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CANNIBALIZATION AND OPTION VALUE EFFECTS OF SECONDARY MARKETS: EVIDENCE FROM THE US CONCERT INDUSTRY

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We examine how reducing search frictions in secondary markets affects the value appropriated by firms in primary markets. We characterize two effects on primary-market firms caused by intermediaries entering secondary markets: the "cannibalization" and "option value" effects. Separation between primary and secondary markets can drive which of the two effects dominates. Firms selling valuable and scarce products are more likely to have separate primary and secondary markets, and will therefore appropriate more value when secondary markets thicken. Firms selling products that are not valuable and scarce will be hurt. Further, we hypothesize that firms have incentives to engineer scarcity by limiting supply when secondary markets thicken to separate primary and secondary markets. We find support for these hypotheses in the U.S. concert ticket industry. Copyright © 2014 John Wiley & Sons, Ltd.

INTRODUCTION

Firms sell their products in primary markets. Secondary markets are those on which a firm's products are resold by someone else. Many goods are resold on secondary markets, including stocks, real estate, electronics, books, and cars. Because buyers and sellers of products on the secondary market are often diffuse, it can be difficult for a prospective buyer to find a seller, leading to high search costs (Stigler, 1962). Intermediaries such as stock exchanges, realtors, online auction sites, and *AutoTrader* magazine help match buyers and sellers in secondary markets, thus reducing search frictions and creating value (Mahoney, 2005; Mahoney and Qian, 2013). The value of intermediaries to the economy is substantial: Spulber (1996) estimates that they account for about one-quarter of the United States gross domestic product. For example, eBay and Craigslist connect buyers to sellers for a variety of secondhand products and Amazon, in addition to serving as a merchant, offers a secondary market for third-party sellers to trade with buyers directly. All three websites are ranked in the top 10 most-visited sites in the U.S.[1] Taobao, the largest Chinese business-to-business Internet intermediary, reportedly handled more than $150 billion in transactions in 2012 (Tsuruoka, 2012).

There is debate, however, about whether lower search frictions in secondary markets benefit or harm primary-market firms. In the debate over the introduction of Amazon's market for secondhand products, called Amazon Marketplace, primary-market suppliers were concerned with cannibalization of their own offerings by those

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[1] www.alexa.com, accessed October 2012.

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from third-party sellers. Amazon, on the other hand, touted the benefits of option value for the suppliers because potential customers would be more willing to purchase products they could easily resell on a secondary market.[2] There are reasons to believe that the reduction of search frictions due to the entry of intermediaries may affect primary-market firms differently (Chatain and Zemsky, 2011), so each view may be correct under different conditions.

In this paper we set out to explain which types of primary-market firms benefit, and which are harmed, by lower search frictions in secondary markets. We begin by characterizing these two effects, option value effect and cannibalization effect, which the entry of intermediaries into secondary markets can have on primary-market firms, and we test our predictions in the U.S. concert ticket market using the plausibly exogenous entry of Craigslist, an intermediary, to identify price effects in the primary market.

Whichever of these two effects dominates determines whether the primary-market firm is the beneficiary or the victim of a reduction in frictions due to the entry of an intermediary into a secondary market. We submit that the option value effect is more likely to dominate the cannibalization effect when the primary and secondary markets are separated. As we detail below, one situation in which market separation occurs is when customers perceive demand as likely to outstrip supply on the primary market—that is, when the product is more likely to sell out. In that case, only the option value effect would exist and primary-market firms would benefit from the entry of intermediaries into secondary markets. On the other hand, when the product is unlikely to sell out, because of either slack capacity or low demand, customers will expect to find sufficient supply on the secondary market. The cannibalization effect will then take hold, and can dominate the option value effect, resulting in the primary-market firm being harmed by the entry of an intermediary. We furthermore hypothesize that firms will seek to engineer scarcity by strategically limiting supply, thereby allowing them to take advantage of the option value effect and mitigate losses from the cannibalization effect.

We test our theory using data on prices in the U.S. concert ticket industry. This industry has a number of advantages for investigating our question. First, there is substantial heterogeneity in (1) popularity across and within artists and (2) venue capacity, which provides variation in the degree to which the product is likely to sell out. Second, for a number of institutional reasons, which we describe below, tickets tend to be underpriced on the primary market, leading to an active secondary market. Third, we can take advantage of temporal and geographical variation in market entry by Craigslist, a prominent Internet intermediary through which many tickets are resold. [3] Craigslist's entry into different markets at different times can be considered quasi-exogenous (Seamans and Zhu, 2014), which allows us to implement a difference-in-differences empirical research design robust to secular trends.

This study contributes to the literature on frictions and value capture. Mahoney (2005) and Mahoney and Qian (2013) suggest that frictions can explain the two fundamental questions in strategy: why firms exist and why their performance varies. They argue that frictions in the market for resources result in firm heterogeneity. Chatain and Zemsky (2011) use a value-based strategy approach to model friction reduction formally, demonstrating that downstream frictions contribute to performance heterogeneity among upstream firms. We contribute both theory and empirics to this growing literature. We introduce theory suggesting that the net effect of the reduction of frictions in secondary markets is made up of two effects: the option value and cannibalization effects. Our theory yields predictions about how these two effects together affect the distribution of economic rents to firms in the primary market. Moreover, we document ways in which firms engineer scarcity by strategically limiting supply, a concept that has been addressed primarily at a theoretical level (e.g., Adegbesan, 2009; DeGraba, 1995; Liu and Van Ryzin, 2008; Stuart, 2007a,b).

THEORY AND HYPOTHESES

Intermediaries in secondary markets help reduce search frictions, which can have either positive or

[2] http://publishing.about.com/library/weekly/aa052102a.htm, accessed December 2012.

[3] As explained below, our main analyses use Craigslist instead of StubHub, a major ticket reseller, to take advantage of the fact that Craigslist's entry is more likely to be exogenous with respect to ticket prices than StubHub's entry. We obtain similar results in robustness tests using StubHub's entry.

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negative effects on firms in the primary market. We decompose the net effects into two individual effects, which we call the "option value" and "cannibalization" effects.

