ORIGINAL ARTICLE

Broadway productions and the value of a Tony Award

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Abstract   This article investigates the effect of a Tony nomination or win on the demand facing a Broadway production using a panel of weekly revenues for Broadway productions from 1996 to 2007. Our results indicate that the effect of a nomination or win is positive in the week of the announcement and gradually increases in successive weeks, presumably due to publicity and word-of-mouth. Winners experience an increase in demand as late as 1 year later when awards are publicized for the following season. Moreover, nominees that do not win the award are penalized heavily in the weeks following the Award announcements. We find that winning a Tony Award increases a production's revenues by 12% in the week immediately following the Awards.

Keywords   Theater · Broadway · Tony Awards · Discrete choice

JEL Classification   Z11

1 Introduction

The Broadway theaters, a group of 39 performance venues on the West Side of Manhattan, are widely regarded as the center of the universe for American theater. Productions in these venues are known for their superior quality and constitute a large segment of the live theater market in the United States. In 2005, 12 million

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people paid to attend a Broadway production, and gross sales for all 39 theaters equaled $825 million (Newman 2005).

One of the most highly anticipated events of the Broadway season is the annual presentation of the Tony Awards, recognizing excellence in Broadway theater. Broadway productions are nominated for Tony recognition in various categories in early May, and the winners are announced at the Tony Awards ceremony in June. The Tony nominations and awards are important for several reasons. Consumers view the nominations and wins as a signal of a show's quality. Like many forms of live entertainment, Broadway productions are experience goods; consumers do not know whether they will enjoy a production until after they have seen it. Consequently, consumers face high uncertainty when deciding whether to attend a production, and they may rely on signals of a show's quality either through word-of-mouth or awards (Deuchert et al. 2005). Producers follow the outcomes of the Awards very closely, as they expect the results to affect attendance, revenues, and the longevity of their productions. Thus, the Awards are thought to have a great deal of influence over the success of a show.

In this article, we estimate the effect of a Tony nomination and win on the demand facing a production. Quantifying the impact of these awards is interesting from an economic and arts policy standpoint. If the Awards do indeed (as producers seem to expect—see Isherwood 1998, for example) play a large role in determining a show's success, then they also potentially impact the efficiency of the Broadway market. If, as has often been suggested, artistry and innovation are actually penalized by some Tony voters (many of whom are regional producers with a vested interest in the outcome),[1] then the Awards may inefficiently discourage innovation in the long run by inducing consumers to attend "worse" shows. In contrast, if the Awards are true indicators of quality, then they potentially increase efficiency in the Broadway market by directing consumers to the shows with the highest artistic value.[2] Investigating the effect of a nomination or win on a production's underlying demand is the first step toward answering this question.

Our goal is to determine whether a Tony nomination or win can significantly increase the demand for a Broadway production. Broadway theater is an interesting setting for examining the impact of awards and word-of-mouth publicity. It is not uncommon for productions to remain on Broadway for years; due to this long horizon the potential for reaping gains from awards and nominations can be large.

We collect data on a long panel of Broadway productions from 1996 to 2007, and we estimate the weekly demand for each production using a discrete choice model. A consumer's utility from attending a production depends upon the production's characteristics, such as the age of the show. While controlling for competition and

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[1] It has often been suggested that some Tony votes are profit-driven rather than artistry-based. See Riedel (2004) for one alleged instance.

[2] Note that the competing theories of superstardom by Rosen (1981) and Adler (1985) provide a useful framework for describing these two possibilities. In Rosen's model, large income gaps occur with small talent differences because all consumers are drawn to the higher quality artist (or production). In Adler's model, one superstar emerges among two equally talented artists, because publicity or word-of-mouth causes consumers to choose the artist (or production) that has become known to them through the media, conversation, or other forms of publicity.

seasonal changes in the overall market, we can separate out the additional impact of Tony nominations and wins. We identify the effect of the intensity of competition or underlying seasonality of the market by changes in the consumer's choice sets over the weeks; more specifically, we observe how a production's market share responds to weekly changes in the composition of its rivals as well the week of the year. The effect of a nomination or win is identified by exogenous changes in the timing of the announcements. The announcements of the nominations are typically in early May with the Awards in early June, and depending on the year, the particular week of the year that the announcement occurs can vary by as much as 3 weeks.

