for such devices and equipment are separately stated and not subsidized by charges for any such service." Thus, under Section 629, firms do not have complete freedom to set prices for set-top equipment.

¹⁶ *AllVid NOI*, *supra* n. 3 at ¶ 17 ("This approach would provide the necessary flexibility for consumer electronics manufacturers to develop new technologies, including combining MVPD content with over-the-top video services (such as videos offered from, for example, Amazon, Hulu, iTunes, or NetFlix), manipulating the channel guide, providing more advanced parental controls, providing new user interfaces, and integrating with mobile devices.").

¹⁷ National Cable & Telecommunications Association, Reply Comments, MB Docket No. 10-91, at 2 ("set-top boxes are an enabler of our core service, which is video, not equipment").

Third, we show that a government-directed commercial market for set-top boxes is unlikely to provide substantial gains in terms of lower costs, lower prices, or increased innovation. If the set-top box can be made cheaper and sold at a lower price, then the MVPD will embrace the cost reduction; profits are higher and consumers are better off. Also, if the set-top boxes can be made more innovative to increase the value to consumers, then the MVPD is incented to implement that innovation; again, profits are higher and consumers are better off. Since the incentives to reduce prices and increase innovation are intact, the prospects for a forced commercial market leading to lower prices and more innovation are slim. If a commercial market leads to lower costs and more innovation, then there is no reason for the FCC to mandate such a market; it will be willingly adopted by the industry.

When placed within an economic framework, the FCC's heavy-handed approach to Section 629 is shown to be largely misguided. To put it bluntly, it appears "[t]he burnt Fool's bandaged finger goes wobbling back to the fire."¹⁸ MVPDs prefer an efficient outcome, and since markets detest inefficiency, a heavy-handed regulatory approach to Section 629 is doomed to fail as history has shown with respect to the CableCard regime. Thereby, our simple economic analysis of set-top boxes—the first of its kind on this issue—encourages the FCC to substantially reorient its thinking on Section 629. The economics of the service-equipment relationship in multichannel video prescribes a light-touch approach for set-top boxes, one much different from the agency's oppressive AllVid (and CableCard) proposal.

So what is the FCC to do? If the existing market mechanism of self-supply for set-top boxes is, in fact, efficient, then the FCC should table the AllVid proposal, at least for the moment, to see if its recent modifications to the CableCard regime prove successful. This brief pause also permits over-the-top video and other new video delivery technologies to further evolve, which we suspect will dramatically alter the multichannel video market. Given the economics of the matter, however, we are not optimistic that either the Commission's recent modifications to the CableCard regime¹⁹ or its new AllVid proposal will end up with a different result than that observed thus far.²⁰

¹⁸ Rudyard Kipling, *THE GODS OF COPYBOOK HEADINGS* (1919).

¹⁹ *Third Report*, *supra* n. 3.

²⁰ See, e.g., *AllVid NOI*, *supra* n. 3, Statement of Commissioner Meredith Baker ("As we consider a long-term solution, I hope that we recall valuable lessons from the CableCard regime. First, our technological mandates come with significant costs. By one estimate, the cost of

(Footnote Continued. . . .)

Competition is evolving in video delivery without the technology-specific mandates of the FCC in the context of Section 629, and an efficient commercial market for set-top boxes will emerge without regulatory interference. An inefficient commercial market, however, will not evolve naturally and will require government action to create and sustain. As we demonstrate, for the Commission's efforts to implement Section 629 to succeed, it is not simply policy that must change, but rather the fundamental economics of the service-equipment relationship in the multichannel video market. Until the underlying economic reality changes, perhaps due to some technological innovation, the FCC's anticipated aggressive approach to Section 629 is likely to keep the agency in "the Valley of Unattained Goals."²¹ In fact, given present economic conditions, Commissioner McDowell's suggestion that "some may want to ask Congress to consider new options" warrants significant consideration.²²

This PAPER is outlined as follows. In Section II, we provide a brief summary of Section 629. In Section III, we provide a brief overview of the Commission's past attempts to implement Section 629, including discussions of both the CableCard paradigm and its new proposed AllVid regime. We also examine the FCC's (and others') arguments both as to why the CableCard experiment failed, and to why the agency believes a new AllVid regime is required. In Section IV, we present our economic analysis of the problem, and show that because the Commission did not understand the economics of the problem in the first instance, the Commission's efforts to implement Section 629 to date have been doomed to failure. Conclusions and policy recommendations are laid out in Section V.

II. Section 629 of the Telecommunications Act

Section 629 was added to the Communications Act by way of the Telecommunications Act of 1996.²³ Congress, seeing that it was possible to have retail competition for telephone customer premises equipment, passed Section

CableCard compliance for the cable industry alone—costs passed on to cable consumers—has totaled nearly one billion dollars. Second, we should be careful not to mandate particular technological solutions that would freeze into place the current state of technology.”).

²¹ *Third Report, supra* n. 3, Statement of Commissioner Robert McDowell.

²² *Id.*

²³ 47 U.S.C. § 549.

629 with similar aspirations for set-top boxes.²⁴ Under Section 629 of the Act, the FCC

shall adopt regulations ... to assure the commercial availability ... of converter boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems²⁵

The statute also requires that such equipment be commercially available to consumers “from manufacturers, retailers, and other vendors not affiliated with any multichannel video programming distributor.”²⁶ A plain reading of the statute implies that consumers should be able to buy or lease equipment *used by consumers to access MVPD programming offered by MVPDs* from someone other than the MVPD. Generally, MVPDs are not vertically integrated into the manufacturing of set-top boxes, and can purchase boxes from a few different manufacturers (boxes are commercially available to the operators).²⁷ These boxes, however, are typically designed to handle the particular needs of individual MVPDs and, consequently, cannot be shuttled across different MVPD platforms.

Other important statutory constraints lend themselves to the interpretation and implementation of the statute. First, in adopting such regulation, the FCC shall “consult[] with appropriate industry standard-setting organizations.”²⁸ Second, the FCC cannot

prohibit any multichannel video programming distributor from also offering converter boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems, to consumers, if the

²⁴ *AllVid NOI*, *supra* n. 3 at ¶ 4, n. 5.

²⁵ Section 629(a).

²⁶ *Id.*

²⁷ Suppliers of set-top box equipment include, but are not limited to, Pace, Motorola, Cisco, Evolution Broadband, Samsung, Panasonic, ARRIS and Tivo. See Comments of the National Cable & Telecommunications Association, MB Docket No. 10-91; CS Docket No. 97-80; PP Docket No. 00-67 (July 13, 2010) at p. ii.

²⁸ Section 629(a).

system operator's charges to consumers for such devices and equipment are separately stated and not subsidized by charges for any such service.²⁹

Thus, by statute, the MVPD may be active participants in a retail set-top box market, though the prices charged for such equipment are subject to some regulatory constraints.³⁰ (The language of the Act suggests a minimum, cost-based price requirement, an interpretation we will make use of below.)

The statute also provides for the FCC to grant waivers under certain conditions,³¹ and provides some other limitations.³² Sunset provisions permit the FCC to set aside entirely the equipment mandates under three conditions: (1) the market for the multichannel video programming distributors is fully competitive; (2) the market for converter boxes, and interactive communications equipment, used in conjunction with that service is fully competitive; and (3) elimination of the regulations would promote competition and the public interest.³³ In the past, the agency has granted numerous waivers of Section 629³⁴ and, in its initial *Navigation Device Order*, excluded DBS distributors from its implementation mandates.³⁵

²⁹ *Id.*

³⁰ Equipment may also be subject to regulation pursuant to Section 623 of the Act.

³¹ Section 629(c).

³² Section 629(d)(1) and (2).

³³ Section 629(e).

