

CASE 3

Sirius/XM Satellite Radio Merger (2008)

Serge X. Moresi and
Steven C. Salop*

In 1997, the Federal Communications Commission (FCC) awarded two licenses for a new innovative service, nationwide satellite radio. Sirius Satellite Radio (Sirius) and XM Satellite Radio (XM) began broadcasting in 2001. Both provided nationwide subscription-based radio services at prices of around \$10 per month. Each offered subscribers more than 100 audio channels, comprising music, sports, talk, traffic, and weather. Each offered considerable variety in music with multiple stations within each genre of rock, pop, country, jazz, and classical. In contrast to AM/FM radio, most satellite radio channels were commercial-free with better sound than AM/FM. They also offered a heavy dose of well-known personalities and sports. For example, shock-jock Howard Stern was a huge driver of subscribers to Sirius, while XM had Oprah Winfrey. Sirius broadcast all of the NFL football games, while XM had all of the Major League Baseball games. No longer would Yankees fans living in Boston get to hear the Yankees games only when they played the Red Sox. There were also NASCAR and NBA channels, religious channels, and channels that were targeted at long distance truckers.

Both services generated enormous market “buzz” when they appeared in the market. By the end of 2006, the two companies had obtained about 17 million subscribers, and analysts were projecting eventual penetration of more than 30 million. The owners of AM/FM stations were concerned that

*The authors consulted for the merging parties. Our team also included two other CRA Vice Presidents, Steven Brenner and Lorenzo Coppi. This article discusses the main economic analyses that are contained in three reports to the Federal Communications Commission: Salop *et al.* (2007a), <http://apps.fcc.gov/ecfs/document/view?id=6519560251>; Salop *et al.* (2007b), <http://apps.fcc.gov/ecfs/document/view?id=6519811380>; Savage *et al.* (2008), <http://apps.fcc.gov/ecfs/document/view.action?id=6519822747>.

they were going to lose even more listeners and would lose access to the most popular content, just as they had lost access to Howard Stern.

Most radio listening takes place in vehicles, and most new cars were becoming equipped with one (but not the other) satellite service. People also installed aftermarket units in older cars. The firms had deals with rental car companies to have the service available in rental cars for renters to try out. The companies also were continuing to innovate: adding more channels and selling portable devices with hard drives that permitted other music to be copied onto the device, broadcasts to be saved, and individual songs to be downloaded for a price. XM and Sirius also introduced streaming audio over the Internet and for sale at wholesale to wireless phone companies. Sirius was introducing a video service for some vehicles.

However, despite all this growth and innovation, neither company had ever earned a profit since their entries. Both had high debt loads and XM was facing a potential credit crunch. The growth picture also was not necessarily so rosy. Listeners had numerous other choices besides AM/FM and satellite radio. The iPod was also introduced in 2001, and the iTunes store rolled out in 2003. Mobile phones offered music services and hard drives for storing subscribers’ music. As of 2006, the introduction of the iPhone was just one year away. Vehicles were also beginning to become equipped with auxiliary jacks and integration software to play music from iPods and mobile phones through the vehicle sound system. HD radio was coming soon, and Internet radio in vehicles was on the horizon.

In February 2007, Sirius and XM proposed to merge. As the only two satellite radio services in the United States, the merger raised the specter of a merger to monopoly. Moreover, as the only two satellite radio licensees, a satellite radio market would be characterized as having prohibitive regulatory barriers to entry. Despite these concerns, the merger was cleared by the Department of Justice (DOJ) in March 2008. After the longest investigation in its history, the merger was approved by the FCC by a vote of 3–2 in July 2008, subject to certain behavioral conditions.¹

In its closing statement, the DOJ concluded “that the evidence does not demonstrate that the proposed merger of XM and Sirius is likely to substantially lessen competition, and that the transaction therefore is not likely to harm consumers.”² There were several evidentiary bases for the DOJ’s conclusion: (1) availability of alternative audio services at the time and expected to increase over time; (2) lack of competition between the merging parties in key input market segments; and (3) beneficial merger-specific efficiencies.

¹ The FCC Opinion and Order is available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-178A1.pdf.

² The DOJ statement is available at http://www.justice.gov/opa/pr/2008/March/08_at_226.html.

In this essay, we explain some of the reasons that the DOJ and FCC approved the transaction and the type of analyses that were carried out by the parties and by the opponents of the merger. We begin by analyzing market definition and substitution among audio entertainment devices. We then discuss some of the other interesting aspects of the competitive effects analysis. The satellite radio companies competed for key inputs as well as subscribers: the audio content to air on the services and the distribution of the devices. This competition for inputs implicates issues that do not arise in most mergers. In addition, the merger presented an interesting efficiency defense. It involved internalizing a novel type of externality that we refer to as “dynamic demand spillovers.” After discussing these issues, we briefly discuss the regulatory outcome and the evolution of the companies and the market after the merger.

THE AUDIO ENTERTAINMENT MARKET

Market definition is a central issue in every horizontal merger. Market definition is used to calculate market shares and the HHI concentration index that is used as an initial screen. Market definition involves the analysis of consumer substitution, which also is the focus of unilateral effects analysis.

In this case, market definition was a primary question. The primary issue was whether the market would be limited just to satellite radio, or whether it would be expanded to include some or all of the other types of audio entertainment: AM/FM radio, iPods and other MP3 players, mobile phones, CDs, and Internet radio. There was also the issue of whether to focus on mobile audio entertainment, as opposed to at home and at work. Market shares could be measured on the basis of listening time, revenue, or devices.

If the proper relevant market were limited just to satellite radio, this would be a merger to monopoly, which would create a strong presumption that the merger would violate the antitrust laws. If the market included other audio entertainment devices and services such as AM/FM radio (which was ironically referred to as “terrestrial” radio), CDs, iPods and other MP3 players, and music services such as Pandora and Rhapsody that are available on mobile phones, then the listening market share of the merged firm would be less than five percent, and the merger would fall into the HHI safe harbor. Emerging technologies like Slacker and Internet radio would reinforce this conclusion. Thus, considerable attention was paid to market definition.

Our analysis concluded that the relevant market would better be defined to include all audio entertainment, and especially terrestrial radio. In this broader market, the merged firm would have had a very small listener share. At the end of 2007, Sirius and XM were projected to have

approximately 17 million subscribers. In contrast, terrestrial radio reaches all consumers and accounted for many more hours of listening in aggregate. Arbitron estimated the listening share of satellite radio as 3.4 percent of radio listening.³ In addition, it was projected that nearly 28 million consumers would have smartphones by the end of 2007. Almost all of those wireless subscribers had access to music services on their phones. iPods and MP3 players had about 46 million users in 2006. More than 70 percent of new cars were becoming equipped with auxiliary jacks for iPods and other devices. Thus, the listener share of satellite radio, for audio entertainment in general and for music in particular, was small and was projected to decline even further.