Option value effect

The first of the two effects that secondary markets can have on primary markets we call the "option value effect." Customers' willingness-to-pay for a product might be lower if the customers are concerned that they will not get the full use of the product. For example, a potential purchaser of a house might be dissuaded by the possibility that her job could eventually require her to move. If, however, the customer knows she can recover a substantial portion of her investment by reselling the house, she may be more willing to buy. In such a case, the existence of a secondary market can raise the willingness-to-pay of buyers in the primary market. The entry of an intermediary that reduces search frictions in the secondary market, therefore, adds option value to the product sold on the primary market. In the language of value-based strategy (e.g., Adner and Zemsky, 2006; Brandenburger and Stuart, 1996, 2007; Chatain and Zemsky, 2011; Ryall and MacDonald, 2004), the intermediary increases the amount of value created.

A number of non-cooperative game-theory models demonstrate this effect (e.g., Ghose, Telang, and Krishnan, 2005; Hendel and Lizzeri, 1999; Miller, 1974; Schiraldi and Nava, 2012), as do a number of empirical studies. For example, Chevalier and Goolsbee (2009) provide an empirical study in the college textbook market, showing that college students are sufficiently forward-looking that they are willing to pay higher prices for textbooks when they are first released than they are willing to pay two years later because they know they will be able to resell the newer textbooks in a secondary market. College students benefit from secondary markets for textbooks in two ways. First, they can use the textbooks for class and then resell after the class ends to recoup some of the cost. Second, they can purchase the textbooks while still deciding whether to take the class or not, and then resell essentially "unused" textbooks if they decide to drop the class after a few weeks. The second of those two is an example of the "option value effect". In some settings consumers have uncertainty about whether they will be able to use a product, and the ability to easily resell the product on a secondary market allows the consumer time to resolve the uncertainty.

Within our specific context, the customer's uncertainty is about whether or not she will be able to attend a concert at a later point in time. Any number of events may arise between the day when the customer considers purchasing the ticket and the day of the concert, which make it difficult or impossible for a customer to attend a concert. For example, an individual may get sick and not be able to attend, a parent may not be able to find a reliable babysitter for his child, or work obligations may require a last-minute trip out of town. If a customer faces too much uncertainty *ex ante,* she may be unwilling to purchase a ticket. On the other hand, if the customer is reasonably certain that she can resell the ticket on a secondary market, then she may be more likely to purchase a ticket. This option to resell is valuable, and in that sense the secondary market can complement the primary market.

Cannibalization effect

While the option value effect of secondary markets increases primary-market firms' ability to capture more value, secondary markets can also cannibalize primary-market sales. Primary-market firms do not directly capture any value from secondary-market transactions and a customer who obtains a product on the secondary market is likely to be a lost customer for the primary-market firm. In this sense, the secondary market can be a substitute for the primary market. A focal firm often has to lower its price on the primary market to compete against secondary-market sellers of its own product. Coase (1972) introduced this effect, conjecturing that durable-goods monopolists could not charge monopoly prices because of competition from other vintages of their own goods. This effect has received significant attention in theoretical literature (e.g., Bulow, 1982) and some attention empirically. Ghose *et al.* (2005) show that the inability to exercise inter-temporal price discrimination exacerbates the cannibalization effect.

The value-based strategy literature provides intuition for why this effect leads to a price decrease. The primary-market firm faces a competitor—the secondary market—offering the same product. The primary-market firm thus adds less value to a negotiation, and the maximum value it can capture is now lower. The intuition is that the buyer can now play off the primary-market firm and its

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secondary-market competitor against each other to bargain prices down.

Hypotheses

The reduction in search frictions in the secondary market from the entry of an intermediary will have different net effects on the primary-market firms, depending on which of the two individual effects dominates, which depends, in turn, on the substitutability of the focal firms' products available on the primary and secondary markets. Secondary markets lead to cannibalization when a potential buyer can acquire the product either from the primary market or from the secondary market. In this case, the buyer is able to play the sellers in both markets off against each other to bargain down the price. Hence, a necessary condition for the cannibalization effect is that the primary and secondary markets are both viable options for the buyer. If the primary and secondary markets are "separated," however, then the buyer is not able to play them off against each other and there is no cannibalization. This suggests that the option value effect is more likely to dominate when markets are separated.

There are a number of ways for primary and secondary markets to be separated, including geographic, temporal, and regulatory separation. Geographic separation can arise when products are resold sufficiently far from the primary market that arbitrage across the two markets is impractical. Temporal separation can arise when demand quickly outstrips supply, which might occur when a product is valuable and scarce.[4] Products in the primary market then sell out before a secondary market has time to develop. In such a case, the two markets are separated. In this paper, we focus on temporal separation.

Entry of a resale intermediary will "thicken" the secondary market in the sense that it decreases search costs in that market (e.g., Hubbard, 2001; Nickerson, Hamilton, and Wada, 2001), meaning that a customer who needs to resell a product will have an easier time locating a buyer. This thickening secondary market reduces the risk that a customer who buys a valuable and scarce product on the primary market will be stuck with it if she is later unable to use it. Such security increases the number of customers willing to purchase the product on the primary market, effectively bidding up the price. Firms selling valued products on the primary market can benefit from the option value effect of the thickening secondary market. Firms selling scarce products can avoid the cannibalization effect as they are likely to sell out their products before the secondary market starts to develop. Hence, they will be able to charge a higher price for their products.[5]

Suppose the primary and secondary markets are not separated, meaning the products available on both markets are relatively close substitutes for each other. This happens, for example, when there is sufficient supply on the primary market relative to demand. We expect the cannibalization effect to come into play in such cases. Customers who anticipate that a secondary market will emerge may be willing to wait to purchase products there. This will push down the prices of primary-market goods. Even worse, when costs are sunk and the goods depreciate quickly, secondary-market sellers could be willing to price below cost to increase their likelihood of recovering some of their investment.[6] Hence, secondary markets may not only prevent primary-market vendors from capitalizing on the option value effect, but may even drive prices down below what their price would have been absent a secondary market.[7]

[4] Both vertical (e.g., high quality vs. low quality) and horizontal (e.g., mainstream vs. niche) positioning of a product will affect whether customers purchase enough of the primary market good for its capacity to be exhausted. As such, our "valuable and scarce" language can reflect product positioning along either dimension.

[5] Our prediction that more popular goods will suffer less cannibalization from the secondary market sounds similar to predictions that a firm's higher-quality brands will suffer less cannibalization from other products in its product lines (De Figueiredo and Kyle, 2006). But in fact, the two predictions are quite different. The cannibalization we describe is of the *same product* later and the mechanism requires market separation.

[6] Imagine, for example, a coffee shop that buys baked goods from a nearby bakery to resell. Because the baked goods become less desirable over time, the coffee shop may be willing to sell them below cost the next day before they become inedible. Some customers may be willing to purchase day-old goods cheap from the coffee shop rather than fresh goods from the bakery at the "fresh" price.