We find that the effect of a nomination or win for a production is consistent with a story of informational cascades (Bikhchandani et al. 1992), where the transmission of information spreads gradually over time. The estimated effect of a Tony nomination or win is positive in the week of the announcement and gradually increases in successive weeks. This "bandwagon" phenomenon has been documented previously in studies on the demand for motion pictures (De Vany and Walls 1996, 1997; Nelson et al. 2001; Deuchert et al. 2005). In contrast to awards in the movie theater industry (Deuchert et al. 2005), we find that the effect of winning a Tony Award is particularly long-lived. Productions that win an award experience a rise in demand 4 months later in the year (during the last quarter of the year) and approximately 1 year later (when the following year's Tony Awards are being promoted). We hypothesize that pent-up demand resulting from the capacity constraint of each Broadway theater may contribute to the longevity of the effect. Finally, a positive effect exists for receiving a nomination; however, this dissipates after the winners are announced. In fact, nominees who do not win Tony Awards are penalized heavily in the weeks following the Tony Award announcements. Using our demand estimates, we find that for a "typical" production, winning a Tony Award will generate nearly 12% or $61,000 in additional revenues for the week immediately after its announcement, and receiving a Tony nomination will generate an additional 3% or $16,000 in revenues in the week immediately following its announcement.

Since the benefits of winning an award extend for many weeks beyond the initial announcement, we also estimate a survival model to examine which factors affect a production's longevity. As expected, we find that receiving a nomination or award decreases the likelihood of market exit.

Previous work on the Tony Awards and Broadway theater focuses on the determinants of the longevity of a show—whether measured through a production's total length of run (Simonoff and Ma 2003; Nygren and Simonoff 2007; Maddison 2004) or total number of performances during its run (Reddy et al. 1998). These outcomes were modeled and estimated as a function of the production's characteristics with its status as a nominee or winner included in certain instances. The previous articles find that winning a Tony Award is associated with increased longevity, though receiving a nomination may not be. Simonoff and Ma (2003) also find that favorable critic reviews in the *New York Daily News* are correlated with greater success, while those in the *New York Times* are not. Our article tackles a different question, investigating how weekly demand for a Broadway show evolves over its run. In addition, our model and data allow us to employ a different

estimating strategy that can directly control for the strength of competition faced by each production in a given week as well as underlying changes in market size over the year.

Another related literature examines the effects of an Oscar (i.e., Academy Awards) nomination or win on motion pictures.[3] Nelson et al. (2001) find that an Oscar nomination or win increases the market share per screen of a film. Deuchert et al. (2005) study how weekly box office revenue depends upon Oscar nominations and awards, and they find that winning an Oscar generates extra revenues for films, though receiving a nomination does not. Similar to Deuchert et al. (2005), we allow the effect of a nomination or win to vary by week. However, our model of demand allows for changes in competition and also includes production fixed effects to capture any unobserved production characteristics. Our method of estimating demand is similar to Einav (2007), Chiou (2008), and Moul (2007) who use a discrete choice model to separate underlying changes in market size from changes in competition over time for the movie theater and home video markets.

The next section gives a brief background and description of the Broadway theater industry. We then describe our data and model of demand and demand estimates, and we estimate a survival model for purposes of comparison with the previous literature.

2 Broadway theater

There are currently 39 venues in New York City that are recognized as "Broadway" theaters. Theaters qualifying for the Broadway designation must seat at least 500 patrons, and typically are located on the West side of Manhattan in the region bounded by 6th and 8th Avenues, from 41st to 54th Streets.[4] The vast majority of these theaters are for-profit organizations, though there are four Broadway houses (the Vivian Beaumont, the Biltmore, Studio 54, and the American Airlines Theatre) that are owned and operated by not-for-profit organizations. All of these theaters operate under contracts with the Actors' Equity Association (AEA), the labor union representing professional actors and stage managers in the United States. Under these contracts, actors in Broadway productions are guaranteed a minimum salary that is higher than the salary minimums required for employees of off-Broadway or regional theaters (Pincus-Roth 2008).

Broadway shows are typically presented eight times a week. The most common schedule includes evening performances on Tuesday through Saturday, with matinee shows on Wednesday, Saturday, and Sunday.[5] Most theaters are "dark" on Mondays, meaning that there are no performances that day. When a Broadway production mounts, it might be a limited engagement with a set closing date, but more often the runs are open-ended (and even limited engagements will often

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[3] See Ginsburgh (2003) for a detailed review of this literature.

[4] The Vivian Beaumont at Lincoln Center is currently the one Broadway house that lies outside this geographic region, with a location on W. 65th Street.

[5] Playbill.com lists the exact schedule for every Broadway production.

extend if the show does well). For this reason, when Broadway producers set ticket prices, they face a complicated profit maximization problem in which the length of the run matters as much as the profits on any given night.