Opponents of the transaction disagreed with this characterization. Their attack focused on market definition and this type of market share analysis. In their view, Sirius and XM were the only satellite radio services, and both were priced identically at \$12.95 per month at the time of the merger announcement. The opponents made a variety of arguments to support their view that the relevant market was solely satellite radio services, particularly in automobiles. They argued that satellite radio was highly differentiated from other audio-entertainment options (particularly AM/FM) because of its greater variety, better sound quality, and lack of commercials on many stations. They also suggested that it was expensive to hook up iPods and mobile phones in automobile sound systems. They suggested in effect that the cross-price elasticity of demand between satellite radio and terrestrial radio was low. In fact, some opponents argued that satellite radio and the alternatives were complements, not substitutes. They also argued that consumers were “locked-in” to the devices that they already owned, which limited the likelihood of substitution to other products. Opponents also argued for a short time frame for market definition analysis. All of these arguments added up to a claim that this was a merger to monopoly.

Even if the market were defined as all-radio, opponents argued that market shares in an all-radio market should be based on revenues instead of subscribers because terrestrial radio is free. This would imply that Sirius and XM would have high market shares. The opponents went on to argue that while only a small number of the most popular satellite radio stations had commercials, the elimination of competition between XM and Sirius would lead the merged firm to increase the number of commercials substantially, thereby harming many satellite radio subscribers who preferred not to listen to commercials.

Considerable merger analysis revolved around all of these market definition and market share arguments. We first discuss the issue of product differentiation and measurement of market shares. We then discuss demand elasticity, product complementarity, subscriber lock-in, and the relevant time frame for the analysis.

³ <http://www.orbitcast.com/archives/satellite-radio-accounts-for-34-of-radio-listening.html>

Product differentiation between satellite radio and terrestrial radio in principle could support a separate satellite radio market. Even aside from the economic and factual analysis discussed below, we were skeptical of this claim here because the primary opponent of the merger was the National Association of Broadcasters (NAB), the trade association that represents the terrestrial radio industry.⁴ The NAB likely would be concerned about *increased* competition from satellite radio, not output restrictions.

We also did not think that the differentiation was sufficient to justify separate markets, for the following reasons:

- Most satellite radio channels were commercial-free, which might provide significant appeal to some subscribers. In contrast, many terrestrial radio channels were airing frequent commercials and thus may have been appealing to different subscribers. However, terrestrial radio stations were reducing the number of commercial minutes to attract more listeners, including from satellite radio. Moreover, individuals that desired commercial-free music also could listen to their own music on iPods and other MP3 players.
- These issues were also relevant to the measurement of market shares. In a market that included these devices or one that included advertising revenue, the Sirius and XM would have a small share of revenue as well as a small share of listening time and devices. Satellite radio subscription revenue is swamped by the advertising revenue earned by terrestrial radio.⁵
- Satellite radio provided more channels than did AM/FM radio. The (population-weighted) average number of radio stations available for a U.S. consumer was about 31 (on average across zip codes), but the number varied significantly around the country. However, other services also provided a large number of channels. At the time of the merger, AT&T wireless services offered 50 commercial-free channels of music, news, and sports for \$8.99 to subscribers with data packages. Sprint offered 10

⁴ For analysis of the merger by the economists that consulted for the NAB, see Sidak and Singer (2008). For another analysis by an economist that consulted for the parties, including his critique of the NAB's economists' reports, see Hazlett (2008). Sidak and Singer's FCC submissions are available at:

1st Declaration, <http://apps.fcc.gov/ecfs/document/view?id=6519008261>;

2nd Declaration, <http://apps.fcc.gov/ecfs/document/view?id=6519560346>;

3rd Declaration, <http://apps.fcc.gov/ecfs/document/view?id=6519738919>.

Hazlett's FCC submission is available at: <http://apps.fcc.gov/ecfs/document/view?id=6519527923>.

⁵ Satellite radio earned some advertising revenue too, but the overall revenue shares of Sirius and XM still were small relative to the terrestrial radio. In this regard, radio stations can be viewed as two-sided or multi-sided platforms that competed for content, listeners, and advertisers. For a discussion of the economics of two-sided and multi-sided platform markets, and of the implications for antitrust and regulatory policy, see, e.g., Evans (2003) and Rysman (2009). For an empirical analysis of the 1996–2006 merger wave in the U.S. radio industry, see Jeziorski (2012). For an application of two-sided market theory to this merger, see Sidak and Singer (2008).

music channels with its basic Power Vision Package and 135 additional channels with a package that was priced \$5 more. These packages were cheaper than satellite radio subscriptions. Streaming services like Pandora, Rhapsody, and Yahoo also offered considerable variety. Finally, surveys showed that most satellite radio subscribers did not listen to that many channels.

- Satellite radio in vehicles also had higher sound quality than did AM/FM radio. However, consumers also could obtain higher sound quality from CDs, iPods/MP3 players, mobile phones, and HD radio.

Besides these observations, we also noted that Sirius and XM also are differentiated from each other in terms of content. Product differentiation reduces the degree of demand substitution between the two services, relative to the degree of demand substitution with other audio entertainment devices. For example, baseball fans could choose to listen on XM or a local AM/FM outlet for their local baseball team, but they could not listen on Sirius. Football was the opposite. It was available on Sirius or local AM/FM stations, but not XM. Sports content from the NBA, and NASCAR also were available on AM/FM, but were available only from one satellite radio provider. Thus, this product differentiation between the two satellite radio services would make it less likely that satellite radio would comprise a market separate from other audio entertainment products.

Economists agree that determining the relevant antitrust market ideally would be based on an estimate of the cross-price elasticity of demand (or the diversion ratio) between the merging parties and their substitutes, and the own-price elasticity for the group of products that comprise the relevant market. However, a formal demand elasticity study could not be carried out for this merger for several reasons: First, Sirius had not changed its subscription price since it entered the market in 2001, and XM changed its subscription price only once, in 2005.⁶ Second, around the time of the 2005 price change, XM and Sirius also improved the quality of their content and changed their programming and service package offerings. Third, it would also have been necessary to control for changes in the product quality of substitutes, such as the introduction of new iPod models within a few months of the XM price increase. Fourth, the demand for equipment and subscriptions also are linked, but in a very complicated way. Finally, demand for satellite radio was dynamic and growing over time, which also would make econometric estimation of demand elasticities very difficult, if not impossible.

Because satellite radio is a durable good with a flow of service over time, demand estimation also would require accounting for expected future prices as well as current prices. In addition, the demand for satellite radio was growing over time as people learned about it and as more vehicles

⁶ There were changes in device prices over time, but the price data were not easily accessible, and the quality of devices also was increasing over time.

became equipped with satellite radio. As will be discussed below, the dynamic demand “spillover” from word-of-mouth advertising complicates profit-maximizing behavior. All of these factors made it impossible to estimate demand elasticities directly.