[7] Note that if the primary-market firm could perfectly factor in the demand for the product, then all products would have the same probability of selling out and we would observe no variation in effect. There are, however, many reasons why firm's prices will not be perfect. These include demand adjusting more quickly than price, exogenous price restrictions such as those in the concert industry (Courty, 2003; Leslie and Sorenson, 2012; Seabrook, 2009), or the simple fact that pricing is very difficult and mistakes are common (Dutta, Zbaracki, and Bergen, 2003).

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Hypothesis 1a: Firms selling products in the primary market that are valuable and scarce will appropriate more value when the secondary market thickens than those whose products are not valuable and scarce.
Hypothesis 1b: Firms selling products in the primary market that are not valuable and scarce will appropriate less value when the secondary market thickens.

The arguments for the hypothesis above rely on the idea that firms benefit when the primary and secondary markets are separated and are hurt when these markets are not separated. This logic, in turn, suggests that benefits may accrue to firms that are able to separate the two markets strategically. Anecdotally, we know this to be the case in other settings; for example, clothing retailers are known to "destroy and discard" unsold clothing to keep it off the secondary market.[8] There is ample theory suggesting that firms strategically alter supply to affect prices in various settings (e.g., DeGraba, 1995; DeGraba and O'Hara, 1992; Liu and Van Ryzin, 2008). More generally, Stuart (2007b) shows that monopolists are able to capture more value when they undersupply their products. Thus, we expect the firms in our focal industry strategically to manipulate supply in a manner that would increase the likelihood of selling out—and thereby separate the markets—in order to take advantage of the option value effect.

Hypothesis 2: Firms in the primary market will elect to produce lower quantities when the secondary market thickens.

EMPIRICAL SETTING

We test these hypotheses in the context of the U.S. concert ticket industry, many features of which make it an ideal laboratory for examining the hypothesized effects from the entry of a resale intermediary. Artists are of heterogeneous popularity and an artist's "quality"—the attention currently being paid to him or her—is not directly chosen. Seats available at concerts are not perfectly adjustable to demand because each market has few venues, the sizes of which are very different.[9] This means that even promoters with a good idea of demand will find it difficult to choose a venue of exactly the right size. Tickets lose all of their value following the show, meaning that secondary-market vendors may be willing to sell below cost as the show approaches. Lastly, prices cannot be perfectly adjusted because of the stigma of artists charging what the market will bear (Courty, 2003; Kahneman, Knetsch, and Thaler, 1986; Leslie and Sorenson, 2012; Seabrook, 2009). The combination of these factors means that we can observe shows with a variety of probabilities of selling out and, therefore, different balances of the option value and cannibalization effects. This unique setting allows us to explore the features that determine which firms will benefit from reduced frictions in the secondary market.

The concert industry[10]

The impetus for a concert is usually a promoter, who selects an artist and negotiates the ticket price and their revenue split. The promoter then rents a venue. The structure of the rent distribution is typically as follows: Artists typically receive an advance from the promoter. Imagine, for example, that an artist receives an advance of $100,000. This means the artist is paid $100,000 immediately, which corresponds to the first $100,000 in ticket revenue. The next block of revenue is allocated to the promoter's "guaranteed profit." This might be $50,000 for expenses and $20,000 for profit. After this threshold of $170,000 is met, the artist and the promoter split the remaining revenue, typically on the order of 80 percent to the artist and the rest to the promoter. Venues are generally paid a fixed rental fee and keep proceeds from concessions and parking. Artists typically keep proceeds from merchandise sales, though sometimes they compensate the venue a percentage for permission to sell on the premises.

Venues select and typically enter into long-term contracts with ticketing providers, which handle the mechanics of ticketing. Tickets are generally distributed through the venue's box office and the

[8] Jim Dwyer, "A Clothing Clearance Where More Than Just the Prices Have Been Slashed," *New York Times*, January 10, 2010, available at http://nyti.ms/Z59RH4, accessed December 2012.

[9] Some venues are able to use tarps or to close off balconies to change capacity, but these moves are coarse adjustments.

[10] The examples below owe much to Krueger (2005). The details are consistent with those conveyed to the authors through interviews in 2011–2012.

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ticketing provider's website; some tickets are distributed directly to the promoter and the artist. Regardless of how tickets are distributed, they are often resold on the secondary market. This can occur because ticket buyers decide that they can no longer attend the concert, because the tickets were bought with the intention of reselling them, or because the tickets were released directly onto the secondary market by an artist or promoter.

Secondary markets for concert tickets can prove tremendously profitable for ticket resellers.[11] Historically, much of the secondary-market exchange took place through brokers or in person in front of the venue the day of the show (Seabrook, 2009). Since the late 1990s, the secondary market has increasingly migrated online and occurs through a secondary-market website owned by the primary ticketing vendor (such as TicketsNow), third-party websites specifically for ticket resale (such as StubHub), or Craigslist. The concert ticket industry has one of the most visible and controversial resale markets. For example, a 1999 *Forbes* column labeled the banning of ticket resale as 1 of the 10 dumbest ideas of the century (Seligman, 1999). Roth (2007), on the other hand, described how ticket resale is often seen as a "repugnant transaction."

Craigslist

Craigslist.org is a website specializing in classified-ad listings and is, in fact, the leading classified-ad service in any medium. As of November 2012, it was the ninth-most-visited website in the U.S.,[12] with about 60 million unique U.S. visitors each month.[13] Craigslist began service in 1995 as an email distribution list of friends in the San Francisco Bay area, before becoming a Web-based service in 1996. It expanded into 9 more U.S. cities in 2000, 4 each in 2001 and 2002, 14 in 2003, and then many more. As of 2012, it was available for more than 700 local sites in 70 countries and has over 50 million new classified advertisements each month.[14]

Among the products advertised on Craigslist are event tickets; so many, in fact, that the company has specific rules for them[15] and the popular press has wondered whether Craigslist would drive scalpers out of business.[16] It is important to point out, however, that Craigslist does not make money from ticket resale[17] and is therefore unlikely to enter any particular market based on ticket sales there. Thus, it is reasonable to assume that the entry of Craigslist into a market is exogenous with respect to ticket resale dynamics.[18]

DATA

Sample

Our primary data were obtained from three sources. A set of data on concerts was obtained from *Pollstar,* the magazine of the live entertainment industry. Data from *Pollstar* have been used in other studies of the concert industry—including Krueger (2005) and Mortimer, Nosko, and Sorensen (2012)—which describe the sample's representativeness. In this dataset, each observation is a single concert. For each concert, the data include the date, headliner, promoters, headliner's management company, number of tickets sold, revenue, venue, capacity for that particular show, and a classification of the artist.[19] Our data window is from 2003 to 2008; we chose this period because of data availability and overlap with our main independent variable, *post craigslist entry*, described below.