³⁴ See, e.g., *In re Cablevision Systems Corporation's Request For Waiver of Section 76.1204(a)(1) of the Commission's Rules, Implementation of Section 304 of the Telecommunications Act of 1996 Commercial Availability of Navigation Devices*, MEMORANDUM OPINION AND ORDER, 22 FCC Rcd 220 (January 10, 2007); *In re Consolidated Requests For Waiver of Section 76.1204(A)(1) of the Commission's Rules, Implementation of Section 304 of the Telecommunications Act of 1996 Commercial Availability of Navigation Devices*, MEMORANDUM OPINION AND ORDER, 22 FCC Rcd 11780 (June 29, 2007); *In re Guam Cablevision, LLC, Request for Waiver of Section 76.1204(a)(1) of the Commission's Rules, Implementation of Section 304 of the Telecommunications Act of 1996 Commercial Availability of Navigation Devices*, MEMORANDUM OPINION AND ORDER, 22 FCC Rcd 11747 (June 29, 2007).

³⁵ *Navigation Device Order*, *supra* n. 13.

III. Implementation Efforts to Date

The history of how the FCC initially sought to implement Section 629 is tortured and complex, so we provide only a brief history here. Notably, the agency's CableCard proposal has withstood judicial review in numerous cases.³⁶

A. *The Failed CableCard Experiment*

When the FCC first sought to implement Section 629, it had to reconcile the statutory goals of assuring "commercial availability" of navigation devices with that of avoiding any major risks to content security. The FCC reasoned that if it could somehow split a typical set-top box into two separate components—i.e., the operational and functional components on one hand and the access control features on the other—it would be possible to have the first part available through retail outlets and the second part, containing the more sensitive access control apparatus, available only from the service provider (i.e., the cable operator). The FCC, noting the danger of "detailed government standard setting," left it to the cable industry and its national standard-setting organizations to develop the appropriate interface.³⁷ This interface eventually became the "CableCard," which is essentially a "plug in" to commercially available equipment performing ancillary functions.³⁸

But the FCC went one step beyond just instructing the industry to develop the CableCard: The Commission also required cable operators to cease providing new integrated set-top boxes with a rule commonly referred to as the "*integration ban*." (That is, the cable operator must use the CableCard in all of its leased equipment.) While the cable industry fought the integration ban on multiple grounds in court, the FCC prevailed each time.³⁹ Although space constraints prevent a detailed exegesis of every legal argument raised in these cases, of particular interest (and germane to the analysis presented here) was the economic rationale set forth by the FCC in support of the integration ban. Specifically, the Commission argued that although the integration ban may impose short-term costs (i.e., *higher prices* for non-integrated set-top boxes), the Commission predicted that the following long-term benefits would outweigh them: (1) the amorphous "benefits likely to flow from a more competitive and

³⁶ See *infra* n. 39.

³⁷ See *General Instrument Corp. v. FCC*, 213 F3d 724, 728-29 (D.C. Cir. 2000).

³⁸ *Id.*

³⁹ See, e.g., *General Instrument, id.*; *Charter Communications v. FCC*, 460 F3d 31 (D.C. Cir. 2006).

open supply market,” including the “potential savings to consumers from greater choice among navigation devices” as well as the “spurring of technological innovations”; and (2) the equally amorphous argument that “Congress regarded the commercial availability of navigation devices as a benefit in and of itself.” Rather than test the veracity of the FCC’s cost/benefit analysis, however, the D.C. Circuit simply deferred to the agency’s expertise.⁴⁰

Yet, by the FCC’s own admission, the hard truth is that the CableCard experiment achieved neither the Commission’s original prognostications nor the Congressional intent of Section 629. According to the FCC, most cable subscribers continue to use the traditional set-top boxes leased from their cable operator; only one percent of the total navigation devices deployed are purchased at retail.⁴¹ Thus, as the FCC conceded, this “evidence indicates that many retail device manufacturers abandoned CableCard before any substantial benefits of the integration ban could be realized.”⁴² The FCC’s predicted gains in terms of prices and innovation from the CableCard regime never arrived. Unfortunately, the same cannot be said about the costs of the CableCard experiment, which are estimated to be at least one billion dollars (if not more).⁴³ The cost-benefit outcome of the CableCard is decidedly, and admittedly, unfavorable.

B. *So Why Did CableCard Fail? The Commission’s Responses*

As noted above, most observers—including the FCC—consider the CableCard regime to be a failure. Undeterred, however, the Commission not only recently made tweaks to its existing CableCard regime,⁴⁴ but also wants to

⁴⁰ See *Charter*, 373 F.3d at 42; see also *Comcast Corp. v. FCC*, 526 F.3d 763, 767 (D.C. Cir. 2008). (“Comcast’s argument in support of a waiver under Section 629(c) primarily turns on cost concerns—the company argues that if non-integrated digital converter boxes become more expensive, then fewer customers will migrate to digital cable. But from the start, the FCC has conceded that the integration ban may impose short-term costs on cable companies and consumers. It reasoned, however, that those costs ‘should be counter-balanced to a significant extent by the benefits likely to flow from a more competitive and open supply market,’ such as lower prices, more choices, and the spurring of technological innovation. We affirmed that determination in *Charter*, and we may not revisit that conclusion here even if we wished to—which we do not.”).

⁴¹ *Supra* n. 4.

⁴² *Third Report*, *supra* n. 3 at ¶ 4; see also *AllVid NOI*, *supra* n. 3 at ¶ 10 (“most manufacturers have abandoned the technology”).

⁴³ *Supra* n. 20.

⁴⁴ *Third Report*, *supra* n. 3.

move on to a successor regime, “AllVid.” In the following three sections, we explore the FCC’s explanations for why CableCard failed and, equally as important, what steps the agency believes will be necessary to remedy the problem. In Section IV, we provide an economic explanation for the failure of CableCard.

1. *The Third Report*

Concurrent with its introduction of the proposed AllVid approach, the Commission recently sought to modify its failed CableCard regime. While the Commission stated that it was “sympathetic” to concerns that it was seeking another bite at the CableCard apple at the same time it was proposing the AllVid regime, the agency believed it necessary to proceed on both tracks because “CableCard is a realized technology” and “consumer electronics manufacturers can build to and are building to the standard today.”⁴⁵ To this end, the Commission instituted five reforms to the CableCard regime which, it hoped, would get the process back on track and produce a competitive retail market as contemplated by Section 629. We take each in turn.

The first step the Commission took was to require cable operators to provide retail devices with access to switched-digital channels (although it did so without specifying the technology that cable operators must use to ensure such compatibility).⁴⁶ In the Commission’s view, subscribers “must be able to use the devices they purchase at retail to access all of the linear channels that comprise the cable package they purchase.”⁴⁷ Thus, reasoned the Commission, providing “retail navigation devices and leased navigation devices with equivalent access to linear programming at an equivalent service price is essential to a retail market for navigation devices.”⁴⁸

Next, the Commission adopted a requirement that cable operators prominently list the fee for their CableCards as a line item on their websites (readily accessible to all members of the public) and annual rate cards separate from their host devices, and provide such information orally or in writing at a subscriber’s request. Moreover, the Commission ordered that these CableCard lease fees be uniform across a cable system regardless of whether the CableCard

⁴⁵ *Id.* at ¶ 8.

⁴⁶ *Id.* at ¶ 13.

⁴⁷ *Id.* at ¶ 14.

⁴⁸ *Id.*

is used in a leased set-top box or a navigation device purchased at retail. Finally, because the Commission was “not convinced” that “cable operators are not subsidizing the costs of leased set-top boxes with service fees,” the Commission adopted a rule that requires cable operators to reduce the price of packages that include set-top box rentals by the cost of a set-top box rental for customers who use retail devices, and prohibits cable operators from assessing service fees on consumer-owned devices that are not imposed on leased devices. According to the Commission, these price reductions must reflect the portion of the package price that is “reasonably allocable” to the device lease fee.⁴⁹

Third, the Commission ruled that “the best means of assuring the development of a retail market for navigation devices” is to require cable operators to allow subscribers to self-install CableCards.⁵⁰ In addition, citing examples in the record where consumers had to schedule multiple appointments with the cable company to install a CableCard they purchased from a third-party retail outlet, the Commission went one step further by making it easier for consumers to file complaints with the Commission.⁵¹ In the Commission’s view, the “need to schedule multiple installation appointments unquestionably is an impediment to realizing a competitive retail market for navigation devices” and, as such, believed that “Congress’s intent in adopting Section 629 was to ensure that cable operators treat retail navigation devices in the same manner that they treat leased navigation devices.”⁵²

Fourth, the Commission mandated that cable operators provide multi-stream CableCards by default, unless a subscriber expressly requests a single-stream CableCard.⁵³ In the Commission’s view, such a requirement will ensure the development of a retail market for navigation devices in that such a mandate “will conform more closely with the concept of common reliance, provide improved customer experience, and impose little, if any, costs on the industry.”⁵⁴

⁴⁹ *Id.* at ¶ 19.