However, we were able to introduce some interesting cross-section econometric analysis that related to what might be called the “quality” elasticity of demand for satellite radio. We compared satellite radio penetration with the number of available terrestrial radio stations across U.S. zip codes. There was considerable variation in the number of AM/FM radio stations, and we were able to fit a tight relationship. We found a clear and relatively smooth inverse relationship, even after controlling for demographic differences among the zip codes and other variables.⁷ Satellite radio had a higher penetration when there were fewer radio stations available in an area. Since the number of terrestrial radio stations is a measure of the quality of the terrestrial radio alternative, this inverse relationship was evidence of cross-elasticity of demand in quality-space. One would expect that a decrease in the quality advantage of satellite radio over terrestrial radio would have much the same type of qualitative effect as would an increase in the satellite radio price, relative to free terrestrial radio.⁸

This evidence was criticized by opponents of the merger and the FCC for omitted variable bias, particular population density, and there was considerable back and forth regarding this issue.⁹ In addition, the FCC was not

⁷These variables included: the percentage of population that is female, the percentage of population in each zip code who live in urban areas, the percentage who commute by car, age composition by gender, variation in educational attainment, percentage of people who commute more than 45 minutes but do not use public transportation, and several interactions among these variables.

⁸The existence of price discrimination is sometimes used as an indicator of market power. There was no geographic price discrimination despite the large variation in the number of AM/FM stations. However, there are impediments to price discrimination here. Price discrimination against such a narrow group of subscribers likely would be too costly and imperfect. First, any price discrimination strategy would be imperfect because people do not necessarily drive and listen where they live. Some fraction of consumers targeted for higher prices by their residential zip codes actually may do most of their listening while driving in zip codes with a large number of AM/FM stations, or vice versa. Second, any price discrimination strategy would be imperfectly targeted because factors other than the number of AM/FM stations also affect a consumer's willingness-to-pay, including income and where and how much a person drives and listens to the radio. In fact, satellite radio penetration varied greatly among areas that received the same number of AM/FM stations. Third, price discrimination against targeted new car purchasers would require the acquiescence and cooperation of the auto manufacturers and dealers. This might have been resisted by the companies. Finally, some consumers in targeted areas could evade the discrimination by purchasing equipment from Internet retailers at lower prices, and some consumers could avoid subscription price discrimination by using their business addresses instead of their home addresses.

⁹FCC Opinion and Order, ¶ 42. In our view, population density was relevant to explaining an independent variable, the number of AM/FM stations, but not the dependent variable, the penetration of satellite radio. As such, it did not belong in the regression. As noted by Intriligator (1978, p. 189), “In general, the best approach is to include only explanatory variables that, on theoretical grounds, directly influence the dependent variable and that are not accounted for by other included variables.”

convinced that the degree of substitution was sufficiently high to broaden the market beyond satellite radio.¹⁰

Some merger opponents suggested that other audio devices were complements for satellite radio, not substitutes that would constrain the pricing of satellite radio. A relevant market includes reasonable substitutes, not complements. Thus, if the devices were complements, they would not belong in the same market.

The opponents' primary evidence of complementarity was that certain data suggested that satellite radio subscribers listen to more terrestrial radio than do nonsubscribers. However, concluding that these products are complements is not correct as a matter of economic logic. Economic complementarity occurs if the cross-price elasticity of demand is negative—that is, if an *increase* in the subscription price of satellite radio would lead to a *decrease* in the demand to listen on the other products; thus, listening on the other products would not constrain the pricing of satellite radio. In contrast, products are economic substitutes if the cross-price elasticity of demand is positive—that is, if an increase in the subscription price of satellite radio would lead to an *increase* in the demand for listening on other products; thus, listening on the other products would constrain the pricing of satellite radio.

In fact, there was direct market evidence of substitution. When people subscribe to satellite radio, they cut back on AM/FM listening, which strongly suggests that satellite and terrestrial radio are substitutes. (Satellite subscribers may not cut back on AM/FM listening on a one-to-one basis, and thus their total listening may increase. This fact pattern, however, would not make listening on satellite radio and terrestrial radio or MP3 players into economic complements.) Similarly, when satellite radio subscribers deactivated their subscriptions, they returned to other audio entertainment options, including, overwhelmingly, terrestrial radio.

Some merger opponents also suggested that satellite radio was a separate market because subscribers were “locked-in” as a result of previous equipment purchases or by the fact that their automobiles came equipped with satellite radio already installed. This lock-in certainly does occur, especially with respect to automobiles. However, any lock-in would not imply a satellite radio market. The lock-in would apply to either XM or Sirius individually, and not to satellite radio generally. Lock-in to an *individual firm* would not provide any incremental pricing power to the *merged firm*.¹¹ In fact, it reduces the potential for adverse competitive effects of the merger, not the other way around, because the lock-in reduces substitution

¹⁰FCC Opinion and Order, ¶ 43.

¹¹A similar analysis would apply to any lock-in to a particular service that was caused by long-term contracts or cancellation fees.

between Sirius and XM before the merger.¹² In any event, consumers face no switching cost if they decide to move to terrestrial radio, as all vehicles are equipped with terrestrial radio receivers.

Finally, the analysis of market definition involves a question of the proper time frame. Opponents desired a very short-term analysis, while the merger proponents suggested a longer time frame. However, regardless of how the market is formally defined, the time frame for competitive effects analysis of mergers is the medium run and not just the short run. The analysis should not focus solely on the impact on competition at the time of the merger, but also account for market dynamics and trends in the marketplace.

This was important here because competition among audio entertainment devices was projected to increase over time. Music was becoming available on mobile phones. It was clear that technology was going to lead to additional audio entertainment choices for consumers who listened in their vehicles or away from home. Wireless phone companies were building out their 3G networks. The first generation iPhone was released in June 2007, and the iPhone 3G was released in June 2008. Pandora was made available on the iPhone 3G. Internet radio and music services on wireless phones also were on the horizon. Hybrid Digital (HD) radio promised increased sound quality and an increase in the number of FM radio stations. Automobile manufacturers were discussing equipping vehicles with HD radios and auxiliary jacks for portable devices. Microsoft Lync and other integration software was being designed to permit users to access and control mobile phones, iPods, SD cards, and other devices through the automobile sound system.

Satellite radio recognized this competition. Sirius and XM offered portable radios that permitted owners to store their own music selections and purchase downloads. Sirius and XM also were attempting to sell their services for use on mobile phones, as was Clear Channel, which was the largest terrestrial radio company.¹³

Given this significant and growing competition, which obviously has occurred in fact, the DOJ concluded that the relevant market was broader than just satellite radio and included other audio entertainment devices. In such a broader market, Sirius and XM had very low market shares. In contrast, the FCC took a worst-case scenario approach, which led it to assume that the relevant market was just satellite radio programming. While the narrow market definition led the FCC to require certain merger

¹² Moreover, XM and Sirius both offered substantially lower subscription prices to people who were buying a second radio subscription, rather than giving a lower price to people who were less locked-in when they were initially choosing between XM and Sirius to be their service provider.

¹³ With respect to the alleged incentive to increase the number of commercials, we argued that such an increase (if it occurred) also would create an incentive to reduce the subscription price to consumers, in part to increase the revenues from commercials by increasing the number of subscribers. Moreover, under the assumptions that were made about the increase in the number of commercials, the beneficial effect of the lower subscription price likely would have more than compensated consumers for the disutility of listening to more commercials.

“conditions,” the increased competition over time led the FCC to limit the time frame for those conditions to three years.