To ensure that concerts in our dataset are comparable, we first restrict the data to shows at U.S. venues. We remove acts that are too frequently categorized as "Comedy," "Theatrical," "Family entertainment," or "Lecture." Since our empirical strategy relies on a difference-in-differences research design that uses artist fixed effects, we also restrict

[11] One show by the Pixies in New Zealand, for example, saw secondary market prices at five times the face value (Schulz, 2010).

[12] http://www.alexa.com/siteinfo/craigslist.org, accessed November 2012.

[13] http://siteanalytics.compete.com/craigslist.org/, accessed November 2012.

[14] http://www.craigslist.org/about/factsheet, accessed November 2012.

[15] http://www.craigslist.org/about/help/reasons and http://www.craigslist.org/about/help/faq, accessed October 2012.

[16] http://news.cnet.com/8301-13526_3-10394757-27.html, accessed June 2013.

[17] Craigslist charges for job listings in a small number of cities and for apartment listings in New York City (http://www.craigslist.org/about/factsheet, accessed May 2011).

[18] We provide some analysis to confirm this in the "Robustness" section.

[19] The classification include genres such as "Pop/Rock" and "Rap/Hip hop" as well as "Family Entertainment," which includes events such as ice shows, and "Comedy," which includes large stand-up acts.

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the data to shows with headliners who performed at least 25 shows during the sample window. This procedure removes artists who were not actively touring and one-off events such as fairs and festivals and provides us with enough observations before and after Craigslist entry to estimate the effect of that event.

In our final dataset, we have 1,304 artists, each of whom performed, on average, 56.5 shows. We include, on average, 12,281.7 shows in each year between 2003 and 2008.

Dependent variables

We use ticket prices in the primary market to measure whether firms benefit from or are hurt by the entry of Craigslist. Prices are an important object of interest because, under certain conditions, they can be thought of as representing the value split between the seller and the customer on a given transaction (Bennett, 2013). If the price is very close to the maximum a customer was willing to pay, she receives little value from the transaction, leaving most to the seller. If the price is very close to the minimum a seller was willing to receive, she has captured most of the value and has left little to the seller.

We construct our main dependent variable, *mean price*, as total revenues divided by the total number of *tickets sold* for the show. We also construct an indicator variable, *sellout*, equal to 1 if the *show capacity* is equal to *tickets sold*.[20]

Independent variables

Our main independent variable is *post craigslist entry*, a dummy variable, which takes the value of 1 for all years after Craigslist has entered the county in which the concert venue is located. Craigslist is a platform for ticket resale, and therefore its entry into a county can indicate that the secondary market for tickets in the county has thickened. These data were hand-collected from www.craigslist.org and have been used in studies of Craigslist's impact in other settings, including the newspaper industry (Seamans and Zhu, 2014) and job search (Kroft and Pope, 2014).

We also collect the number of revisions to an artist's Wikipedia page in a given year as a measure of her relative popularity in that year. Wikipedia, the largest Web-based free encyclopedia, is the sixth-most-visited website in the world.[21] Its articles are collectively written by volunteers and can be edited anytime by anyone with Internet access. Each Wikipedia page has an associated revision history page, providing detailed information about each modification, including the date and time, the content modified, and the contributor ID.[22] The number of revisions for an artist's page in each year is thus a proxy for the attention she receives that year. This measure allows us to track the shifting popularity of each artist in our dataset.[23] For artists without a Wikipedia page, we register zero revisions. As our empirical analysis controls for artist-level fixed effects, the Wikipedia revisions measure allows us to capture variations in popularity for a given artist over time, not across artists. For use in robustness tests, we also collect the number of *unique contributors* making Wikipedia revisions. A feature of this data source is that the Wikipedia API allows us to disambiguate between artists' names and other uses of those words. Other data sources, such as Google search trends or Lexis Nexis search counts of number of mentions of an artist's name in the press don't have such a feature and will therefore have the issue that, for artists with common names (e.g., Adele, Queen, Prince, Pitbull, etc.), data collected from these sources may be conflated with other uses of the words.

Our choice of this measure, which could capture both positive and negative publicity, is based on the assumption that in this industry both types of publicity contribute to artists' popularity. Indeed, singers such as Miley Cyrus often strategically use

[20] In the data, *show capacity* varies with show, rather than venue, for two reasons. First, different stage set-ups, such as those including a proscenium, can restrict the number of available seats. Second, promoters can manipulate the number of seats in the venue by, for example, covering seats with tarps or not selling tickets to a balcony.

[21] www.alexa.com, accessed December 2012.

[22] See http://en.wikipedia.org/wiki/Help:Page_history for a detailed explanation of Wikipedia's revision history.

[23] In contrast, Krueger (2005) uses the length, in millimeters, of an artist's entry in *The Rolling Stone Encyclopedia of Rock and Roll* to measure an artist's importance. Krueger's measure is not suitable for our present study for three reasons: The entry does not vary with time; it has not been updated recently enough to capture new artists in the data window; and for many artists there would be no entry. Another possible measure of popularity is the number of page views of an artist's page on Wikipedia. Unfortunately, Wikipedia didn't start collecting data on page views for each page until February 2007. As reported in Greenstein and Zhu (2012), there is a significant correlation between the number of page views and the number of revisions in each year for Wikipedia articles.

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Table 1. Summary statistics

	Obs.	Mean	Std. dev.	Min	Max
Mean price	73,690	30.22	22.86	0.01	1,993.71
Show capacity	73,690	3,329.52	4,906.97	67	70,000
Tickets sold	73,690	76.54	24.14	2	100
Post craigslist entry	73,690	0.64	0.48	0	1
Above average no. broadband ISPs per capita[a]	73,690	0.80	0.40	0	1
State prohibits scalping	73,690	0.07	0.26	0	1
Wikipedia revisions	73,690	211.94	433.67	0	5,235
Sell out	73,690	0.32	0.47	0	1

[a] *Above average no. broadband ISPs* refers to shows in county-years in which the county has more than the average number of ISPs offering service of >200 kbps in that year.

negative publicity to improve their popularity.[24] In addition, a study of many social media by *Next Big Sound* finds high correlation between Wikipedia pageviews of an artist with album sales.[25] Prior academic studies such as Asur and Huberman (2010) and Dhar and Chang (2009) find that the total volume of conversations, positive or negative, on social media is a strong predictor for the demand of artists' products such as albums and movies. Along similar lines, we collect additional information from the All Music Guide (AMG) to further validate our popularity measure.[26] We find a strong correlation between the number of Wikipedia revisions in a given year and whether the artist had an album on the Billboard charts ($c = 0.22$, $p < 0.00001$), had a single on the Billboard charts ($c = 0.46$, $p < 0.00001$), or won a Grammy award during that year ($c = 0.19$, $p < 0.00001$).