⁵⁰ *Id.* at ¶ 26.

⁵¹ *Id.* at ¶ 28.

⁵² *Id.* at ¶ 29.

⁵³ A multi-stream cable card permits multiple channels to be decoded, permitting, for example, a DVR to record one channel while another channel is being watched.

⁵⁴ *Third Report, supra* n. 3 at ¶ 33.

Fifth, the Commission took steps to update and streamline CableCard device certification. In particular, the Commission both modified its rules to reflect updated testing procedures and formally prohibited CableLabs or other qualified testing facilities from refusing to certify Unidirectional Digital Cable Products for any reason other than a failure to comply with the conformance checklists referenced under current rules. However, the Commission observed that these rule changes did little more than codify the certification process as it exists today.⁵⁵

Notably, all the FCC's actions appear to view the CableCard's failure as a result of limitations in its operational parameters. Never has the agency considered that its proposals are being impeded by the underlying economics of the equipment-service relationship in multichannel video markets. This omission is important. If CableCard's defects lie in its inherent inefficiency relative to self-supply, then solving the problems outlined by the FCC will not produce a successful alternative to the CableCard of the past. The theoretical analysis *infra* indicates that even if the commercially- and self-supplied set-top boxes are identical, the commercial model may be relatively inefficient, imposing significant implementation costs without any offsetting benefits. Moreover, if changes to the CableCard regime, or adoption of the proposed AllVid approach, cannot resolve the operational defects identified, then failure of AllVid is near certain as the regulatory approach is burdened with both inefficiency and operational shortfalls. In fact, with rapidly evolving technology, it is possible that the principle defect in CableCard and AllVid is the mere act of defining the device, in that by defining the device the FCC locks in a technological standard that will soon be outdated.

2. *The AllVid NOI*

In the FCC's *AllVid NOI*, the agency takes a slightly different approach to explain why CableCard failed and why the AllVid approach is required. According to the Commission, the "limited interest in purchasing retail devices that can access MVPD services" is attributable to "two fundamental defects."⁵⁶ First, the Commission believes that "with few exceptions retail navigation devices are unable to provide functionality beyond that available in devices which subscribers can lease from their providers and often are unable to access many of the MVPD services that leased set-top devices are able to access."

⁵⁵ *Id.* at ¶ 37.

⁵⁶ *AllVid NOI*, *supra* n. 3 at ¶ 15.

Second, the Commission believes “that as a general matter a retail navigation device purchased for use with one MVPD’s services cannot be used with the services of a competing MVPD.”⁵⁷ Again, both explanations for the CableCard’s failure are operational characteristics of the device. Notably, the FCC provides no explanation as to why its AllVid mandate will successfully resolve these operational defects or, more importantly, how AllVid is more future-proof than the CableCard. Moreover, the FCC has yet to consider the possibility that the failure of the CableCard may be the consequence of powerful and legitimate economic forces working against its success.

To remedy these alleged defects, the FCC chose to dig in rather than reconsider; that is, the agency proposes merely to “soup-up” the CableCard to remedy its operational shortcomings. This leads the agency to the AllVid approach, which seeks to:

place the network-specific functions such as conditional access, provisioning, reception, and decoding of the signal in one small, inexpensive operator-provided adapter, which could be either (i) a set-back device—which today could be as small as a deck of cards—that attaches to the back of a consumer’s television set or set-top box, or (ii) a home gateway device that routes MVPD content throughout a subscriber’s home network. The adapter would act as a conduit to connect proprietary MVPD networks with navigation devices, TV sets, and a broad range of other equipment in the home. The AllVid adapter would communicate over open standards widely used in home communications protocols, as outlined below, enabling consumers to select and access content through navigation devices of their choosing purchased in a competitive retail market. MVPDs would, of course, be free to participate in the retail market by offering navigation devices for sale or lease to consumers, but those devices would be separate from the adapter and marketed separately.⁵⁸

The AllVid adapter is conceptually identical to the CableCard in that its primary purpose is to separate conditional access from the other functions of the set-top box. As such, the FCC’s general approach to Section 629 is largely unchanged by

⁵⁷ *Id.*

⁵⁸ *Id.* at ¶ 22.

AllVid. Unfortunately, although the FCC again promises that AllVid will be different and that a vibrant and innovative retail market is just around the corner,⁵⁹ there is no compelling evidence that AllVid will succeed where the CableCard has failed. As we show *infra*, the economic factors that killed the CableCard are likewise working against the FCC's aggressive AllVid approach, so that AllVid is likely to follow the same path to costly failure as taken by the CableCard regime. With rapidly evolving technology, success is unlikely for any regulation that, by its very nature, locks in a particular technology. Of this, the CableCard is an archetype.

3. Other Explanations for CableCard's Failure

Notwithstanding the preceding two sections, the Commission has in various other forums also set forth one other explanation for the failure to realize the goals of Section 629: MVPD "foot dragging." For example in the *AllVid NOI*, the Commission specifically stated that it wants to create a regime wherein device manufacturers are encouraged "to develop and introduce innovative smart video devices *without being deterred by the need to consult with MVPDs.*"⁶⁰ FCC Commissioner Michael Copps echoed a similar sentiment in his statement to the *AllVid NOI*, arguing:

The path to the retail market has been, for many reasons, obstructed at nearly every turn. Something is clearly not working as intended when consumers encounter such disparities between the cost, installation and support of CableCard devices for those who purchase a retail device and for those leasing the cable provider's set-top box.⁶¹

And Commissioner Mignon Clyburn apparently holds a similar view, noting:

The time has undoubtedly arrived for us to examine the potential for *any* electronics manufacturer to offer smart video devices at retail that can be used with the services of *any* MVPD. In

⁵⁹ *Id.*, where the Commission specifically states that the new AllVid model will, *inter alia*, "spur the development of a competitive retail market in navigation devices, thus providing subscribers with viable alternatives to leasing or buying a set-top box from their MVPD" and "drive down retail prices for devices used to access MVPD services without increasing the prices of those services".

⁶⁰ *Id.* at ¶ 22 (emphasis added).

⁶¹ *Id.*, Statement of Commissioner Copps.

addition, given that the current process for obtaining MVPD certification is so cumbersome and expensive, I am eager to explore ways in which such manufacturers can forego unnecessary coordination and negotiation with MVPDs.⁶²

The sentiment that the cable industry intentionally sabotaged CableCard is widely held. For example, the left-leaning political interest group Free Press claims that the “cable industry played a prominent role in impeding the potential success of CableCard, a fact often brought to the Commission’s attention.”⁶³ Similarly, Professor Marvin Ammori, former General Counsel of the Free Press, argues that CableCard failed because MVPDs “generate huge fees from renting these boxes because they dominate the market for them and have made it difficult for consumers to purchase boxes from any independent company.”⁶⁴ Likewise, Public Knowledge argues that the failure of CableCard was not “technical or economic, but behavioral” because “MVPDs have consistently attempted to keep ‘foreign devices’ from their networks.”⁶⁵ And, not to be left out, Pennsylvania State Professor Rob Frieden argues that “cable operators have largely thwarted the Congressional mandate to give consumers alternatives to the operator-leased devices.”⁶⁶

These views of the matter are questionable in many respects. First, the prices of the set-top box are mostly regulated at cost by the FCC. Furthermore, the agency seems more concerned that equipment prices are subsidized rather than marked up well above costs. So the “huge fees” point is invalid to the extent it possesses a market power connotation. Second, there is neither evidence nor argument supporting the notion that the set-top box offers any increase in market power to the cable industry. As such, there is no reason to suspect that the industry’s behavior with respect to the set-top box is either anticompetitive or anti-consumer. Third, to the extent the industry has impeded the CableCard’s development, such efforts may be driven by legitimate business and social concerns. Indeed, the FCC freely admitted that the CableCard regime may lead

⁶² *Id.*, Statement of Commissioner Clyburn.