COMPETITION FOR CONTENT

Sirius and XM potentially do compete for high-value content such as, for example, professional sports or Howard Stern. This raises a potential *monopsony* concern from the merger, as the merged company would be able to negotiate lower prices with the content providers. Our analysis concluded that the merged company might be able to bargain for lower prices, but there would not be a significant monopsony problem that would harm consumers. In fact, the merger could lead to higher prices being paid for content.

The classical monopsony concern is not that input suppliers would be harmed but that the reduction in input purchases would lead to reduced output. That was unlikely to be the case here. Much of the content is supplied inelastically, so there would be no opportunity for output-reducing monopsony conduct. Other content such as NFL football or MLB would be produced regardless of the price that was negotiated for satellite radio rebroadcast. The number of satellite radio subscribers is too small to affect the incentives to produce the content. For example, the NFL will not play or broadcast fewer games if they receive a smaller payment from the merged firm. That payment is a very small fraction of the total NFL revenue. In this situation, a reduction in the payment will not lead to any reduction in programming. When content is provided inelastically in this way, there can be no monopsony output distortion.¹⁴

There could be a reduction in the price that would be paid to content providers from the change in bargaining power. However, while this would harm content providers, it would not harm consumers. Lower payments for content could lead to the incentive for a lower retail subscription price and a larger number of subscribers, in contrast to the situation in anticompetitive monopsony. This is because the process for acquiring this content likely involves an efficient bargaining process, not monopsonistic price setting. This lower price and increased output causes consumer benefits. This result is simplest to see when content payments are structured explicitly on a per subscriber basis.¹⁵ In this situation, lower content payments imply that the satellite radio provider achieves a lower marginal cost of adding subscribers.

¹⁴ Blair, Kaserman, and Romano (1989). Even for content that is produced solely for satellite radio, there is a greater likelihood that the negotiations would lead to no reduction in supply, but simply a reduced payment for inframarginal content through nonlinear prices.

¹⁵ Structuring payments on a per-subscriber basis often is an efficient way to deal with uncertainty over the total value of the content to the distributor, and the number of subscribers can be a useful metering device. Per-subscriber payments for cable programming content are common. For a technical analysis of this issue, see Tirole (1990, pp. 176–178).

This result would lead simply and directly to an incentive to lower price and increase output.¹⁶

In addition, the payments received by content providers actually could increase as a result of the merger. Specifically, the merged firm might be willing to pay a larger amount for the exclusive rights to particular audio content than either XM or Sirius would be willing to pay on their own. Since the merged firm would be able to offer the content to all of the XM and Sirius subscribers, the value of the content would be higher because it could be sold to more subscribers.

In a bidding context, this higher value could translate into a higher payment for the content owners for another reason: The merger would have the effect of replacing two relatively weak bidders (i.e., XM and Sirius) with a single, more aggressive bidder (i.e., the merged firm) vis-à-vis other bidders. For example, consider a situation where the merged firm would win the bidding competition for a particular audio content, but neither XM nor Sirius would have been able to win the bidding in the absence of the merger, say, because they would have lost to an HD radio network. In this situation, where the merged firm would outbid the HD radio network, the content owner would obtain more revenue. In fact, the content owner could benefit even if the merged firm would not win the bidding competition. In this scenario, the merger would intensify the competition between the “final two” (i.e., the HD radio network and the merged firm), and the content owner would benefit regardless of which bidder would prevail in the bidding.

COMPETITION FOR DISTRIBUTION

Sirius and XM operate on different frequency bands. At the time of the merger, there were no radios on the market that were interoperable for both

¹⁶It is interesting to see how lower payments for content reduce the marginal cost of adding subscribers, even when those payments are lump-sum amounts that do not depend explicitly on the number of subscribers. In particular, this result occurs for new products with dynamic demand such as satellite radio. For example, consider a new service that has a contract with a content provider until the end of year. The contract specifies a fixed lump-sum payment of \$1 million, and the service currently has 1 million subscribers. Thus, when the service and the content provider negotiated the contract, they agreed the payment should be about \$1 per subscriber and then agreed to an upfront payment of \$1 million, given the expected number of subscribers. Clearly, this contract has no effect on the service's marginal cost of adding subscribers. However, suppose that demand is dynamic and therefore adding subscribers this year implies more subscribers next year (all else equal). Suppose further that the service expects that the new contract with the content provider that will be signed at the end of this year also will be based on a “content price” of \$1 per subscriber (while still specifying a fixed lump-sum payment). In this case, because demand is dynamic, the marginal cost of adding subscribers this year depends on the “content price” that the service expects it will pay next year. Suppose now that the service merges with another service and, as a result of the reduction in competition for content, the service expects that in future negotiations it will be able to reduce its payments to the content provider and that those future payments will correspond to a price of (say) 90 cents per subscriber. Because demand is dynamic, this reduction in future payments for content implies a reduction in the marginal cost of adding subscribers this year, even though the merger has no effect on the current contract with the content provider. For further details, see Salop *et al.* (2007a, Appendix B).

Sirius and XM. This meant that subscription competition between them could focus only at the point where the radio was purchased. The merger in principle could lead to a reduction in this competition, and concerns were raised about it. However, the evidence indicated that competition between Sirius and XM likely would be quite limited going forward.

There are two channels of distribution for satellite radio: retail and automotive. At the time of the proposed merger, most consumers obtained satellite radio in their vehicles. Moreover, satellite radio was becoming integrated by the manufacturers into the audio system as original equipment, rather than consumers' purchasing aftermarket units. Automobile manufacturers did not offer consumers a choice of Sirius or XM. Instead, some automobile manufacturers offered exclusively XM, while others offered Sirius.

There were technological reasons for this specialization: The radios had to be integrated into the manufacturers' audio systems. In addition, by having Sirius and XM bid for the exclusive position, the manufacturers likely were able to obtain better prices. Such buyer-driven exclusivity is observed in many industries. Perhaps the notable example is exclusives that Coca Cola and Pepsi have with fast food chains such as McDonald's and Burger King.

The merger would eliminate this bidding competition, of course. However, it did not lead to complaints by the automobile manufacturers. Nor would it likely lead to anticompetitive effects. This is because competition for sole-source automobile contracts would essentially be dormant for a significant period of time. Virtually all of the automotive manufacturers had already chosen a satellite radio partner and had agreed to very long-term contracts. Moreover, once the decision had been made, there were significant switching costs to change provider. Therefore, not much competition between XM and Sirius was expected to occur for quite some time in the automotive segment.

By the time of the merger, the retail channel had virtually collapsed. Aftermarket vehicle and portable satellite radios no longer were “hot” retail items, having been superseded by mobile phones. Some retail sales involved consumers with satellite radio in their vehicles purchasing supplementary units for home. Substantial other sales were made to subscribers of one satellite radio service who desired content that was exclusive to the other satellite radio service. (We will discuss competition for content below.)