We use artist, promoter, year, and two-digit ZIP code fixed effects in our regressions, as specified below. We also use several variables as controls in robustness checks. From SeatGeek, a ticket search engine,[27] we obtain data on which states prohibit scalping, represented by the indicator variable *state prohibits scalping*. We obtain information on the yearly number of high-speed Internet service providers (ISPs) at the ZIP-code level from the Federal Communications Commission. We average this number across all ZIP codes in the county in which a venue is located, and then divide by the county population to create the variable *high-speed ISPs per capita* to measure broadband availability.[28] Descriptive statistics of the variables are presented in Table 1.

RESULTS

Main results

The ideal experiment for achieving our goal would be to assign thicker secondary markets to a random sample of concerts. As this experiment is not feasible, we attempt to replicate it in an observational study. We interpret the entry of Craigslist, which for the purposes of this study is plausibly exogenous (Kroft and Pope, 2014; Seamans and Zhu, 2014), as a shock to the thickness of the secondary market for concert tickets. Craigslist's entry was staggered over time and did not occur in all of our markets. This allows us to identify the difference robust to secular trends.

Our base specification is a difference-in-differences design. To test Hypotheses 1a and 1b, we regress mean prices for concert i, for artist a, in geographic area s, in year t on an indicator for whether the show occurred after the entry of Craigslist into the focal market and a set of controls. The controls include the number of revisions to the Wikipedia page for the headlining artist in the current year, fixed effects for the headlining artist, and the venue's two-digit ZIP code. We also include year fixed effects to control for general

[24] See, for example, http://www.theguardian.com/lifeandstyle/lostinshowbiz/2013/aug/29/twerking-miley-cyrus-no-bad-publicity, accessed December 2013.

[25] Source: http://blog.nextbigsound.com/post/37277146054/what-social-media-has-to-do-with-record-sales, accessed December 2013.

[26] www.allmusic.com

[27] http://seatgeek.com/blog/ticket-industry/ticket-resale-laws, accessed August 18, 2012.

[28] Wallsten and Mallahan (2010) and Kolko (2010) both show that the number of ISPs in a market is positively correlated with the availability of broadband.

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trends at the industry level. Standard errors are clustered at the artist level.

$$MEAN\ PRICE_{iast} = \alpha + \beta \times POST\ CRAIGSLIST\ ENTRY_{st} + \gamma \times CONTROLS_{ast} + \epsilon_{iast} \quad (1)$$

Model 1 of Table 2 presents the results of estimating (1). The coefficient on *wikipedia revisions* is positive and significant, indicating—as expected—that artists can charge higher prices as their popularity increases. Second, we note that there is no main effect of *post craigslist entry* at conventional levels. Our prediction, however, was that entry by an intermediary would differentially affect artists depending on their popularity. In Model 2 of Table 2, we therefore add an interaction term *post craigslist entry* × *wikipedia revisions*. The coefficient on the interaction is positive and significant, suggesting that Craigslist's entry led to an increase in prices for artists at their greatest popularity. The results suggest that prices were roughly 36 percent more sensitive to artist popularity after the entry of Craigslist.[29] Before the entry of Craigslist, an increase in popularity of one standard deviation was associated with an increase in mean ticket price of about $0.99.[30] After Craigslist's entry, it was associated with an increase of $1.34.[31] At a show of average size, that after-entry figure amounts to a revenue increase of $4,489.70.

The models above assume a linear effect of popularity. Next, we relax this assumption and regress mean price on a cubic of log revisions separately for shows that took place before the entry and then for shows that took place after. Figure 1 presents the regression-predicted prices of shows by whether or not they occurred after the entry of Craigslist into the local market. Figure 1 suggests that Craigslist had a negative effect on prices for artists with less popularity—those below 650 revisions.[32] Price increased significantly for artists with greater than 650 revisions. This result is consistent with the theory that suggests that it is for shows likely to sell out that a thicker secondary market allows promoters to raise prices in the primary market. To summarize, the results presented in Table 2 and Figure 1 provide evidence in support of both Hypotheses 1a and 1b.

We next provide evidence that the effect is driven by the *ex ante* propensity for shows to sell out. It is important to demonstrate this mechanism because it underscores the reasoning behind Hypothesis 2: namely, that firms want to engineer scarcity following a thickening of the secondary market. During this period, ticket prices were largely set before tickets went on sale. Prices were set as a function of the promoter and artists' expectations of how likely the show was to sell out. To proxy for the promoter and artists' expectations of a sellout, we estimate a logistic regression model of *sellout*, an indicator

Table 2. Craigslist entry increased ticket prices for the most popular artists

Dependent variable	(1) Mean price	(2) Mean price
Post craigslist entry	−0.140	−0.312*
	(0.150)	(0.162)
Wikipedia revisions	0.00333***	0.00259***
	(0.000573)	(0.000497)
Post craigslist entry × Wikipedia revisions		0.000937**
		(0.000431)
Constant	25.99***	26.05***
	(0.463)	(0.462)
Observations	73,690	73,690
R^2	0.692	0.692
Artist FE	Yes	Yes
Year FE	Yes	Yes
ZIP two-digit FE	Yes	Yes
Sample	All	All

Note: Errors clustered at the artist level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

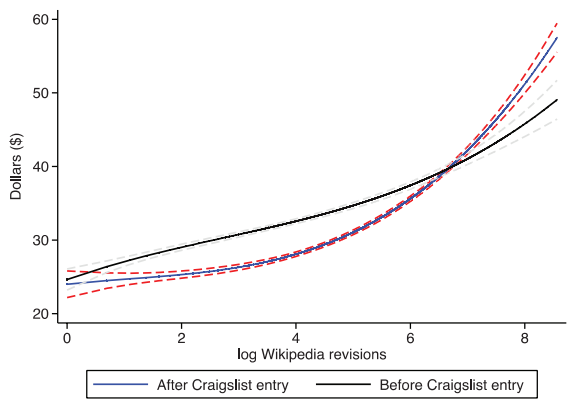

Figure 1. Predicted prices by popularity (Wikipedia revisions)

[29] 0.000937/0.00259 = 0.36.