⁶³ Free Press Comments, *In the Matter of Video Device Competition*, MB Docket No. 10-91, at 3.

⁶⁴ Marvin Ammori, *Copyright’s Latest Communications Policy: Content-Lock-Out and Compulsory Licensing for Internet Television*, 18 *COMMLAW CONSPECTUS* 375, 388 (2010).

⁶⁵ Public Knowledge Comments, MB Docket No. 10-91, at 6.

⁶⁶ Rob Frieden, *Lock Down on The Third Screen: How Wireless Carriers Evade Regulation of Their Video Services*, 24 *BERKELEY TECHNOLOGY LAW JOURNAL* 819, 834 (2009).

to higher costs and prices for equipment.⁶⁷ Under this “foot dragging” theory, a legitimate question to contemplate is whether the industry should be condemned for impeding the CableCard or whether the FCC should be condemned for mandating it. The answer lies in the relative efficiency of self-supply to regulatory-induced commercial supply, and whether the incentives of the MVPDs in this regard can be trusted. We turn to these questions next.

IV. The Economics of the Set-Top Box

Multichannel video providers, such as cable and satellite television operators, are in the business of selling subscriptions to multichannel video services.⁶⁸ In most cases, these services require that a piece of equipment, a set-top box, be located at the consumers’ home or business. The primary purpose of this box is to convert the video signal (in some cases a scrambled signal for security) to a standardized output accepted by consumer premises equipment (i.e., television sets); the boxes are also used to order and provision video-on-demand, display channel guides, and some other features. These set-top boxes are manufactured by consumer electronics manufacturers (e.g., Pace, Cisco, Motorola, Arris, and so forth) and acquired by consumers from their chosen MVPD. MVPDs are not vertically integrated into the manufacturing of such equipment.⁶⁹ A monthly fee for the box (about \$7-10 per month), which typically includes an “insurance” service as well, since defective equipment is typically replaced without fee, is charged for the box.⁷⁰ (By comparison, wireless companies typically charge a \$4.99 monthly premium for replacement of mobile telephone equipment, but this includes a \$50-150 deductible.⁷¹) Thus, this “insurance” service provided by the

⁶⁷ *Supra* n. 40.

⁶⁸ DirecTV 2009 Form 10-K (2010) at 2 (“We are a leading provider of digital television entertainment in the United States and Latin America. Our two continuing business segments, DIRECTV U.S. and DIRECTV Latin America, which are differentiated by their geographic location, are engaged in acquiring, promoting, selling and/or distributing digital entertainment programming via satellite to residential and commercial subscribers”); Comcast 2009 Form 10-K at 1 (“We are a leading provider of video, high-speed Internet and phone services (“cable services”), offering a variety of entertainment, information and communications services to residential and commercial customers”).

⁶⁹ However, we note that today most DBS-related equipment is MVPD branded.

⁷⁰ *AllVid NOI*, *supra* n. 3, at ¶ 13. See also the websites of DirecTV and Dish Network (viewed in October 2010).

⁷¹ <http://www.wireless.att.com/learn/basics/choosing-features-services/wireless-insurance.jsp>.

MVPD is valuable.) For cable operators, the prices are regulated to (some measure of) cost plus a return of 11.25%.⁷²

In this section, we consider the economic incentives of a multichannel video provider with regard to the set-top box, and discuss how such incentives relate to the implementation of Section 629. In the *AllVid NOI*, the FCC contends that Section 629 could lead to “[c]ompetition in the manufacturing and distribution of consumer devices” as Congress envisioned. The alleged benefits of such competition are “innovation, lower prices and higher quality.”⁷³ In light of this view of Section 629, we model price and quality choices of the multichannel video provider with regard to services and boxes. Also, in an effort to address the belief that the multichannel video providers have intentionally frustrated the development of a competitive market for set-top box equipment,⁷⁴ we evaluate the provider’s preference for self- versus market-supply of the boxes. The model mimics the typical transaction by assuming a consumer purchases a multichannel video service, which requires the use of a set-top box. Since market power is often argued to drive the behavior of multichannel video providers with regard to the set-top box, we assume the video provider is a monopolist. (Obviously, MVPDs are not monopolists as each faces competition from *at least* two other providers in nearly all geographic areas.⁷⁵)

A. Basic Theoretical Setup

We consider the case of a single provider of a service, S , produced at a constant per unit cost of s . Each consumer decides whether or not to buy the service, depending on their valuation of it. In order to obtain the service, however, the consumer must also procure a converter or “set-top box”, B , and this box can, in theory, be produced or provided either by the multichannel

⁷² See, e.g., Charter 2009 Form 10-K (2010) at 6 (“In accordance with FCC rules, the prices we charge for video cable-related equipment, such as set-top boxes and remote control devices, and for installation services, are based on actual costs plus a permitted rate of return in regulated markets.”).

⁷³ *AllVid NOI*, *supra* n. 3 at ¶ 23.

⁷⁴ *Id.*, Statement of Commissioner Copps.

⁷⁵ DirecTV and Dish Network have nearly ubiquitous coverage in the continental United States. See, e.g., *In re CoxCom d/b/a Cox Communications Phoenix, Petition for Determination of Effective Competition in Various Arizona Communities*, DA 10-2247, MEMORANDUM OPINION AND ORDER (Nov. 29, 2010) (finding that the Phoenix market was “effectively competitive” for purposes of price deregulation under Section 623(1) of the Act because of competing service provided by two direct broadcast satellite (“DBS”) providers, DirecTV and Dish Network).

video provider or by an outside “retail market” source. Thus, the service S and the box B are perfect complements, neither having value without the other.

Consumers value the S, B combination, and are assumed to buy it if the full price is less than the associated valuation. Letting p be the price paid for service S , and r the price of the box B , consumer i buys service if $v_i > p + r$. We assume there are many consumers, and that their valuations, v , are distributed randomly, with cumulative density $F(v)$, marginal density $f(v)$, and with support on the interval $[0, \infty)$. Thus, for the price system (p, r) , the proportion of consumers who buy S and B is just $[1 - F(p + r)] \geq 0$.

B. *Optimal Prices*

We begin by considering the profit-maximizing pricing problem of a service provider who also is the sole seller of the boxes. Thus, consumers must buy both S and B from the service provider, paying prices p and r determined by this provider without restriction. How would such a provider set prices, and would the seller’s monopoly power over the box market prove important for the outcome? The well-known answer is “No”, due to the perfect complementarity of S and B : the seller gains no advantage from its control of the box market and only the combined price $(p + r)$ is determined by profit maximization. To see this, let b be the per box cost of the seller, and let s be the per customer cost of service. The service provider’s profit is:

$$\pi = [1 - F(p + r)](p + r - b - s), \quad (1)$$

and the firm selects p and r to maximize this expression. This problem, though, is partially degenerate in that only the sum $(p + r)$ is determined by this exercise. In other words, the component prices p and r are individually irrelevant to profit, and the firm can select any combination of p and r that sum to the value determined by the maximization. Thus, let $z = p + r$, and write profit as:

$$\pi = [1 - F(z)](z - b - s), \quad (2)$$

Maximization of (2) with respect to z yields the following condition:

$$[1 - F(z)] - f(z)(z - b - s) = 0, \quad (3)$$

where these expressions are to be evaluated at z^* , the optimal solution. Thus, *any* prices (p^*, r^*) , that satisfy the condition $z^* = p^* + r^*$ are profit maximizing. Let us denote the profit-maximizing profits from z^* as π^* .

C. Consumer Surplus

Consumer welfare will be taken to be equal to total consumer surplus in this market. This total surplus is the sum of individual surplus over the mass of consumers purchasing the service. The expression for consumer welfare, $CS(z)$, is given by:

$$CS(z) = \int_z^{\infty} (v - z)f(v)dv, \quad (4)$$

We note that consumers always benefit from a reduction in the total price of service:

$$\frac{\partial CS}{\partial z} = -[1 - F(z)] \leq 0. \quad (5)$$

This analysis, although somewhat simple, illustrates several important points, some of which we will turn to now. There are two main features of the model to keep in mind. First, since the service and box are consumed together, consumers care only about the sum of the prices, or z . Second, consumers always prefer a lower aggregate price z ; if z falls, then consumers benefit.