This view of the retail market also was supported by consumer survey evidence. There was very little subscriber switching between Sirius and XM. When people deactivated their satellite radio subscription, they almost always switched to other audio entertainment options, not to the other satellite radio service. It also would be surprising for retail consumers who already had a device to switch to the rival satellite radio service in response to a small subscription price increase by either XM or Sirius. The retail prices of the radios averaged about \$100. The annual subscription cost of

the service was less than \$200 per year. If there were a 10 percent increase in the subscription cost, it would take five years of savings to recover the \$100 cost of the new device. Therefore, it was unlikely that the merger would create significant upward pricing pressure on subscription prices. However, as a backstop, the merging companies made a voluntary commitment to cap subscription prices at current rates for three years after the merger.¹⁷

PENETRATION PRICING, DEMAND SPILLOVERS, AND OTHER EFFICIENCY BENEFITS

The merger promised numerous efficiency benefits. The merging parties claimed that they would obtain substantial cost savings. While the DOJ and FCC were skeptical about whether some of these savings were merger-specific, both nonetheless concluded that the likely variable cost savings (those most likely to lead to lower prices charged to consumers) were substantial. These included economies of scale in radio development and production. There were also benefits to consumers from combining the exclusive content across the two platforms. The merger also would increase the incentive to create dual-band, interoperable radios.

From an economic analysis point of view, the most interesting efficiency benefits of the merger flowed from the fact that demand in this new industry was dynamic and growth depended on word-of-mouth advertising. This “dynamic demand” property affected pricing incentives by creating an incentive for low “penetration pricing.” The efficiency flowed from the way in which the merger would *increase* the incentive for this penetration pricing. This is because advertising by one firm increases demand for the other firm as well. This spillover effect” was significant here because demand is dynamic. By internalizing this externality—what we called the “dynamic demand spillover effect”—the merger would cause lower prices, *ceteris paribus*.

The dynamic demand spillover effect is not a complicated concept. It begins with the premise that in a growing market, increased current sales lead to higher sales in the future. This dynamic demand spillover effect occurs for several reasons:

First, dynamic demand can be attributed to a process of information diffusion, which can take various forms.¹⁸ For example, it could involve word-of-mouth diffusion from early adopters to late adopters that raises awareness for the product. In effect, early adopters could act as “marketing

¹⁷ Radio prices were not capped, but the retail equipment market was very small, and the vehicle manufacturers had long-term contracts.

¹⁸ The foundations of information diffusion theory are presented in the seminal work of Rogers (1983). See also Bass (1969) and Mahajan, Muller, and Wind (2000).

agents” on behalf of the firms that provide the product. The dynamic demand also could describe a more general informational phenomenon of “viral marketing:” Early adopters explain and demonstrate the product to their friends, which allows the friends to experience the product without buying it. Current subscribers also recommend the product to their friends. This type of information diffusion reduces uncertainty for potential customers and thereby induces incremental purchases by some of them. More generally, people may become more comfortable with the product over time as it has “proven itself” in the marketplace.

Second, dynamic demand can be attributed to network effects or bandwagon effects. Network effects would occur if the value of the product to consumers increases as larger numbers of other consumers acquire the product.¹⁹ Alternatively, over time additional sales of the product may lead it to become more fashionable, creating a bandwagon effect that increases future sales growth. The additional sales and information diffusion can generate a “market buzz” that can spur further growth by creating a momentum for the product. Similarly, the incentives of retailers can also give rise to dynamic demand functions if retailers are more willing to invest in promoting a product if and when the product has proven to be popular.²⁰

Third, dynamic demand can be attributed to consumer inertia or other switching costs.²¹ For example, suppose that consumers are more willing to purchase a nondurable product in the future if they begin purchasing in the present. In that case, future demand will be increased if current sales rise. This consumer inertia could be psychological. It could involve habituation, as in the case of cigarettes. Alternatively, the inertia could arise if consumers invest in learning how to use a product, as in the case consumer software. In that latter type of situation, when the product wears out or is replaced by upgrades, the consumer is more likely to purchase the product already being used. Again, this would lead to higher current sales’ driving higher future sales.

This analysis can be applied directly to the Sirius/XM merger. The merger involved two firms that had been in business less than six years and had achieved a penetration of only five percent of U.S. population. Their sales were projected to nearly double over the next four years. Survey evidence indicated the importance of word-of-mouth advertising among consumers. Most subscribers said that satellite radio had been recommended to them and that they recommended it to others. They also recommended the

¹⁹ For example, see Katz and Shapiro (1985).

²⁰ During this penetration phase, the firm similarly has the incentive to offer large inducements to retailers to stock the product and demonstrate it to consumers who come into the store. The retailers serve the same role as early adopters, spreading the word about the product, demonstrating it, and recommending it.

²¹ A survey of work on markets in which consumers face switching costs can be found in Klemperer (1995).

other service, not just the one they had. Analysts also stressed this viral marketing and “market buzz,” and the firms used it as a marketing tool.

The firms also took into account longer-run considerations in setting prices. In evaluating the profitability of a price increase, growing firms like XM and Sirius would have the incentive to focus more on the impact of price changes on prospective new subscribers than simply on the impact of the price change on current subscribers. For example, in 2005 before the merger, Sirius CEO Mel Karmazin said, “We know that there is price elasticity. What our focus today is on growing the category. It is a relatively small number of people that are currently subscribing to satellite radio. We want that number to grow huge, and we think that being attractively priced at retail, providing great content at good value is the way we grow the market.”²² He went on to say, “Our general sense is we know that we have the ability to increase our price. . . . Having said that, our interest as a Company is in growing subscribers.”²³

In more technical economic terms, Karmazin was describing “penetration pricing:” Growing firms recognize that losing a customer today (or slowing down growth) may cost more than any forgone short-run price-cost margin, which is the usual consideration in mature markets. The cost is greater because every lost current customer means a loss of future margins, both for that particular customer (until the customer churns) and for other customers that would have been attracted to satellite radio by virtue of the dynamic demand spillovers.

In such a market, pricing incentives are affected in a fundamental way. The behavior of a myopic firm that would maximize short-term profit does not coincide with that of a rational, forward-looking firm that maximizes long-term profit. In particular, a forward-looking firm that faces a dynamic demand function has an incentive to set a lower current price, relative to the one that it would charge if it maximized short-term profit.²⁴ In this way, the firm can boost the future demand for its product, with the resulting increase in long-term profit more than offsetting the initial decrease in short-term profit. This strategy of setting a lower current price is referred to as “penetration pricing.” The low current price represents an investment in future demand.

Similarly, the firm has an incentive to spend more than it otherwise would on both demand-enhancing investments (product quality improvements and advertising) and cost-reducing investments. This is because the resulting increases in current sales due to these investments will have a

²² Thomson Street Event, Sirius Satellite Radio Final Transcript, SIRI, Q1 2005 Sirius Satellite Radio Earnings Conference Call (April 28, 2005, p. 11).

²³ *Id.* pp. 12–13.

²⁴ There is a large body of literature that discusses the pricing decision of firms that face dynamic demand functions. For example, see Kalish (1983). For an extension to oligopoly, see Dockner and Jorgensen (1988).

dynamic spillover effect: increasing future sales as well. Of course, once the dynamic demand process stops in the future, a firm will have the incentive to raise its price. At that point, there will be no investment motive for penetration pricing.