Box office prices are set using a form of price discrimination known as pricing tiers or "scaling the house," so that seats in more favorable locations in the venue (e.g., the orchestra or front mezzanine) are priced higher than less attractive seats (e.g., rear balcony). The typical show advertises between two and four different price tiers, and musicals generally offer more tiers and are priced slightly higher, on average, than plays. Within the musical and play categories, there has historically not been much variance in box office prices across shows; between 2001 and 2005 most musicals priced their orchestra seats at $100. Currently, in 2008, orchestra tickets range in price from $110 (*Hairspray*) to $122 (*Jersey Boys*).[6] Once producers have set the box office price schedule (before the show opens) these prices tend to change infrequently, if at all, during the show's run. Relatively low price variance exists for full-price tickets purchased at the box office (or through the producer's official ticket vendor—typically either Telecharge or Ticketmaster). It has often been suggested that producers deliberately under-price at the box office, possibly with the goal of selling out the house early in the run in order to generate excitement and higher future demand (Courty 2003). For this reason, the most popular shows may operate at or near capacity implying that consumers must purchase tickets far in advance. As a result, any additional boost in demand from a Tony nomination or win may be represented by a modest sustained increase over a long period of time.

In addition to buying through the box office, consumers can also purchase tickets through other offline and online sources. Same-day discount (usually half price) tickets are available at TKTS, which has booths in Times Square and at South Street Seaport. For shows that are not sold-out, producers can bring in last minute revenues by discounting the remaining unsold seats. In addition, the Internet has substantially increased the flexibility in purchasing tickets for Broadway performances, since producers can post online coupons or two-for-one deals. Thus, a show with only three or four official price tiers can have several more pricing points. Finally, it is worth noting that for the most popular shows, individuals might pay prices far above a ticket's face value, by securing tickets that are re-sold by a scalper or licensed broker.

The Broadway theaters are the only theaters whose productions are deemed Tony Award eligible. The Tony Awards were established in 1947 by the American Theatre Wing, a non-profit organization dedicated to "celebrating excellence and supporting education in the theatre" (http://www.americantheatrewing.org). The goal of the Awards is to recognize excellence in American theater. Today the Awards are presented by the Wing in conjunction with the Broadway League (formerly the League of American Theatres and Producers), the national trade

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[6] In addition, most shows have begun pricing a small group of highly desirable orchestra seats as "premium" seats (*The Producers* was the first show to try this, in 2001). The prices for premium seats for musicals currently range from $151.50 to $302.

association for the Broadway industry.[7] Awards are currently given in 25 different categories including Best Musical, Best Play, Best Original Score, Best Revival of a Musical, Best Revival of a Play,[8] Best Performance (awarded in 8 different categories: Leading Actor/Actress in a Musical/Play and Featured Actor/Actress in a Musical/Play), Best Choreography, Best Costume Design, etc.

The Tony Awards Nominating Committee, a rotating panel of approximately 30 members of the theater community, views each new Broadway production in a season[9] and nominates productions for awards via secret ballot. The Awards are then voted on by the approximately 750 Tony Award voters, a group that includes members of the governing boards of the major theatrical labor unions,[10] voting members of the Broadway League, designated members of the American Theatre Wing, and designated members of the Casting Society of America.[11] Producers of nominated shows must provide free tickets to the Tony voters, and the voters must attend performances of all nominated productions.

3 Data

The primary dataset consists of weekly production data from June 1996 to September 2007 collected from Playbill.com. Every week the Broadway League compiles a chart of Broadway grosses, which is available on the League's website (http://www.broadwayleague.com) and on Playbill.com. This chart lists the venue, weekly gross, total attendance, number of previews,[12] number of performances, total capacity, average ticket prices, and attendance as a percentage of total capacity for each production on Broadway.

Supplementary information on Tony nominees and winners was collected from the official Tony website (http://www.tonyawards.com). The announcement dates of the winners and nominees were collected from newspaper and magazine sources. We dropped weeks for which data on attendance were missing for certain

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[7] The League consists of theater owners and operators, producers, and general managers of the commercial theater industry.

[8] The Revival categories are for new productions of plays and musicals that were previously produced "in substantially the same form in an eligible Broadway theatre and [have] not had a professional performance in the Borough of Manhattan at any time during the three years immediately preceding" ("Rules and Regulations," http://www.TonyAwards.com).

[9] A Broadway season typically starts in June immediately after the announcement of the previous season's Tony Awards and ends early the following May, on a date established by the Tony Awards Administration Committee.