D. Effect of Regulated Set-Top Box Prices

In most cases for the cable television industry, the price of the set-top box is regulated at a cost-plus 11.25% return. What is the effect of this regulation? Suppose that the regulated price is r' . Being free to set the price for service, the seller would just set $p^* = z^* - r'$ so that profits and consumer surplus would be unchanged. The single price p is sufficient to extract all available profits for the seller. Note that it is irrelevant what price is set by regulation for the box (such as $r' = b$ as in the existing regulation); since the full price is $z = p + r$, any modification to r can be offset by a corresponding change in p .

E. Competitive Supply

We consider next the existence and effects of a competitive alternative supply of set-top boxes. Suppose that this competitive market supply is infinitely elastic at a price of r_m .⁷⁶ The effect of this circumstance on the seller and consumers depends, of course, on what r_m is, and particularly whether r_m is larger or smaller

⁷⁶ That is, consumers can purchase all they care to at price r_m .

than b , the service provider's cost per box. We assume the service provider and the competitive suppliers of boxes offer identical boxes, so that the competitive sellers capture the entire box market if $r_m < r$, and sell no boxes otherwise. Let π_m be the service provider's optimal profit with competitive supply price r_m . We have the following:

Proposition 1: $\pi_m \geq \pi^*$; MVPD profits are never lower with market supply than self-supply.

Proof. If the service provider sets a price $r < r_m$, and sets $p^* = z^* - r$, then he obtains the profit π^* , so he can always assure himself of this profit level. However, if $r_m < b$, then he can do even better. To see this, suppose the seller sets $p_0 = z^* - r_m$, and sets r at any level above r_m , so he sells no boxes. In this case his profit is:

$$\pi_0 = [1 - F(z^*)](p_0 - s) \quad (6)$$

Since $p_0 > z^* - b$, we have $\pi_0 > [1 - F(z^*)](z^* - b - s) = \pi^*$. Thus, whenever $r_m < b$, we have $\pi_m \geq \pi_0 > \pi^*$. Q.E.D.

The proof demonstrates that MVPDs may prefer that set-top boxes be provisioned by a commercial market rather than by self-supply if the commercial market can supply such equipment more efficiently than can the MVPDs. In fact, the proof understates the case somewhat, since the pricing policy $p = p_0$ described above is not the optimal policy with competitive supply at a price below the service provider's own costs. An optimal pricing rule can lead to profits even higher than those at p_0 when $r_m < b$.

Consider the seller's *optimal* response to competitive box supply at a price r_m that is below the seller's own cost level b . We know from the proof of Proposition (1) that, if $r_m < b$, the seller will do better by surrendering the box market to the competitive suppliers. Hence, the total price faced by consumers would be $z = p + r_m$ and the revenue received by the service provider per customer would be $(z - r_m)$. Formally, the service provider selects z to maximize profit given r_m :

$$\pi(z; r_m) = [1 - F(z)](z - r_m - s) \quad (7)$$

This parameterized and unconstrained optimization problem exhibits complementarity in the objective function:

$$\frac{\partial^2 \pi}{\partial z \partial r_m} = f(z) > 0. \quad (8)$$

Thus, the objective function in (7) possesses strictly increasing differences between z and the parameter r_m . Standard results in lattice programming imply that the optimizing solution will be an increasing function of the parameter r_m .⁷⁷ If we let $z_m(r_m)$ denote the optimal solution to this unconstrained maximization problem, then we have that $z_m(r_m)$ is an increasing function. A direct comparison of (2) and (7) yields the immediate fact that $z_m(b)$ equals z^* . Thus, if $r_m < b$, we have that $z_m(r_m) < z^*$. Hence, consumers face a lower total price and, by Expression (5), consumer welfare will be higher.

This result, combined with Proposition 1, has the following significance. When the service provider behaves optimally, and efficient competitive suppliers provide the box at a price $r_m < b$ (the service provider's box cost), the service provider will welcome the competitive supply, which will increase his profits. Further, the full price of service to the customers is declining in the level of the competitive box cost r_m . Thus, any reduction in such costs serves consumers and the firm alike, and the firm has no incentive to block such sales.

F. *Incentive to Reduce Set-Top Box Costs and Prices*

In the previous section, we showed that the MVPDs prefer a commercial market for set-top boxes when such an arrangement is more efficient and leads to lower equipment prices for consumers. We show here that MVPDs likewise will pursue cost reductions that reduce equipment prices to consumers. Noting that $d\pi/dz = 0$ at the optimal choice z^* , simple differentiation shows:

$$\frac{\partial \pi^*}{\partial b} = -(1 - F(z^*)) < 0. \quad (9)$$

Thus, the service provider would welcome any reduction in the cost of B (such as a reduction in b to $b' < b$, say), since the reduction will result in increased seller profits. The Commission, therefore, should expect video providers to seek low cost and efficient production of their set-top equipment.

It is also the case that a lower cost for set-top equipment increases consumer welfare. Notice that the objective function in (2) exhibits strictly increasing differences between z and b . The optimal aggregate price, z^* , will be an increasing function of box cost:

⁷⁷ See, e.g., D. M. Topkis, *SUPERMODULARITY AND COMPLEMENTARITY* (1998).

$$\frac{\partial z^*}{\partial b} > 0. \quad (10)$$

We know from Expression (5) that consumer welfare is determined by z^* . Since lower box costs increase profits, lower total prices, and increase consumer welfare, lower box costs increase overall economic welfare. In the case of costs, therefore, the incentives of multichannel video provider are in line with the interest of consumers and economic welfare. Both the CableCard and AllVid proposals have been based on the idea that a retail market for such set top equipment may reduce the cost of such devices, but this argument implies that the multichannel video providers are not interested in cost reductions, which we have just shown is a false view.

G. *Incentive to Innovate*

Another argument used by the Commission to support both its CableCard and AllVid creations is that such actions will “spur innovation.” Embedded in this reasoning is that multichannel video providers do not have adequate incentive to innovate. We turn now to the important problem of market innovations in the box which increase consumer valuation of the service S , rather than decreasing the cost of the box. Although there are many ways one might represent such a change in valuation due to some innovation in service (e.g., proportional increases in values, first order dominating shifts in the valuation distribution, and so on), the simplest and most obvious way is merely to assume the new innovation raises all consumers’ valuation levels by some positive amount “ e ” (i.e., an *enhancement*). Although simple, this formulation allows for a very clear view of the effects of such value enhancement on the welfare of consumers and the service provider when both behave optimally.

With the enhancement e , consumer i will buy service if $v_i + e > p + r$. This is equivalent to the inequality $v_i > p + (r - e)$. Thus, technically speaking, we can directly translate the enhancement into our previous analysis simply by absorbing it into the box price (r). Hence, let $r_e = (r - e)$ and define $z = p + r_e$. The service provider’s profits are:

$$\pi(z; r_e) = [1 - F(z)](z - r_e - s) \quad (11)$$

Next, we let $z_e(r_e)$ denote the maximization of this profit function with respect to z , given the parameter r_e . Noting the exact similarity between (11) and (7), we can use (8) to conclude immediately that $z_e(r_e)$ is an increasing function. Since

$r_e < r$ and $z^* = z_e(r)$, we have that $z_e(r_e) < z^*$. Recalling from (5) that CS is a decreasing function, we conclude that $CS(z_e(r_e)) > CS(z^*)$.⁷⁸ Consumer welfare increases if the market provides a technologically enhanced box.

The service provider's profit also increases when the competitive market provides an enhanced box. Since $z_e(r_e)$ is optimal and $r_e < r$, we have that

$$\pi(z_e(r_e); r_e) \geq \pi(z^*; r_e) > \pi(z^*; r) = \pi^* \quad (12)$$

The service provider has no incentive to block the competitive market's enhanced box as it clearly provides greater profit opportunities. Any enhancement that increases consumer valuation is seen to result in both increased seller profits and increased buyer welfare. Thus, if such an enhancement were available, then the service provider would welcome its introduction and consumers would benefit as well.