[30] The standard deviation of our revisions measure is 382.382 × 0.0026 = 0.989.

[31] 382 × (0.0026 + 0.0009) = 1.34.

[32] The negative effect appears to be for artists with *ln(revisions) < 6.5 => revisions < 650*.

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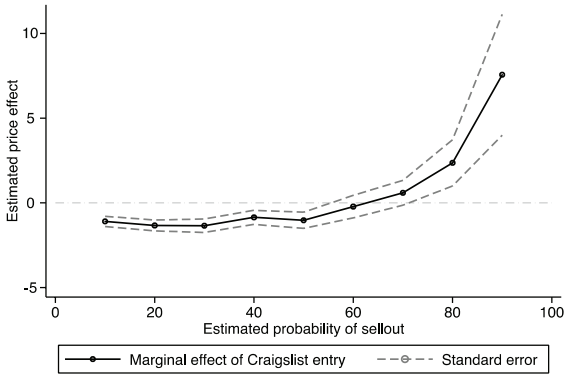

Figure 2. Effect of Craigslist entry on prices by predicted probability of sellout

for selling all of the available tickets. The independent variables in this model are a quadratic for *show capacity*, a quadratic for *wikipedia revisions*, an indicator for whether the show took place during the summer months, and fixed effects at the year, two-digit ZIP, and artist levels. We then predict the probability that a show will sell out and collapse that into buckets of 10 percentage points each. The predicted value deciles represent the price setters' *ex ante* expectation that the show is likely to sell out. Figure 2 depicts the coefficients on the interactions of dummies for being in each of the buckets and a dummy for being post Craigslist entry. The point at the 90-percent probability of selling out indicates a positive and significant increase in price for shows with a greater than 90-percent predicted probability of selling out after the entry of Craigslist. The results add support for the prediction that the effect of Craigslist was negative for the shows least likely to sell out and strongly positive for those that were quite likely to sell out.

Hypothesis 2 suggests that firms try to adjust capacity in response to the entry of an intermediary. In our setting, that would mean that a promoter serving a specific segment of the market, for example stadium-sized events or jazz clubs, would move toward showing events in smaller venues or change seating layouts to eliminate some seats to engineer scarcity. To evaluate Hypothesis 2, we regress the average capacity arranged by promoter p in geographic area s in year t on an indicator for whether the show occurred after the entry of Craigslist into the focal market and a set of controls, including the number of revisions to the headlining artist's Wikipedia page in the current year, fixed effects

Table 3. Promoters switched to smaller venues after change

Dependent variable	(1) Capacity	(2) Capacity	(3) Capacity
Post Craigslist entry	−525.2**	−546.0***	−501.7**
	(209.3)	(208.1)	(202.1)
Wikipedia revisions		1.163**	1.265**
		(0.460)	(0.569)
Post Craigslist entry × Wikipedia revisions			−0.146
			(0.333)
Constant	5,920***	5,809***	5,808***
	(410.4)	(389.8)	(392.4)
Observations	12,518	12,518	12,518
R^2	0.673	0.677	0.677
Promoter FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
ZIP two-digit FE	Yes	Yes	Yes

Note: Observations are at the promoter × ZIP two-digit × year level. Standard errors clustered at the promoter level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

for the promoter, two-digit ZIP code, and year.[33] Standard errors are clustered at the promoter level.

$$CAPACITY_{pst} = \alpha + \beta \times POST\ CRAIGSLIST\ ENTRY_{st} + \gamma \times CONTROLS_{pst} + \epsilon_{pst} \quad (2)$$

Model 1 of Table 3 presents the results of estimating Equation 2. The coefficient on *post craigslist entry* is negative and statistically significant at the five-percent level, indicating that promoters are likely to switch to smaller venues after the entry of Craigslist. Specifically, we see the average promoter putting an artist of average popularity in a venue with about 500 fewer seats. This is consistent with promoters attempting to separate the markets to get the benefits of the option value effect without facing the cannibalization associated with a thickened secondary market. This shift toward smaller venues also decreases ancillary revenue associated with larger shows, such as concessions and parking. Because the specifications in Table 3 include promoter fixed effects, they absorb any effects associated with the few large vertically integrated promoters. Model 2 includes our measure of artist popularity; the positive coefficient on this variable indicates that promoters seek larger venues for more popular artists, as would be expected. Model 3 includes

[33] The average is taken across all concerts arranged by the promoter in the geographic area for the given year.

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the interaction between Craigslist's entry and artist popularity. The coefficient on this interaction is negative but insignificant. These results suggest that whether the artist is popular or not, the promoter seeks a smaller venue following the thickening of the secondary market from Craigslist's entry.

Robustness tests

Craigslist entry

To corroborate our claim that Craigslist's entry is exogenous for our purposes, we estimate a discrete-time probit model predicting Craigslist's entry into a market. Since all regressions are at the market level, we take an average of artist *wikipedia revisions* and *mean ticket price* for shows in the market year. Table 4 presents the results. *Mean wikipedia revisions* and *mean ticket price* are not significant in any of the three models, including the model with no controls. Model 2 suggests that Craigslist may enter areas with more Internet usage—as measured by the average number of ISPs per capita—sooner than other areas, but this effect disappears in Model 3 when we control for population and income. These results support our claim that Craigslist does not choose when and where to enter based on ticket prices or artist popularity.

Table 4. Discrete-time probit model predicting Craigslist entry into a market

Dependent variable	(1) Craigslist entry	(2) Craigslist entry	(3) Craigslist entry
Mean Wikipedia revisions (1,000s)	0.035	0.023	0.011
	(0.039)	(0.039)	(0.037)
Mean concert mean price	0.000	−0.000	−0.001
	(0.001)	(0.001)	(0.001)
ISPs per capita		−0.434*	−0.025
		(0.226)	(0.131)
State prohibits scalping		0.002	−0.010
		(0.039)	(0.038)
Population (100,000s)			0.021***
			(0.005)
Population^2			−0.000***
			(0.000)
Income (100,000s)			1.591*
			(0.955)
Income^2			−2.028**
			(1.035)
Observations	1,488	1,488	1,488
Pseudo R^2	0.169	0.175	0.233
Year FE	Yes	Yes	Yes

Note: Reported coefficients represent marginal effects. Standard errors clustered at the county FIPS level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Wikipedia revisions

We use the number of Wikipedia revisions to measure an artist's popularity. This measure provides considerable variation across artists and within each artist. In unreported regressions, we conduct robustness checks after replacing this measure with alternative measures including whether the artist had an album on the Billboard charts, had a single on the Billboard charts, or won a Grammy award during the year. Our results are qualitatively unchanged.