[10] These include Actors' Equity Association, Dramatists Guild of America (an association of playwrights, composers, and lyricists), Society of Stage Directors and Choreographers, United Scenic Artists (the labor union for theatrical designers and artists), and the Association of Theatrical Press Agents and Managers.

[11] The CSA is a professional society of theatrical casting directors.

[12] Broadway shows typically run 4–6 weeks of "preview" performances before the official opening night. During previews, the director is still making small changes to the show, and any technical glitches are worked out. There is an implicit agreement that critics will not review the show until the official opening night, at which point it is considered a finished product.

Table 1 Summary statistics

Variable	Mean	Standard deviation	Minimum	Maximum
Gross revenues	548,980	305,400	1,138	1,851,212
Attendance	7,898	3,239	24	21,631
Number of previews	0.55	1.87	0	16
Number of performances	7.27	2.16	0	16
Capacity	1,255	358	499	1,935
% Attendance	79	17	3.4	109

The number of observations is 16,150. All variables are measured at the weekly level. Gross revenues are reported in 2007 dollars. Previews and performances are accounted separately; performances refer to non-preview showings. Capacity is the total number of tickets available for any given show. Percentage attendance reported in excess of 100% is due to the sale of standing-room only tickets

productions.[13] For the remaining 576 weeks in the sample, the data contain complete information on every Broadway production presented during that week.

The final sample consists of 16,150 observations. Table 1 contains summary statistics. The average weekly gross (in 2007 dollars) was approximately $550,000 and weekly attendance averaged nearly 8,000 patrons.[14] Most shows did not sell-out; the average capacity was 79%.[15] The average age of a production was 2.7 years, and in any given week 29 productions played on Broadway, on average.

A total of 428 unique productions were observed in the sample.[16] Productions were classified into one of three categories: musicals, plays, and special engagements.[17] We identified a production's type by first looking at the categories for which it was nominated for a Tony. For instance, if a production was nominated in a "Best Play" category, then we classified it as a play. For all remaining productions that did not receive Tony nominations, we referred to the Internet Broadway Database (http://www.ibdb.com), which also lists each production's classification. We followed a similar procedure to identify which productions were revivals. The productions consisted of 39% musicals, 53% plays, and 8% special engagements. Due to the long panel, some productions appear as the original run and then as a revival several years later.[18] Over this time period, 36% of the productions were revivals. The average length of the run for a production was approximately 44 weeks.

Of the 428 productions in the sample, 49% received a Tony nomination in at least one of the 25 categories, and 23% won at least one Tony Award. In the week prior

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[13] Seven weeks were dropped from the sample due to missing data for certain productions in those weeks.

[14] Average prices and grosses were adjusted to 2007 dollars using the CPI.

[15] Some productions report capacity greater than 100% due to the sale of tickets for standing room only.

[16] As a rule of thumb, two productions with the same name were identified as separate productions if a gap of more than 12 weeks existed between the two.

[17] Special engagements are typically one-woman or one-man shows.

[18] These revivals are treated as unique productions since, as described above, they are completely new productions of a previously performed show.

to the announcement of the nominees, the average attendance for (eventual) Tony winners was 76% of capacity while the average attendance for future nominees that did not win was 65%. In the week prior to the announcement of the Tony Awards, the average attendance for (eventual) Tony winners was 80% while the average attendance for nominees that did not win was 74%.[19]

4 Demand for Broadway theaters

4.1 Logit model

Using a logit model, we estimate the weekly demand facing each Broadway production. In our discrete choice model of demand, an individual decides which Broadway production to attend (if any) in a given week. The utility of attending a production depends upon the production's characteristics, such as its quality, how long it has been running, and whether it received a Tony nomination or Tony Award. Individual i's utility from attending production j in week t is given by

$$u_{ijt} = \delta_{jt} + \varepsilon_{ijt}, \tag{1}$$

where δ_{jt} is the mean utility and ε_{ijt} is an idiosyncratic individual error term with a Type I Extreme Value distribution. The mean utility of production j in week t depends upon its characteristics as given by

$$
\begin{aligned}
\delta_{jt} = {} & \theta_j + \tau_t - \lambda(t - r_j) + \phi Prev_{jt} + \sum_{k=1}^{5} \alpha_k NomBefore_{kjt} \\
& + \sum_{k=1}^{52} \beta_k NomAfter_{kjt} + \beta_{52\,plus} NomAfter_{52\,plus,jt} t \\
& + \sum_{k=1}^{52} \gamma_k Win_{kjt} + \gamma_{52\,plus} Win_{52\,plus,jt} + \xi_{jt},
\end{aligned} \tag{2}
$$

where θ_j is a fixed effect for production j, τ_t is a dummy for the week of the year, $(t - r_j)$ is decay or the number of weeks the production has been on Broadway, and ξ_{jt} is an unobserved time-specific taste for each production. The fixed effect captures any characteristics of the production that are constant over time—e.g., whether the production is a play or musical, venue characteristics, and any unobserved attributes. The weekly dummies capture underlying changes in the seasonality of demand. The decay allows for individuals to prefer "newer" shows, and it also allows for the fact that the individual may have already seen an "older" show previously. This specification also assumes that the decay effect is