We have established that MVPD providers will actively pursue cost reductions and innovations in a manner consistent with consumer interests. Of course, all available cost reductions or imaginable innovations may not be pursued, since in some cases the two may be at odds: a better box may be a more costly box; or, a cheaper box may be a less sophisticated box. In any case, the tradeoffs are apparent. If the innovation increases demand sufficiently enough to warrant a higher cost (and thus a higher price), then it will be pursued. If not, then it will not.⁷⁹ While we do not model variations in the capabilities of set-top boxes (e.g., high-definition functionality, digital video recording, and so forth), MVPD providers offer a variety of boxes, with different costs and prices, that suit the needs of particular customers.

⁷⁸ Note that $\int_{p+r-e}^{\infty} (v + e - p - r)f(v)dv = \int_{z_e}^{\infty} (v - z_e)f(v)dv = CS(z_e)$.

⁷⁹ As is well known, private gains from innovation may be less than the social gains. As such, firms typically under-invest in innovation. This underinvestment is a general phenomenon and is not limited to the cable industry or the set-top box. For a demonstration of this point, see, e.g., G. S. Ford, T. M. Koutsky and L. J. Spiwak, *The Efficiency Risk of Network Neutrality Rules*, PHOENIX CENTER POLICY BULLETIN NO. 16 (May 2006) (available at: <http://www.phoenix-center.org/PolicyBulletin/PCPB16Final.pdf>) at p. 9. On the general problem of underinvestment in innovation, see also T. R. Beard, G. S. Ford, T. M. Koutsky and L. J. Spiwak, *A Valley of Death in the Innovation Sequence: An Economic Investigation*, 18 RESEARCH EVALUATION 343-356 (2009). To our knowledge, there is no evidence (of which we are aware) to suggest that the general incentive to innovate in the multichannel video industry is diminished relative to that in other industries due to the divergence of private and social gains.

V. Evidence and Anecdotes

In the previous section, we presented a formal economic analysis of set-top boxes that provides a number of significant insights. In contrast to the common view, our theoretical analysis reveals that the set-top box conveys no market power to the MVPD and that the MVPD has no anticompetitive preference for self-supply. The MVPD simply prefers whatever market arrangements most efficiently deliver the equipment to its consumers. Our analysis reveals that if the equipment can be made cheaper and offered at a lower price, then the MVPD will embrace the cost reduction. Also, if the set-top devices can be made more innovative to increase the value to consumers, then the MVPD is incented to implement that innovation. These theoretical results directly conflict with the common view of the service-equipment relationship in the multichannel video market, which is the view held by the FCC as it formulates its Section 629 strategy. However, this “common view” is devoid of any economic foundation, and is, thus, dubious.

In this section, we provide some evidence and anecdotes supporting the general themes of our theoretical analysis. A lack of data does not permit a formal econometric analysis of our theory. Nevertheless, there is good evidence to suggest that the theory has value, and we present some of that evidence below.

A. *Equipment is Not a Tool for Surplus Extraction*

Some potent evidence supporting this theory comes from the archetype equipment model specified by the FCC—the broadband cable modem.⁸⁰ Indeed, the *National Broadband Plan* observes, inter alia, that broadband modems are an “analog for innovation in set-top boxes” because a cable modem “provides all network functions” and “connects via a standardized Ethernet port to numerous devices consumers can buy at the store—including PCs, game consoles, digital media devices and wireless routers.” In so doing, argues the Commission, “innovation can happen on either ‘side’ of that device without affecting the other side.”⁸¹ Similarly, in the *AllVid NOI*, the agency argues, “Ethernet and the IEEE 802.11 standards have led to nationwide interoperability for customer data networks while allowing broadband service providers to deploy differing

⁸⁰ *National Broadband Plan*, *supra* n. 3 at 52 (“Broadband Modems as an Analog for Innovation in Set- Top Boxes”).

⁸¹ *Id.*

proprietary network technologies.”⁸² Plainly, the FCC believes the retail acquisition of the set-top box can and should be like the broadband modem.

What is interesting about the FCC’s analogy is that like set-top boxes, the broadband modem is a piece of equipment provided by broadband providers (including MVPDs) that is inextricably linked to the provider’s service. If the self-supply of equipment is an important instrument for surplus extraction, as some claim, then we would expect to see the MVPDs (and other broadband providers) behave similarly with regard to the modem as they do the set-top box. Yet, the MVPDs who also provide broadband services permit, without interference or constraint, the customer’s acquisition of broadband modems in the commercial market. Both cable and DSL broadband modems can be purchased at big-box stores such as Best Buy. (In fact, two of the authors of this paper are using their own personal cable modem to receive broadband service from cable operators.) This fact indicates that the equipment itself is not a source of market power for MVPDs, as our theory implies. Furthermore, most consumers continue to lease cable modems despite the presence of a competitive retail market for such devices.⁸³ It appears, from the FCC’s own analogy, that the demand for commercial alternatives to leased equipment is low.

Why, then, are there substantially more cable modem options for consumers at retail than is the case with the set-top box? We argue here that one explanation for that difference is that for broadband modems a commercial market is equally as efficient as self-supply, but self-supply, all things considered, is the more efficient arrangement for set-top boxes. The relative efficiency of self-supply may arise from conditional access, security and theft concerns, some of which are driven by contractual relationships with copyright owners.⁸⁴ Such concerns are not generally relevant for broadband modems.⁸⁵

⁸² *AllVid NOI*, *supra* n. 3 at ¶ 17.

⁸³ Letter to C. Kirjner and W. Lake from NCTA, *supra* n. 2 at n. 4.

⁸⁴ See, e.g., Comments of AT&T, MB Docket No. 10-91, at 51-57; Reply Comments of DIRECTV, Inc., MD Docket No. 10-91, at 16-23; Reply Comments of Verizon, MB Docket No. 10-91, at 15.

⁸⁵ Indeed, as the agency itself concedes, with a cable modem “PC manufacturers do not need to sign non-disclosure agreements with broadband service providers, license any intellectual property selected or favored by broadband service providers or get approval from any broadband service providers or any non-regulatory certification bodies to develop or sell their PCs at retail or enable consumers to attach them to service provider networks through the interface device.” *National Broadband Plan*, *supra* n. 3 at 52.

Analogies are often useful, but the FCC's search for a suitable analogy for the set-top box—whether the telephone or the data modem—is largely pointless. The relative efficiency of self-supply versus commercial-supply of equipment may vary substantially across industry sectors and services. Different outcomes should be expected and regulatory-induced homogeneity renders no apparent benefit. The agency should, at a minimum, study the root causes of these differences, without pre-judgment, and use this knowledge to guide policy rather than simply presume the outcome in one market will be transferable to another.

B. *Now You See It, Now You Don't in DBS*

In its *Navigation Devices Order*, the FCC decided that satellite video providers, like DirecTV and EchoStar, need not comply with the FCC's separate security rules. The Commission's rationale is particularly important to review in detail:

[D]ifferences in the marketplace for DBS equipment, where devices are available at retail and offer consumers a choice, as compared to equipment for other MVPD services, particularly cable operators, provide justification for not applying the rule requiring separation of security functions to DBS service. We are reluctant to implement a rule that could disrupt an evolving market that is already offering consumers the benefits that derive from competition. In the DBS environment, *there are three service providers and at least ten equipment manufacturers competing to provide programming and equipment to consumers. The equipment is available at retail stores.* The result, over a relatively short time frame, has been lower equipment prices, and enhanced options and features. Requiring DBS providers to [comply with the separate security rules] would serve a limited purpose and disrupt technical and investment structures that arose in a competitive environment.⁸⁶

At the time of this decision, it was true that DBS equipment was made by a wide variety of manufacturers and could be purchased in numerous retail outlets. Not today. Nearly all DBS equipment is MVPD-branded, though still available at big box retailers and smaller outlets. However, when a consumer purchases the DBS

⁸⁶ *Navigation Devices Order*, *supra* n. 13 at ¶ 64 (Emphasis supplied).

service, the equipment is treated as “leased.”⁸⁷ The evolution of the service-equipment relationship in DBS is highly relevant. The move from a commercial to a leased self-supply model in the DBS sector “arose in a competitive environment.” As such, the evidence points to the conclusions that the self-supply model is relatively more efficient than the retail model, since inefficiency is not tolerated by competition. We recognize this is but one interpretation of these facts, but it seems apparent that some consideration by the FCC as to the causes of this significant change in the service-equipment relationship in the DBS sector is warranted before substantially expanding the scope of its Section 629 efforts.