This analysis has important implications for the usual hypothetical monopolist profitability test for market definition used in merger analysis: A price increase may appear profitable if only the near-term impact is considered, but may fail to raise longer-run profitability or serve the longer-run interests of the firm in the post-merger world. Moreover, even a *temporary* price increase would have longer-term effects when demand is dynamic and thus may fail to maximize longer-run profits even if it is profitable in the short-run. In these circumstances, the optimal price would not satisfy the standard conditions for short-run profit-maximization. A short-run profitability test would not adequately capture the impact of longer-term (i.e., nontransitory) price increases in a growing market with dynamic demand, as is explained more technically in the appendix section of this case study. Thus, a SSNIP test (i.e., a small but significant and nontransitory increase in price) that is based on the static Lerner condition would misleadingly imply that a price increase would be profitable.

A finding that demand is inelastic in the short run also would not necessarily imply that a merged firm would have the incentive to raise prices. In fact, that exercise would lead to a market definition that is overly narrow.²⁵ To carry out the hypothetical monopolist test correctly, it would be necessary to perform a dynamic analysis and evaluate the effect of the price increase on the growth rate of the hypothetical monopolist’s sales, as well as the impact on the customer base at the time of the price increase. A dynamic critical loss analysis would take the firm’s growth rate into account and would evaluate how the price increase would reduce current and future sales, both through direct price effects and also because of dynamic demand spillovers.

The most important implication of this dynamic demand analysis for the satellite radio merger is that it implies an efficiency benefit from the merger. The demand-increasing investments undertaken by one competitor in the industry also generate dynamic spillover benefits *to the other competitor*. Some consumers who learn about satellite radio from a subscriber of one service (say, Sirius) likely will purchase the other service (XM) because they prefer the exclusive audio content of the other service or because only the other service is offered for the vehicle brand that they are purchasing.

²⁵ Merger opponents did try to define a satellite radio market on the basis of short-run profit maximization. Ironically, their analysis led to the erroneous conclusion that Sirius and XM each comprised separate single-firm markets, because both firms were pricing below their short-run profit-maximizing prices.

This externality—the fact that a competitor captures some of the spillover benefits—creates a pre-merger free-rider problem.²⁶ It limits to some degree the incentive of each firm to engage in penetration pricing and other investments in the pre-merger world.²⁷ Now, consider the impact of the merger: The merger would resolve the free-rider problem because the merged firm would internalize the spillover externality and thereby increase the incentive to invest in lower prices or higher quality.²⁸

Dynamic demand spillovers that influence automobile original equipment manufacturers (OEM) subscriptions are particularly likely to involve *external* spillovers. Because virtually all OEMs offered only a single brand of factory-installed satellite radio, most potential OEM subscribers were finding that their choice of satellite radio service was determined by their choice of vehicle, not by whether XM or Sirius was recommended to them. For example, a consumer who purchased a GM vehicle and who was interested in satellite radio because of recommendations from a Sirius subscriber would find that only XM was available. Given the increasing relative size of the OEM channel, this source of external spillovers was becoming increasingly important.

This procompetitive incentive for lower penetration pricing was expected to occur immediately following the merger. Of course, this dynamic demand spillover benefit will not go on forever. The market will eventually mature, and the incentives to exploit the dynamic demand spillover effect may then no longer be significant. However, the increasing competition from mobile broadband access, more robust and widespread cellular networks, and other technological advances would prevent the merged firm from exercising market power in the future.

This analysis does not prove that the downward pricing pressure (and analogous upward quality pressure) from internalizing the dynamic demand spillover effect dominates any upward pricing pressure from a merger between competitors, even in the first periods after the merger.²⁹ That conclusion would require a balancing that we were unable to carry out in a

²⁶ If price decreases by one competitor tend to be matched by price decreases by another competitor, that competitive response does not resolve the free-rider problem. Each firm still disregards the demand benefit that is obtained from its price reduction by the other firm.

²⁷ Firms also may inefficiently overinvest in brand-specific advertising and underinvest in generic advertising of satellite radio service.

²⁸ A similar analysis applies to the incentive to undertake cost-reducing investments. When a satellite radio provider decides how much to invest to reduce its variable costs, it would take into account that a cost reduction will allow it to charge a lower price and increase its current subscriber base. In addition, it would take into account that the higher current sales will generate higher future sales due to the dynamic spillover effect. However, pre-merger the satellite radio provider would not take into account that higher current sales also will generate higher future sales for the other satellite radio provider. Therefore, the merged firm has a greater incentive to reduce variable costs than does each of the individual firms pre-merger.

²⁹ The positive externality discussed here thus coexists with the usual negative externality between a firm's lower price in period t and the other firm's profit in period t .

quantitative way. However, in light of the competition from other audio entertainment devices and the limited competition between Sirius and XM at the time of the merger, we expected this pro-competitive effect would dominate. Moreover, this pro-competitive effect would be in addition to the other efficiencies.

An interesting research question is how broadly this theory would reach. This dynamic demand spillover analysis clearly does not apply to every market. However, it can be an important element in the analysis of industries where most of the following conditions occur: a new product technology, where the value of the product is not obvious to the potential customers; an immature product early in its life cycle—not close to saturation, with high growth opportunity; growth that is driven significantly by word-of-mouth/recommendations by current customers; evidence that there is pricing for growth (penetration pricing); imperative for growth because of the need to maintain interest in the product category (market buzz and distributor attention/investment) to generate continued demand; and evidence of external demand spillovers.

REGULATORY OUTCOME

As was indicated at the beginning of this chapter, the DOJ cleared the merger in March 2008. The DOJ concluded that “the evidence did not support defining a market limited to the two satellite radio firms that would exclude various alternative sources for audio entertainment, and similarly did not establish that the combined firm could profitably sustain an increased price to satellite radio consumers. Substantial cost savings likely to flow from the transaction also undermined any inference of competitive harm. Finally, the likely evolution of technology in the future, including the expected introduction in the next several years of mobile broadband Internet devices, made it even more unlikely that the transaction would harm consumers in the longer term.”

The FCC operates under a broader public interest mandate than just the antitrust laws. The FCC also maintains that the parties bear the burden of proving that a transaction serves the public interest on balance.³⁰ In addition, the FCC has the power to withhold approval of the license transfers that are required for a merger, whereas the DOJ must attempt to block the merger in court. These differences imply that the FCC has much more bargaining power in settlement negotiations with the parties. As a result, the FCC often is much more interventionist and much more political than the DOJ. That was the case here.

³⁰ FCC Opinion and Order, ¶ 48.

The FCC approved the merger in July 2008 by a 3–2 vote. However, the FCC conditioned its approval on several provisions, including the following:

- Capping the monthly subscription price at the current level for three years;³¹
- Requiring a la carte channel and smaller package options at prices not to be raised for three years;
- Designing and selling an interoperable radio (i.e., one that would receive both signals), and payment of \$19.7 million for violations of previous FCC regulations; and
- Setting aside eight percent of channel capacity for noncommercial and diversity channels.

The price cap was designed to resolve concerns about market power until the other emerging technologies gained greater strength. Requiring a la carte options had been an FCC agenda item under Chairman Martin. The requirement of interoperable radios and the payment involved the failure of the firms previously to sell interoperable radios. The channel set-aside was designed to resolve concerns about diversity.