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[19] Our model of demand in the next section will use fixed effects to capture any unobserved time-invariant characteristics of each production. As discussed in the next section, our results are qualitatively similar when we include lags of market shares to control for time-variant factors.

independent of the opening date of the production. The dummy variable $Prev_{jt}$ equals 1 if production j was showing previews in week t.

We allow the effect of a Tony nomination to vary before and after the Tony Awards are announced. Typically, at most 5 weeks separate the announcement of the nominations in early May and the Tony Awards in early June, so for $k = 1, 2, \ldots, 5$, we define $NomBefore_{kt}$ as a dummy variable that is equal to one in the kth week after the announcement of a nomination for production j, but before the Tony Awards. To capture the effect of being a Tony nominee after the Awards are announced, we create another series of dummy variables. For a nominated production, we define $NomAfter_{kt}$ as a dummy variable that is set equal to 1 for a nominee in the kth week (where $k = 1, 2, \ldots, 52$) after the Tony Awards and 0 otherwise. If more than 1 year (52 weeks) has passed since the Awards, the variable $NomAfter_{52plus,t}$ is set equal to 1.

We also allow the effect of winning a Tony to vary over time following the announcement of the Awards. The variable Win_{kt} is a dummy variable that is equal to one in the kth week after the Tony Awards for $k = 1, 2, \ldots, 52$, and the variable $Win_{52plus,t}$ is equal to one if more than 52 weeks have passed since production j received the Tony Award.[20] The coefficient α_k is therefore the effect of a Tony nomination on utility in the kth week after the announcement but before the winners are announced, and the coefficient γ_k is the effect of winning a Tony Award beyond the effect of a nomination.

Given the utility specification, we can calculate the predicted market share for each production in a given week. A consumer will choose to attend the production that gives the highest utility. For convenience, re-write Eq. 2, so that $U_{ijt} = X_{jt}\delta + \varepsilon_{ijt}$, where X is the vector of all the independent variables and δ is the vector of parameters (θ, τ, λ, α, β, γ, and ξ). Then the probability of consumer i attending production j in week t is given by

$$P_{ij} = Prob\big(U_{ijt} \geq U_{ikt}\big) = Prob(\varepsilon_{ikt} - \varepsilon_{ijt} \leq (X_{ijt} - X_{ikt})\delta)$$
$$= \frac{\exp(X_{jt}\delta)}{1 + \sum\limits_{k} \exp(X_{kt}\delta)}, \tag{3}$$

where k indexes the alternatives in the consumer's choice set. Equation 3 implies that if we integrate over ε, which has a Type I Extreme Value Distribution, then we get the standard logit formula (Ruud 2000). When we observe a large population, the probability of attending a production should equal its market share.

Following Berry (1994), we can manipulate and simplify the market share formula in Eq. 3 to obtain a relationship between a production's market share and the characteristics of the market and its competitors

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[20] We also estimated the model using a threshold of 3 and 6 months. The results are qualitatively similar compared to a threshold of 1 year post-nomination and post-award.

$$\ln(s_{jt}) - \ln(s_{0t}) = \theta_j + \tau_t - \lambda(t - r_j) + \phi Prev_{jt} + \sum_{k=1}^{5} \alpha_k NomBefore_{kjt}$$

$$+ \sum_{k=1}^{52} \beta_k NomAfter_{kjt} + \beta_{52\,plus} NomAfter_{52\,plus,jt} \qquad (4)$$

$$+ \sum_{k=1}^{52} \gamma_k Win_{kjt} + \gamma_{52\,plus} Win_{52\,plus,jt} + \xi_{jt},$$

where s_{jt} is the market share of production j in week t and s_{0t} is the market share of the outside good ($j = 0$) in week t. The "outside" good is not attending a Broadway production and choosing an alternative leisure activity.