C. *The Cost of Set-Top Boxes*

A reduction in cost for set-top boxes is significant for the industry. For cable operators, consumer premises equipment (video boxes, VoIP equipment, and broadband modems) is their largest annual capital expense, representing more than half of total capital expenditures. These costs are not always recovered by lease fees.⁸⁸ The figures for Comcast and Charter Communications are provided in Table 1. As explained by Comcast, “[d]uring 2010, we expect capital expenditures to be approximately \$1.2 billion. We expect the nature of these expenditures will continue to be composed primarily of purchases of customer premise equipment related to telephone and other advanced services.”⁸⁹ Our theory shows that firm profits rise when set-top box costs fall, so the industry will actively seek to minimize the cost of the equipment and, in turn, minimize the price to consumers. Given the significant share of capital costs, cost reductions are likely to be significant to MVPDs’ profits and their consumers’ well-being.

⁸⁷ L. Moss, *DirecTV’s New Lease on Life*, MULTICHANNEL NEWS (January 23, 2006); DirecTV Form 10-K (2009), p. 5 (“Most set-top receivers provided to new and existing subscribers are leased subsequent to the introduction of the lease program on March 1, 2006”); Dish Network 2009 Form 10-K (2010) at p. 4 (“We incur significant upfront costs to provide our new subscribers with in-home equipment, including advanced HD and DVR receivers, which most of our new subscribers lease from us. While we seek to recoup such upfront equipment costs mostly through monthly fees, there can be no assurance that we will be successful in achieving that objective.”).

⁸⁸ See, e.g., Dish Network 2009 Form 10-K (2010) at p.4, *id.*

⁸⁹ Charter 2009 Form 10-K (2010) at 48.

Table 1. Distribution of Capital Expenditures

| | Comcast | Charter |
|-----------------------------|-------------|-----------|
| Customer Premises Equipment | 2,934 (58%) | 593 (52%) |
| Scalable Infrastructure | 855 (17%) | 216 (19%) |
| Line Extensions | 120 (2.4%) | 70 (6%) |
| Upgrade/Rebuild | 421 (8.4%) | 28 (2.5%) |
| Support Capital | 356 (7.1%) | 227 (20%) |
| Commercial Services | 351 (7%) | ... |
| Total Capital Expenditures | 5,037 | 1,134 |

Source: Comcast and Charter 2009 Form 10-K.

There is more empirical evidence to support this conclusion. As observed in the *AllVid NOI*, the FCC has granted waivers “to cable operators in financial distress”⁹⁰ and in cases rendering “substantial public interest benefits by significantly reducing cost.”⁹¹ Plainly, if waivers are granted in cases of financial distress and provide benefits in the form of reduced costs, then the existing CableCard regime must be costly—cable companies are better off financially with a waiver, in part because they can offer lower priced equipment to consumers to expand their subscriptions. As noted above, the Commission admitted before the D.C. Circuit that its integration ban may increase the cost of set-top boxes in the short-run.⁹² The agency’s promise of an offset in the form of lower prices and more innovation never materialized, but the higher prices and costs did.

D. *The Industry Supports a Commercial Market*

While the MVPD industry is uniformly against the FCC’s strict control of set-top box design and evolution by way of its AllVid mandate, the industry does not appear to be opposed to a commercial market for set-top equipment, or even opposed to some of the functionality embedded in the AllVid device. For example, the National Cable & Telecommunications Association (“NCTA”) states,

Our industry is committed to providing content to consumers where and when they want it, on all possible consumer devices, and for those devices to be innovative platforms for new applications. We want consumers to be able to buy video devices

⁹⁰ *AllVid NOI*, *supra* n. 3 at ¶ 9.

⁹¹ *Id.* at ¶ 10.

⁹² *Supra* n. 40.

at retail and to know that cable content can be among their video sources.⁹³

The NCTA outlines seven principles to which cable operators are committed, including, but not limited to, the principle that “consumers should have the option to purchase video devices at retail that can access their multichannel provider’s video services without a set-top box supplied by that provider.”⁹⁴ Included in its lists of potential solutions is “delivery from the ‘cloud’ without the need for any dedicated receiving device.”⁹⁵

The industry does, however, comprehend the complexity of the issue. For example, as the NCTA states,

well-crafted solutions must account for how content providers license programming to distributors, how all video providers associate security, transactional, advertising, and promotional elements with their video products, how consumer electronics manufacturers and retailers build support for new product categories, what consumers are willing to buy rather than lease, and how to assure that solutions do not inadvertently handicap future innovation. Solutions must also assure that, as Internet content is delivered over the television, it is afforded all of the copyright protections that apply when it is delivered to the home computer.⁹⁶

Considering these (and other) complexities related to the technical delivery of modern multichannel video services, it is not difficult to see why the self-supply of set-top equipment is widely-viewed in the industry as more efficient than a commercial market.

These statements are, as indicated, from elements of the cable television industry; an industry many feel has intentionally given the CableCard short shrift. There will surely be those that view these industry comments as disingenuous. However, our economic analysis encourages an alternative view—perhaps a better explanation for the alleged difference between stated

⁹³ NCTA Comments, MB Docket No. 10-91, at Exhibit A.

⁹⁴ *Id.*

⁹⁵ *Id.*

⁹⁶ *Id.*

intent and behavior with regard to set-top boxes is that the technical and practical nuances of creating a commercial market for such equipment are greatly underappreciated by industry outsiders, including the FCC.

An MVPD provider's line of business is selling video. As noted above, the MVPDs are presently contemplating ways to deliver their programming over an increasing number of devices (iPad, Xbox, Wii, among others) and using a wide variety of formats. Improving the set-top box, getting it into the hands of consumers at lower prices, and possibly even eliminating the box altogether, is plainly in the interest of the MVPD provider as long as such actions increase the consumers' willingness-to-pay for video services. In this light, opposition to AllVid is not about the device's proposed functionality, or about a competitive market for equipment. The opposition, it appears, arises from ham-handed regulatory mandates for particular technological choices that *limit* innovation and tend to raise the price for equipment (as did the CableCard). Higher prices for equipment, absent an offsetting quality increase, are not good for consumers or for MVPD providers.

E. *Incentive to Innovate*

Above we presented an economic model showing that the incentives of the multichannel video provider with respect to the set-top box are compatible with the desires of consumers and economic welfare in terms of innovation. This view is consistent with the financial reporting of the cable industry. The largest cable operator, Comcast, stated in its Form 10K filing,

We are focusing our technology initiatives on extending the capacity and efficiency of our networks, increasing the capacity and functionality of advanced set-top boxes, developing and integrating cross-service features and functionality, and developing interactive Internet protocol based services.⁹⁷

In their annual financial filings, the cable industry also makes clear the harms to innovation that would flow from an aggressive regulatory approach to implementing Section 629:

⁹⁷ Comcast 2009 Form 10-K (2010) at 3.

Some of the alternative approaches [to Section 629], if adopted, could impose substantial costs on us and impair our ability to innovate.⁹⁸

Since the set-top box is an essential component of many MVPD services, improving the set-top box is plainly an important goal of the industry. Giving customers high-cost, low-quality set-top boxes reduces the demand for service, and thus reduces profits. As we have shown above, even a monopolist would not pursue such a strategy. Moreover, there is no good reason to suspect that outside vendors will have more interest in innovation than multichannel video providers, so a forced commercial market for set-top boxes is unlikely to generate much benefit in this regard.⁹⁹

VI. Caveat: The Case of Variable Proportions

The analysis presented above assumes a one-to-one type consumer demand for boxes B and service S . Although this appears to be a fairly restrictive assumption, the applicability of the analysis to the case of a “continuous” number of boxes can be easily demonstrated. The number of boxes used by a household may be some number greater than one.¹⁰⁰ Suppose that we retain our demand set-up, with the addition of a representative consumer model for set-top box demand. The immediate consequence of this formulation is that, while consumers vary, as before, in their valuations of service (v varies as above), consumers have identical demands for boxes or, somewhat less restrictively, consumer welfare resulting from changes in box prices (or qualities) can be sufficiently analyzed using the widely-applied representative consumer formulation. This approach avoids the technical complications that necessarily arise when we have differentiated households that exhibit possibly correlated valuations for service and boxes. (It is quite unclear, *a priori*, how these preferences should be represented in this more complex case.)