Internet access

Our theory suggests that the increase in price is due to a thickening of the secondary market. Specifically, users with Internet access become more likely to participate in the secondary market after the entry of an intermediary. If this were the case, larger effects should be found in regions with greater Internet use. In Table 5, we present models including

Table 5. Craigslist's entry had stronger effect in areas with high Internet access

Dependent variable	(1) Mean price	(2) Mean price	(3) Mean price
Post Craigslist entry	−0.290**	−0.451**	−0.0191
	(0.145)	(0.184)	(0.288)
Wikipedia revisions	0.00255***	0.00244***	0.00355***
	(0.000294)	(0.000360)	(0.000465)
Post Craigslist entry × Wikipedia revisions	0.000987***	0.00141***	−0.000709
	(0.000272)	(0.000327)	(0.000464)
High-speed ISPs per capita in county (1,000s)	2.249**		
	(1.075)		
Constant	26.02***	27.71***	27.57***
	(0.710)	(1.532)	(0.631)
Observations	73,616	58,713	14,977
R^2	0.692	0.675	0.823
Artist FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
ZIP two-digit FE	Yes	Yes	Yes
Sample	All	High ISPs	Low ISPs

Note: *High ISPs* are those county years in which the county has more than the average number of ISPs offering service of >200 kbps in that year. Errors clustered at the artist level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

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Table 6. StubHub entry generates higher prices for the most popular artists, especially in areas with higher Internet usage

Dependent variable	(1) Mean price	(2) Mean price	(3) Mean price	(4) Mean price
Post StubHub entry	0.186	0.00749	0.0484	−0.335
	(0.143)	(0.158)	(0.214)	(0.350)
Wikipedia revisions	0.00333***	0.00270***	0.00280***	0.00270***
	(0.000574)	(0.000479)	(0.000328)	(0.000399)
Post StubHub entry × Wikipedia revisions		0.000898**	0.00105***	0.000859*
		(0.000410)	(0.000296)	(0.000441)
Constant	25.80***	25.91***	27.34***	27.79***
	(0.486)	(0.480)	(1.546)	(0.724)
Observations	73,690	73,690	58,713	14,977
R^2	0.692	0.692	0.675	0.823
Artist FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
ZIP two-digit FE	Yes	Yes	Yes	Yes
Sample	All	All	High ISPs	Low ISPs

Note: Errors clustered at the artist level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

our measure of Internet access. Model 1 shows that the main finding from Table 2 on the interaction between Craigslist entry and Wikipedia revisions remains robust after controlling for Internet access. Model 2 repeats the regression from Model 1, but for only those county-years for which the county had more than the average number of broadband ISPs for that year. The coefficient on the interaction suggests that, in such areas, there is a strong effect of Craigslist entry on the most popular artists. Model 3 repeats this regression on the sample of shows in county-years with below average broadband access. The insignificant coefficient suggests that the entry of Craigslist had little effect in areas with limited broadband access, as predicted. A chi-square test reveals that the coefficients on the interactions in Models 2 and 3 are different at the 99.7-percent level, adding further support for the aforementioned theory.

StubHub

StubHub is an online secondary market for tickets. Like Craigslist, StubHub made its site available for use in different markets at different times. Unlike Craigslist, however, StubHub is in business for ticket resale, so we cannot consider its entry exogenous with respect to ticket price responses as we do with Craigslist. To verify the generality of our findings, we hand-collected information on StubHub's entry into different markets by searching historical versions of www.stubhub.com on the Internet Archive. We create *post stubhub entry*, a dummy variable that takes the value of 1 for all years after StubHub has entered the county in which the concert venue is located. We repeat the analysis for the entry of StubHub. Models 1 and 2 of Table 6 recreate Models 1 and 2 of Table 2, but using the entry of StubHub rather than the entry of Craigslist as the treatment. Prices are higher for the most popular artists after StubHub enters, as they are after Craigslist enters. Models 3 and 4 of Table 6 replicate Models 2 and 3 of Table 5. As with Craigslist, the effect associated with StubHub is greatest in areas with higher Internet penetration. Figure 3 replicates Figure 2, but again using StubHub's entry in place of Craigslist's. The results are qualitatively similar: Craigslist's entry leads to lower prices for shows

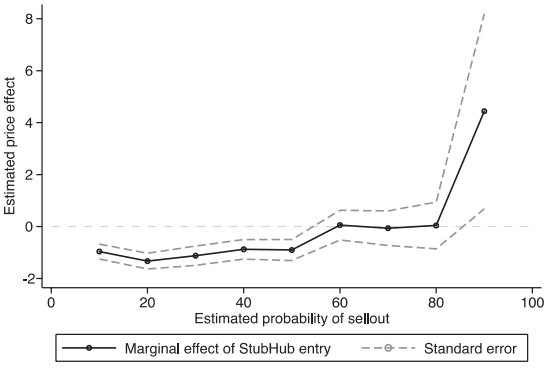

Figure 3. Effect of StubHub entry by predicted probability of sellout

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less likely to sell out and higher prices, though weakly identified, for the shows most likely to sell out.