We calculate a production's market share in a given week by taking its reported weekly attendance and dividing it by the total US population. Population estimates were taken from the annual estimates by the Census (based on 1990 and 2000 data) and linearly interpolated across the months of the year. The share of the outside good is calculated by subtracting the sum of all productions' market shares in a given week from 1. The dependent variable is the difference between the logarithm of a production's market share and the logarithm of the share of the outside good. This variable will fluctuate from week to week, depending upon the size of the population and the total tickets sold for production j as well as its competitors.

The weekly dummies capture fluctuations in demand during the year; for instance, the summer months experience a surge in tourism and are peak times for Broadway theater. The predicted market share formula for a production (and our estimating equation above) takes into account the relative strength of competition from other rivals. Individuals explicitly choose among the set of available Broadway productions in a given week. This allows for changes in the strength of competition to affect a production's market share.

The effects of the Tony nomination and win are identified by exogenous changes in the timing of the announcements. The announcements of the nominations are typically in early May with the Awards in early June. Even so, depending on the year, the particular week of the year in which the announcement occurs can vary by as much as 3 weeks. The coefficients on production characteristics and week of year are identified by changes in a consumer's choice set over time. For instance, the effect of competition is identified by observing a production competing against different sets of rivals over the weeks. As the market size can fluctuate from week to week, the underlying seasonality in the market is identified by observing the same set of productions competing during different weeks of the year.

4.2 Results

Table 2 reports select results from estimating Eq. 3 using the logit model. Column 1 contains the results from the full sample. Column 2 drops observations from September, October, and November of 2001 as demand and production runs of Broadway theaters were adversely affected during the months subsequent to the September 11th attacks. As Table 2 indicates, the results are qualitatively similar

Table 2 Logit regression: the effect of a Tony nomination on a production's market share in the weeks prior to the Tony Awards

	(1) All	(2) Drop 9/11	(3) All	(4) Drop 9/11
Decay	−0.001** (0.000)	−0.001** (0.000)	−0.001** (0.000)	−0.001** (0.000)
Preview	−0.125** (0.013)	−0.132** (0.013)	−0.125** (0.013)	−0.132** (0.014)
Nomination				
Week 1	0.031* (0.016)	0.030 (0.016)		
Week 2	0.077** (0.018)	0.076** (0.018)		
Week 3	0.064** (0.021)	0.063** (0.020)		
Week 4	0.038 (0.022)	0.037 (0.022)		
Week 5	0.025 (0.053)	0.025 (0.053)		
Nomination in "Main" category				
Week 1			0.034* (0.016)	0.034* (0.016)
Week 2			0.072** (0.019)	0.071** (0.019)
Week 3			0.064** (0.021)	0.063** (0.021)
Week 4			0.041 (0.023)	0.041 (0.022)
Week 5			0.023 (0.055)	0.023 (0.055)
Nomination in "Other" category				
Week 1			−0.002 (0.052)	−0.004 (0.054)
Week 2			0.144** (0.047)	0.141** (0.048)
Week 3			0.072 (0.061)	0.070 (0.060)
Week 4			−0.013 (0.076)	−0.015 (0.075)
Week 5			0.107* (0.047)	0.109* (0.047)
Observations	16,150	15,823	16,150	15,823
R^2	0.86	0.87	0.86	0.87

Standard errors are clustered by production and month. The dependent variable is the logarithm of a production's market share relative to the market share of the outside good ($\ln(s_{jt}) - \ln(s_{0t}) = \ln(s_{jt}/s_{0t})$). Table reports the effect of a Tony nomination in the weeks after the nomination, but before the Tony Awards. Regressions also include weekly dummies, production fixed effects, and a series of indicators for Tony nomination or win in the weeks following the Awards. Columns 3 and 4 allow the effect to vary by the type of Tony nomination or award received—"main" (best production or acting category) and "other"

*Significant at 5%, **significant at 1%

across the different specifications and have the expected signs. The coefficient on *decay* is negative, indicating that older shows have a lower market share. The coefficient on *preview* indicates that productions experience a lower market share in weeks during which they show previews.

The *Nomination* coefficients reported in Table 2 are the effects of a Tony nomination in the weeks after the nominees are announced, but before the winners are revealed at the Tony Awards. We find that a Tony nomination has a positive effect on a production's demand in the weeks leading up to the Awards. In the week immediately following the nomination announcements, a production's market share (relative to the outside good) increases by 3.0% if it is nominated, as shown in

column 2 of Table 2.[21] The effect increases in the second week to 7.6% and falls slightly to 6.3% in the third week after the nomination. After the fourth week, any benefit of the nomination has dissipated. This is consistent with a story of informational cascades where word-of-mouth gradually spreads after the nominations.