Given this set-up, a reinterpretation of the meaning of the box price r and the enhancement variable e allows us to generalize the previous results in each

⁹⁸ Charter 2009 Form 10-K (2010) at 13; *see also* Comcast 2009 Form 10-K (2010) at 9.

⁹⁹ The source of innovation must rest in the “diversity” logic. *See, e.g.*, R. Burt, *Structural Holes and Good Ideas*, 110 *AMERICAN JOURNAL OF SOCIOLOGY* 349-399 (2004); S. Surowiecki, *THE WISDOM OF CROWDS* (2005).

¹⁰⁰ Comcast 2009 Form 10-K (2010) at 2 (“On average, as of December 31, 2009, each digital video customer had 2.0 digital set-top boxes, including digital transport adapters”).

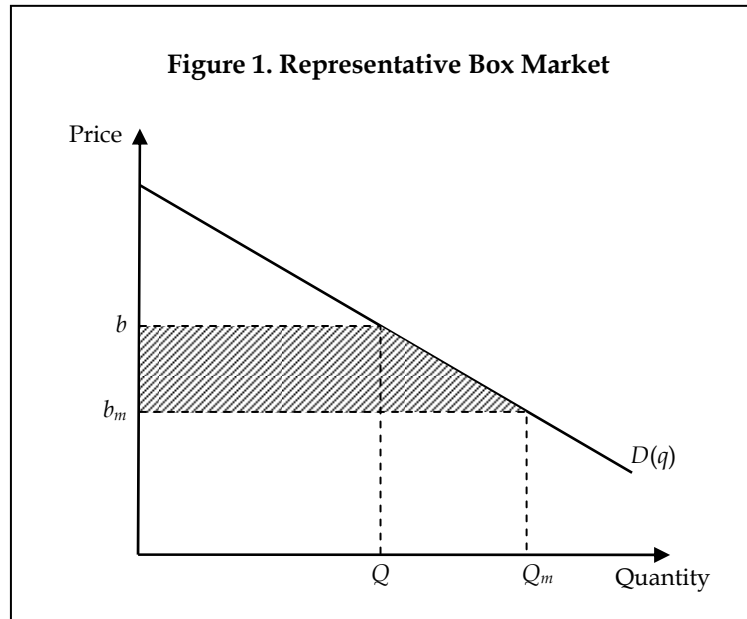
particularly when the service provider's box price is regulated. Specifically, it is once again the case that the service provider and consumers would benefit from a reduction in box "price" through competitive supply, and the service provider would not block, but would welcome, a competitive provision of boxes (if at a lower cost than self supply). Again, the incentives of the service provider, and those of consumers and society, would be well aligned.

We assume additional boxes increase the utility of the service by an amount equal to the area under the inverse demand curve $D(q)$, as illustrated in Figure 1. The cases where the box is supplied by the service provider at a cost-regulated price (b) or provided by a competitive market at a price of b_m can be easily compared using our prior framework. Letting $D(Q) = b$ and $D(Q_m) = b_m$, the enhancement from boxes in each case is given by:

$$E = \int_0^Q D(q) dq \quad (13)$$

$$E_m = \int_0^{Q_m} D(q) dq \quad (14)$$

Next, let $r = (bQ - E)$ and $r_m = (b_m Q_m - E_m)$. We can now apply the prior analysis to this situation noting that r_m is less than r by an amount equal to the shaded area in Figure 1.



The implication of this finding is immediate. Suppose that a competitive supply of boxes emerges at a box price b_m below the service provider's regulated

offering. Then the provider voluntarily yields the box market to the entrants, and the result of this action is effectively a reduction in the box “price” r , as detailed above. From our prior analysis, we know that this results in increased service provider profits and increased consumer welfare, so social welfare increases. Consumers respond to the lower box price by buying more boxes, creating an additional benefit to service/equipment consumption.

While the set-top box prices for cable television operators are often regulated, this is not the case for direct broadcast satellite providers. The satellite providers are not subject to rate regulation under the provisions of the 1992 Cable Act or the 1996 Telecommunications Act; nor are they now required to provide separate security functions in the form of a CableCard or similar device.¹⁰¹ (The AllVid approach will subject DBS providers to price regulation of their equipment, which today appears to be priced below cost.) In the case of continuous demand, the freedom to set both service and box prices gives rise to the potential for price discrimination. Theoretically, the discriminatory price vector for service and boxes could be anything. How price discrimination would be used in the industry is theoretically ambiguous; it is an empirical question. Fortunately, evidence is available. For satellite video providers, a set-top box is required for each television, and the prices for such boxes are unregulated. The case for discriminatory pricing leading to high box prices is highest in the satellite industry. However, the evidence does not support the use of such practices. Dish Network, for example, provides the standard set-top boxes at *no additional charge*.¹⁰² High Definition boxes are only \$7.00 per month, which is consistent with pricing in the regulated cable television industry. DirecTV has a receiver lease fee of \$5.00 per receiver.¹⁰³ Notably, prior to 2006 DirecTV did not use a lease program, yet the same \$5.00 fee applied to each additional television in the customer’s home (each set-top box requires a converter card, so quantity can be measured).¹⁰⁴ The change to a leasing program did not alter the pricing of additional television outlets, indicating that the set-top box is not a useful tool for implementing price discrimination.

¹⁰¹ See 47 U.S.C. § 549; *Navigation Device Order*, *supra* n. 13 at ¶ 64.

¹⁰² <http://www.dishnetwork.com> (last visited October 2010).

¹⁰³ <http://www.directv.com> (last visited October 2010).

¹⁰⁴ DirecTV 2009 Form 10-K (2010) at p. 41-2 (“DIRECTV U.S.’ revenues are not expected to change significantly due to the lease model, as the monthly mirroring fees currently charged to subscribers will generally be replaced with monthly lease fees”).

VII. Conclusion

Where one stands depends on where one sits. We argue in this PAPER that the FCC needs to alter its perception on the proper implementation of Section 629 with this reorientation based on the economics of the multichannel video market and the role of the set-top box. Specifically, we argue that the common view that the set-top box is a tool by which multichannel video providers can extract surplus from consumers is invalid. Multichannel video providers, including cable companies, have no anticompetitive motivation with regard to the set-top box. In fact, multichannel video providers prefer the efficient outcome, and the interest of the MVPD and the consumer is common. If a commercial market for such equipment is relatively more efficient than self-supply, then the multichannel video provider will embrace it, increasing its profit while also increasing consumer welfare. Alternately, if self-supply is more efficient, then the multichannel video provider prefers self-supply—also to the benefit of consumers. The multichannel video provider has strong incentives to reduce the price and cost of converter equipment as well as to pursue value-enhancing innovation. Thus, if we observe self-supply of set-top equipment, then the presumption should be that self-supply is relatively more efficient than a commercial market. It follows, then, that a regulation-forced commercial market for such devices is likely to produce higher prices and lower economic and consumer welfare.

We acknowledge that the Commission may sense some legal obligation to address the mandates of Section 629. That said, the agency retains the flexibility to either *minimize* or *maximize* its intrusion into the video marketplace. We argue that the FCC should consider, at least for a moment, that the dominance of self-supply in the set-top box market is a consequence of its relative efficiency. (Alternate views should also be considered and scrutinized.) Economic logic provides some support for this view, thereby encouraging a more temperate implementation strategy, which means something unlike the heavy-handed AllVid approach. The additional fact that the video market is evolving at a rapid pace further supports a sober approach to Section 629.¹⁰⁵ Regulations designed and implemented today will be archaic in the very near term.

¹⁰⁵ *AllVid NOI*, *supra* n. 3 at ¶ 13 (“delivery platforms continue to evolve at a rapid pace”).