Stigma effect

One might be concerned that the observed pricing pattern is a result of Craigslist ameliorating a "stigma" effect. The idea is that popular artists may want to charge higher prices, but the stigma of high prices prevents them from doing so. After the entry of Craigslist, consumers observe very high prices on the secondary market for popular artists and thus update their opinions about the "appropriate" prices for those artists. As a result, after Craigslist's entry, the stigma effect is "loosened" and the artist is able to charge more. If the stigma effect really is constraining artists' ability to set prices, we would expect that in states where scalping is not prohibited, artists should be able to sell their tickets at higher prices even before Craigslist's entry as consumers are used to seeing high prices from scalpers or reading about these high prices in the media. Hence, for these states, we should observe weaker effects from Craigslist's entry. We replicate our analysis by restricting the sample to states where scalping is not prohibited and report the results in Table 7. The coefficient of the interaction term is of similar magnitude and significance as the one in Table 1. Hence, the evidence does not support this alternative explanation.[34]

Table 7. Results are similar for states where scalping is not prohibited

Dependent variable	(1) Mean price	(2) Mean price
Post Craigslist entry	−0.472***	−0.646***
	(0.160)	(0.169)
Wikipedia revisions	0.00332***	0.00254***
	(0.000601)	(0.000509)
Post Craigslist entry × Wikipedia revisions		0.000973**
		(0.000427)
Constant	25.65***	25.68***
	(0.479)	(0.479)
Observations	68,529	68,529
R^2	0.687	0.687
Artist FE	Yes	Yes
Year FE	Yes	Yes
ZIP two-digit FE	Yes	Yes
Sample	Scalping not prohibited	Scalping not prohibited

Robust standard errors in parentheses. Errors clustered at the artist level.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

DISCUSSION AND CONCLUSION

Secondary markets are an important part of the economy. The entry of intermediaries into secondary markets reduces search frictions. This "thickening" of the secondary market allows for better matching between buyers and sellers. It does not, however, affect all primary-market firms equally. We maintain that the firms whose primary markets are separate from their secondary markets will benefit more following entry of an intermediary in the secondary market. Firms that cannot separate their primary and secondary markets will be hurt. We also submit that firms will seek to separate strategically the primary and secondary markets following entry of an intermediary in the secondary market.

Following Craiglist's entry, we find that shows by artists with lower popularity in a given year exhibit a significant decrease in price; those by artists at their greatest popularity exhibit a significant increase. To confirm that these effects are driven by the hypothesized mechanism, we show that the results are moderated by the further level of Internet usage. We also observe that promoters strategically try to limit average venue capacity across their portfolio once Craigslist has entered the market. This finding further corroborates the idea that benefits, in the form of higher prices, will accrue to firms whose products are valuable and scarce. We obtain similar results in robustness tests using entry by www.StubHub.com, a well-known online ticket intermediary, in place of entry by Craigslist. Our results provide a first step toward understanding firms' heterogeneous ability to appropriate value when search frictions are lowered in secondary markets.

These results have implications for managers. With the proliferation of intermediaries on the Internet, it is inevitable that many products will be resold online. Many firms perceive these secondary markets as potential threats to their ability to appropriate value and have sought to eliminate this possibility through leasing contracts, warranties that only

[34] One might be concerned that after the entry of Craigslist, strategic scalpers may change their behavior and, as a result, affect firms' ability to appropriate value. This robustness check also suggests that our results are not driven by this alternative explanation.

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apply to first buyers, or contractual prohibition of resale. However, our results suggest that firms may benefit from the secondary market if they can keep it separate from their primary market.

Our findings also have implications for other literatures. First, our proposed theoretical mechanisms are a novel contribution to the literature on contrived capacity constraints. While a theoretical literature in economics and operations research has suggested situations in which firms might have incentives to constrain supply (e.g., DeGraba, 1995; DeGraba and O'Hara, 1992; Liu and Van Ryzin, 2008; Stuart, 2007b), there has been little empirical investigation of the phenomenon. We argue and provide evidence that firms in our setting alter their product by creating capacity shortages. While we believe the benefits from scarcity generalize across many other settings, more theoretical and empirical research is needed to determine the boundary conditions of this idea.

We also add to the literature on intermediation that sits at the intersection of economics, finance, and strategy. Intermediaries remedy market imperfections that can arise from information asymmetries (Stigler, 1962) or institutional voids (Khanna and Palepu, 1999, 2000; Ricart *et al.*, 2004). While, in principle, intermediaries reduce search costs, thereby facilitating trade between buyers and sellers (Spulber, 1996, 2007), there may be conditions under which intermediaries manipulate the search process so as to capture more value for themselves (Hagiu and Jullien, 2011). Intermediaries operating in two-sided markets serve buyers and sellers on each side and thus have the option to set prices on each side to capture value (e.g., Rochet and Tirole, 2003; Zhu and Iansiti, 2012). We add to the literature on intermediaries by describing conditions under which upstream firms receive either benefit or harm from downstream resale intermediaries.

In addition, our study contributes to the literature that examines the interaction between online and offline channels. Much of this work has found that online intermediaries reduce buyer search costs, thereby improving the efficient matching of buyers and sellers (e.g., Kroft and Pope, 2014). A number of these studies have found substitution effects between online and offline channels (e.g., Forman, Ghose, and Goldfarb, 2009; Goldfarb and Tucker, 2011; Liebowitz and Zentner, 2012; Seamans and Zhu, 2014). In contrast, our study looks at the interaction between an online secondary market and an offline primary market and finds that, under some conditions, secondary markets may add value to primary markets.

This study has three important limitations. First, while our setting provides features—such as constrained capacity, restrictions against perfect pricing, and complete depreciation—that allow for reliable identification, it is not representative of all secondary markets. The salient features of the concert ticket industry are that the good is fungible, local, and perishable. We expect our results will more easily generalize to settings with similar features. Future work in other settings will help test our results' sensitivity to the features of this particular market and help us to understand better the boundary conditions of our theory (Durand and Vaara, 2009).

Second, firms in the primary markets may consider other possible strategies, such as lobbying for regulatory intervention, to separate primary markets from secondary markets. These strategies could be important considerations for certain settings. While we find some evidence that firms act to create separation between primary and secondary markets, we note that firms in the primary market may be slow to change their strategies. For example, routines, once institutionalized, may be difficult to change, leading to organizational rigidities when faced with market shocks (Kaplan and Henderson, 2005; Leonard-Barton, 1992; Rawley, 2010). Similarly, organizational complexity implies that some firms are less adroit than others, and may react slowly to change (Zhou, 2011). Firms in industries other than the one we studied may have more institutionalized routines, or may be slower to realize a changing business landscape, and may therefore be less likely to create separation between the primary and secondary markets than we observe in the concert ticket industry.

Finally, the "firms" in our setting are the artist–promoter pair, which we treat as a unitary actor.[35] Due to data limitations, we are unable to analyze how the additional value captured by this "firm" is allocated between each of the actors. Future researchers might consider collecting data on the revenue split between artist and promoter for each concert, and study how the split changes after secondary markets thicken. It would be particularly interesting to study how the split between actors

[35] While we treat the artist–promoter pair as a "firm," thus abstracting away from their internal revenue split, note that these pairs are not "firms" in a legal sense.

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varies by relative bargaining expertise (e.g., Ahuja, Coff, and Lee, 2005) and formal or informal institutions and norms (e.g., Chacar and Hesterly, 2008).

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