In addition to the specification discussed above, we estimate Eq. 3 allowing the effect of a Tony nomination or award to vary by category as well as over time. We split Tony nominations and awards into two categories: "main" and "other." We designate the "main" category to include nominations for best production and best acting: best play, best musical, best revival (play and musical), best special engagement, best actor in a musical, best actress in a musical, best featured actor in a musical, best featured actress in a musical, best actor in a play, best actress in a play, best featured actor in a play, and best featured actress in a play. The "other" category refers to excellence in all other areas—costume, sound and lighting design, musical score, book, choreography, and orchestrations. For nominations, we classify productions into two categories—those that received at least one nomination in the "main" category and those that received a nomination in the "other" category but not in a "main" category. For winners, we separate productions into those that won at least one award in a "main" category versus those that won in the "other" category without any wins in the "main" category. As nominations and wins in the "main" categories receive greater publicity, we expect awards in these categories to have a stronger impact on demand.

In columns 3 and 4 of Table 2, we report select results from this exercise. Our results are qualitatively similar across these two columns. As expected, the effect of receiving a nomination or win is stronger for the "main" category than for the "other" category. At the 1% significance level, we reject the joint hypothesis that the coefficients for the effect of the nominations before the Awards are equal across the "main" and "other" categories. Similarly, we reject the joint hypothesis at the 1% significance level that the coefficients for the effect of the nominations after the Awards are equal across the "main" and "other" categories, and we also reject the joint hypothesis that the effect of a win is equal across categories.

Figures 1 and 2 graph the effects of a Tony nomination and win in the "main" category during the weeks after the Tony winners are announced.[22] Figure 1 plots the estimated weekly coefficients for the Tony winners as a function of the number of weeks after the winners are announced. Recall that the coefficients on *Win* capture the effect of winning a Tony beyond a nomination. We find a statistically significant and positive impact of winning a Tony on a production's demand beyond the effect of a nomination. In the week immediately following the Tony Awards, "main" category winners' market shares increase by 11.5% relative to the outside good.

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[21] Note that the estimated coefficients can be interpreted as the percentage change in production j's market share relative to the outside good, since the dependent variable can be written as $\ln(s_{jt}) - \ln(s_{0t}) = \ln(s_{jt}/s_{0t})$.

[22] The effects of a Tony nomination or win for the "other" category are statistically indistinguishable from zero. The effects are also qualitatively similar when all Tony categories are pooled together. The table of coefficients is available from the authors upon request.
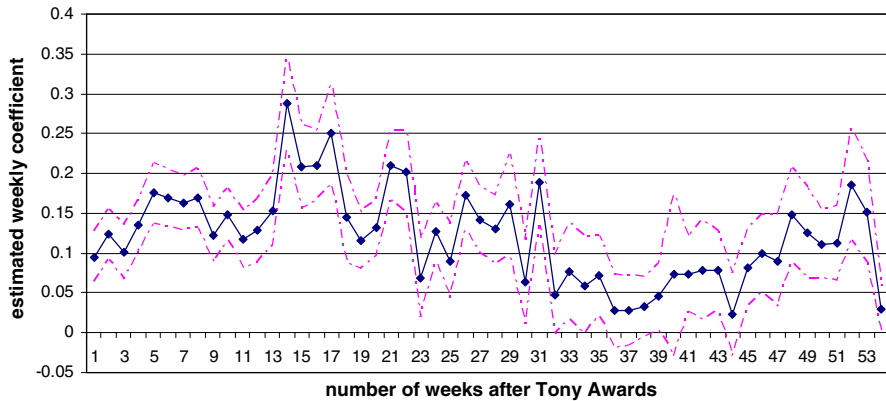
Fig. 1 The effect of winning a Tony in the "main" category on a production's market share during the weeks following the Tony Awards. *Notes*: Data points are the estimated weekly coefficients of the effect of a Tony win in the weeks following the Tony Awards; they represent the percentage change in a production's market share relative to the outside good. The sample excludes months (September, October, and November) following September 11, 2001. The *dashed lines* indicate one standard deviation above and below the estimated coefficients. This is the effect of winning a Tony above and beyond the effect of receiving a nomination
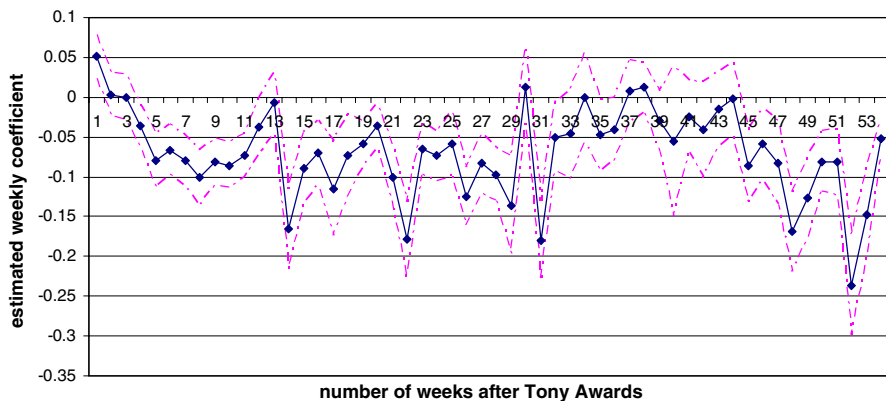