Both the DOJ and FCC outcomes were controversial at the time. Seventy-two members of Congress had criticized the transaction. Dissenting FCC Commissioner Adelstein concluded that “it is remarkable that the Commission took so long to do so little.”³²

MARKET AFTERMATH

One month before the merger was approved, Sirius and XM stock prices dropped significantly, out of fear of bankruptcy. By early 2009, the stock price of the combined company fell as low as five cents per share, which was a big drop from prices of around \$14 for XM and about \$3 for Sirius at the time of the merger announcement. However, the company obtained \$500 million in financing from John Malone, who is a cable TV pioneer who controlled a large media company, Liberty Media, in exchange for a 40 percent equity interest in the company.

The merged company has since recovered financially. After the expiration of the price cap period, it raised its prices. At the time of this writing in April 2012, Sirius and XM basic subscriptions each cost \$14.49 per month for a basic plan of 130 channels, with additional premium programming that is available for \$17.99 per month total. By the end of 2011, the company had achieved a base of 21.9 million subscribers, versus 17.3 million at the end of 2006. The company also reached a state of profitability with an

³¹ The parties had offered this commitment at the time of their original merger announcement to address potential FCC concerns.

³² See Murray (2009, p. 94). See also Gordon (2008).

EBITDA margin of 24 percent. It achieved a free cash flow of more than \$200 million in 2010 and more than \$400 million in 2011.

We have not undertaken a retrospective competitive effects analysis. It is clear that consumers retain considerable listening options—more than they did at the time of the merger announcement. The introduction of iPhones and other smartphones has made Rhapsody, Pandora, other free streaming radio services, and a multitude of Internet radio stations widely available, either for free or for a price that is comparable or lower than Sirius XM. In addition to AM/FM, most new automobiles are equipped with auxiliary jacks and provide software integration for mobile phones and other devices. HD radio is available (or announced) on many brands of new vehicles, including Ford, Toyota, BMW, Mercedes, Volkswagen, Subaru, and others.³³

We will leave to readers the task of carrying out a rigorous study of whether this merger led to a thriving audio entertainment market or whether Sirius XM is exercising market power. But here are some facts to help get you started:

- Satellite radio has not achieved nearly as many subscribers as was projected at the time of the merger announcement. Its share of audio entertainment remains very small.³⁴
- At the time of this writing,³⁵ the basic subscription price for the merged company is \$14.49 per month, an increase of about \$1.50 (i.e., 11.5%) since the merger announcement four years earlier. At the same time, its programming has improved, and it has retained certain popular exclusive content, notably Howard Stern. Moreover, after four additional years, the dynamic demand effects have probably dampened down, so one would have expected some price increases, even if there had been no merger.³⁶
- Rhapsody is currently priced at \$14.99 per month.
- The commercial-free Pandora One premium service is \$3 per month, and there is a free service with commercials. Pandora has a lower subscription price than Sirius XM, but earns more on advertising. An informal study in 2011 (before the Sirius XM price increase) made the point that an active user of Pandora generated \$457 in annual revenue for Pandora, whereas a Sirius XM subscriber generated only \$141. Broadcast radio stations earned an average of \$844 per listener.³⁷

³³ <http://www.ibiquity.com/automotive> (visited April 20, 2012).

³⁴ A 2009 Nielsen study estimated that AM/FM accounted for 74 percent of audio time in the car versus about five percent for satellite radio. http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/11/VCM_Radio-Audio_Report_FINAL_29Oct09.pdf.

³⁵ April 2012.

³⁶ We do not have information on relative prices of various audio entertainment devices. In 2009, Apple permitted recording labels to raise the price of some iTunes songs from 99 cents up to \$1.29 or to lower them to 69 cents. We have not calculated the change in the average iTunes price relative to the Sirius/XM price.

³⁷ <http://www.radioinsights.com/satellite-radio/>.

APPENDIX

This appendix analyzes the pricing decision of a firm that faces a dynamic demand function. It explains technically how dynamic demand functions involve current sales that have a spillover effect on future sales, and how this leads to an incentive to engage in penetration pricing. This has important implications for market definition and competitive effects analysis in merger cases. A firm's low penetration pricing generates a positive externality on other firms' future profits because the dynamic spillover effect increases the future sales of *all* the firms, not just own future sales. This gives rise to a pro-competitive justification for mergers, as the merged entity will internalize this externality and thus will have a greater incentive to engage in low penetration pricing.

Pricing in the Presence of Dynamic Demand

A firm that faces a dynamic demand function has an incentive to engage in penetration pricing: to charge a price that is below the level that maximizes the firm's short-term profits.³⁸ To illustrate, consider a firm that sells its product in a market that lasts for two periods. In period 1 (present) the demand for the firm's product is given by:

$$Q_1 = d_1(P_1) \quad (\text{A1})$$

where Q_1 and P_1 denote the quantity and price of the firm's product in period 1, respectively. The function $d_1(P_1)$ is assumed to be decreasing, reflecting the standard assumption that the volume of sales decreases as the price increases.³⁹

In period 2 (future) the demand for the firm's product is given by:

$$Q_2 = d_2(P_2, Q_1) \quad (\text{A2})$$

where Q_2 and P_2 denote the quantity and price of the product in period 2, respectively. The function $d_2(P_2, Q_1)$ satisfies two assumptions: (1) It is decreasing in the second-period price P_2 ; and (2) It is increasing in the first-period quantity Q_1 . The former assumption says that the volume of sales in period 2 (Q_2) decreases as the price in period 2 (P_2) increases. The latter says that current sales have a spillover effect on future sales, such that an increase in the volume of current sales (Q_1) leads to a higher volume of future sales (Q_2). This could reflect, for example, the fact that in period 1 information diffuses from early adopters to late adopters and creates higher future demand for the product.

³⁸ The firm also has greater incentives to undertake demand-enhancing and cost-reducing investments than when demand is not dynamic.

³⁹ The demand for the firm's product (implicitly) depends also on the prices of other products. For simplicity, we hold the prices of these other products constant.

The firm will set prices in periods 1 and 2 so as to maximize the discounted sum of its profits from both periods (i.e., its long-term profit). In other words, the firm solves:

$$\max_{P_1, P_2} \Pi_1 + \delta \Pi_2 = (P_1 - C_1)d_1(P_1) + \delta(P_2 - C_2)d_2(P_2, Q_1), \quad (\text{A3})$$

where C_1 and C_2 denote the firm's (constant) marginal cost in periods 1 and 2, respectively, and $\delta > 0$ denotes the "discount factor" between periods 1 and 2.⁴⁰

Letting $s = \partial d_2(P_2, Q_1) / \partial Q_1$ denote the dynamic spillover effect between current and future sales, the first-order conditions for profit maximization yield:

$$\frac{(P_1 - C_1) + \delta s(P_2 - C_2)}{P_1} = \frac{1}{E_1} \quad (\text{A4})$$

and

$$\frac{P_2 - C_2}{P_2} = \frac{1}{E_2}, \quad (\text{A5})$$

where E_1 and E_2 denote the absolute values of the price elasticities of $d_1(P_1)$ and $d_2(P_2, Q_1)$, respectively.

Equation (A5) is the standard *static* Lerner condition that characterizes the firm's profit-maximizing price in period 2. It says that the firm's profit margin in period 2 (expressed as a percentage of the second-period price) is equal to the inverse elasticity of demand in period 2.

Equation (A4) is a *dynamic* Lerner condition that characterizes the profit-maximizing price in period 1. It is similar to the standard static condition, except that the relevant profit margin is not just the first-period margin (i.e., $P_1 - C_1$) but also includes the discounted future margin obtained in period 2 from an additional sale in period 1 (i.e., $\delta s(P_2 - C_2)$).

Moreover, from equation (A4), it follows that the presence of dynamic spillover effects tends to reduce the price in period 1, relative to the case of no dynamic spillover effects (i.e., the case with $s = 0$). To see this, it is useful to rewrite equation (A4) as shown below:

$$\frac{P_1 - [C_1 - \delta s(P_2 - C_2)]}{P_1} = \frac{1}{E_1}. \quad (\text{A6})$$

This says that the dynamic spillover effect makes the firm behave as if its first-period marginal cost was lower by the amount $\delta s(P_2 - C_2)$, which is the discounted margin that the firm will obtain in period 2 from an additional sale in period 1. As a result, in the same way that a reduction in marginal cost induces a firm to lower its price, the dynamic spillover effect

⁴⁰ One can assume that the discount factor is less than 1; i.e., $\delta = 1/(1+r)$, where r is the rate of interest. Alternatively, one can assume $\delta > 1$ if period 2 in fact corresponds to a much longer period than period 1.

tends to reduce the price in period 1. Thus, the benefit of the spillover effect is also shared by consumers in the form of a lower price. All else equal, the greater is the extent of the dynamic spillover effect, s , the more pronounced is the incentive to lower the price.⁴¹

The intuition behind the result is straightforward: When current sales lead to higher future sales—i.e., $s > 0$ —the firm faces the following trade-off between current and future profits: By setting a lower first-period price, relative to the price that maximizes the (short-term) first-period profit, the firm forgoes some profits in the first period. At the same time, however, the lower price allows the firm to expand sales in the first period, which in turn increases demand and hence profitability in the second period. In a longer time frame, this effect will continue to occur as long as demand exhibits dynamic spillover effects.⁴²

Implications for Merger Analysis

There are three important implications of penetration pricing for merger analysis: First, penetration pricing has an important implication for the implementation of the SSNIP test and market definition. If one were erroneously to evaluate the profitability of a SSNIP using the *static* Lerner Condition, then one likely would find the SSNIP to be profitable. However, a correct implementation of the SSNIP test should be based instead on the *dynamic* Lerner condition (see equation A4), which takes into account the dynamic spillover effect. This is what a forward-looking hypothetical monopolist who maximizes long-term profit would use.

Second, even if a rigorous econometric study were to find that the short-term demand for a group of products is relatively inelastic, that fact would not imply that the group of products is a proper relevant antitrust market.

Third, penetration pricing has implications for competitive effects analysis. Each firm's low penetration price in period 1 creates a positive externality on the other firm's profit in period 2. By reducing its price in period 1, a firm sells more in period 1, which means that the other firm also will obtain a greater boost to its second-period demand. Each firm does not account for

⁴¹ For example, if $C_1 = C_2 = 1$ and $E_1 = E_2 = 2$, then Equations (A4) and (A5) imply $P_2 = 2$ and $(P_1 = 2(1-\delta s))$. Thus, the stronger is the dynamic spillover effect (i.e., the higher the value of s , the lower is the price in period 1. To illustrate this point, suppose that the discount rate is $\delta = 1$ and the dynamic spillover effect is initially $s = 0.5$. Then, the first-period price is $P_1 = 1$ and is 50 percent lower than in the absence of a dynamic spillover effect (i.e., the case with $s = 0$). If the spillover effect increases to $s = 0.75$, then the first-period price falls from $P_1 = 1$ to $P_1 = 0.5$, a further 50 percent reduction. Notice that in this type of dynamic market, the (long-term) profit-maximizing first period price can be less than marginal cost. This is reminiscent of below-cost pricing that may arise when a firm sells complementary products (e.g., a firm might sell razors at prices below cost in order to sell more blades later).

⁴² The dynamic spillover effect may last for several periods, and its magnitude may change over time as the market grows and matures. Eventually, the dynamic spillover effects vanish, and demand becomes static. Until that time, the firm has an incentive to engage in penetration pricing.

the spillover benefit obtained by the other firm. This is a type of pre-merger free-rider problem. A merger will allow the two firms to internalize the positive externality that is created by penetration pricing, which gives them an incentive further to decrease their prices to boost future demand.

The increased incentive to reduce prices post-merger can also be understood in the context of the two-period model described above: The internalization of the positive externality on the other firm's future profit corresponds to an increase in the extent of the dynamic spillover effect: s . As a result, in the same way that an increase in the extent of the dynamic spillover effect, s , leads a firm to decrease its first-period price, the merger will create an incentive for the merging firms to decrease their first-period prices post-merger.⁴³ In a longer time frame, these effects will continue to occur as long as demand exhibits dynamic spillover effects.

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⁴³ This analysis does not prove that the downward pricing pressure from internalizing the dynamic demand spillover effect dominates any upward pricing pressure from a merger between competitors, even in the first periods after the merger. The positive externality discussed here thus coexists with the usual negative externality between a firm's lower price in period t and the other firm's profit in period t .

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CASE 4

Revisiting a Merger: *FTC v. Evanston Northwestern Healthcare* (2007)

Deborah Haas-Wilson*

INTRODUCTION

On February 10, 2004, the Federal Trade Commission (FTC) issued a three-count complaint that challenged the January 1, 2000, merger of Evanston Northwestern Healthcare Corporation (Evanston, or ENH) and Highland Park Hospital (HPH) under Section 7 of the Clayton Act. Count I of the complaint alleged that the Evanston merger violated the Clayton Act in specified relevant product and geographic markets. Count II alleged the same anticompetitive behavior, but did not allege a specific product or geographic market. Under this count the FTC argued that it is not necessary to prove a relevant market because evidence of significantly higher post-merger prices demonstrated that the Evanston merger substantially lessened competition.¹ Count III alleged that the group of physicians who were associated with the hospitals had engaged in price fixing on behalf of its employed and affiliated physicians. Since the third count raised different issues and was settled by a consent agreement, it will not be discussed here.

At the time of the merger Evanston owned two hospitals—its 400-bed teaching hospital in Evanston, Illinois, and a 125-bed community hospital in nearby Glenview, Illinois. The acquired 150 to 200-bed community hospital is also located in the affluent suburbs north of Chicago: Highland Park. The three hospitals form a geographic triangle, and there are no other hospitals within this triangle, although there are many other hospitals that are

* Deborah Haas-Wilson served as the Federal Trade Commission's primary economic expert during the administrative trial.

¹ The Commission did not rule on Count II. "Having found that the evidence is sufficient to define the product and geographic markets, and that complaint counsel has prevailed under Count I, we consider it unnecessary to decide whether the law permits establishing a violation of Section 7 without defining a relevant market."