Fig. 2 The effect of a Tony nomination in the "main" category on a production's market share during the weeks following the Tony Awards. *Notes*: Data points are the estimated weekly coefficients of the effect of a Tony nomination in the weeks after the Awards; they represent the percentage change in a production's market share relative to the outside good. The sample excludes months (September, October, and November) following September 11, 2001. The *dashed lines* indicate one standard deviation above and below the estimated coefficients

The results are consistent with a story of informational cascades. During the initial weeks after the win, the market shares of winners gradually increase as word-of-mouth spreads. As mentioned above, the longevity of the effects of the Tony Award may be amplified by capacity constraints of theaters, as individuals may be forced to purchase tickets weeks in advance due to currently sold out

performances.[23] In our sample, however, the effect from such rationing is likely to be small since very few shows operate at full weekly capacity.[24] During the week before nominations were announced, the average attendance for (eventual) nominees was 70% of capacity with fewer than 3% of productions selling out. During the week before the Awards, the average attendance for (eventual) winners was 80% with fewer than 10% of productions selling out.

In addition, the benefit of winning a Tony varies over time. A peak is reached around 4 months after the Tony Awards during the last quarter of year. The effect gradually tapers off, but winners from the previous year also receive a boost in market share approximately 1 year after the Tony Awards—i.e., when the next year's Tony Awards are heavily promoted. The benefits of winning a Tony therefore accrue gradually over the weeks and experience two surges later in the year that are coincident with the last quarter of the year and the following year's Tony Awards.[25]

Figure 2 plots the estimated weekly coefficients for Tony nominees as a function of the number of weeks after the winners are announced; these estimated coefficients represent the gain in market share (relative to the outside good) of receiving a Tony nomination after the Awards. Once the Tonys have been awarded, any benefit of being a nominee (but not a winner) is eliminated. In fact, the negative coefficients on *NomAfter* indicate that a penalty exists for nominees who do not win. In addition, the penalty gradually increases over the initial weeks after the announcement. This result is consistent with previous work that indicates a penalty for losing in the theater industry. Simonoff and Ma (2003) find that losing a Tony nomination decreases a show's post-award longevity. They postulate that the public may view losing a Tony Award as "negative information," and this increases the risk of a show closing. Under our demand model, the penalty is consistent with a scenario in which revenues rise for all nominees before the Tony Awards, but following the Awards announcements the public pays more attention to the winners at the expense of the losers. In our utility maximization model, consumers have fixed time and budget constraints, and they must choose among shows. Consequently, the revenues of winners increase after the Awards while the losers' revenues fall as consumers substitute from one production to another.

Our findings of the gradual impact of nominations and wins on productions' market shares is consistent with informational cascades that have been found in

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[23] Note that the presence of capacity constraints would tend to work against us finding an effect of winning a nomination or Tony Award. The announcement of a nomination or win would not lead to increased sales as productions are already at capacity. In this case, our estimates of the Tony effect would be a lower bound on the true effect.

[24] The weekly capacity includes the combined totals from weekday and weekend shows. To the extent that weekend shows may sell a greater proportion of available tickets, the weekly capacity will be an average measure.

[25] Our results are qualitatively similar when we include a lagged dependent variable in our estimating logit equation to capture any potential time-varying unobservable factors. As expected the magnitudes are smaller as higher current market shares are allowed to be correlated to previous week's market shares; this is due to the fact that the lagged dependent variable may also capture the word-of-mouth effects stemming directly from the nomination or win, so the estimates will be a lower bound on the true effect of a Tony.

other industries such as the motion picture industry (Nelson et al. 2001; Deuchert et al. 2005). Previous work by Deuchert et al. (2005) finds that audiences punish Oscar nominees that do not win, similar to the phenomenon we observe for Broadway productions and the Tony Awards. Broadway productions differ significantly from movies, however, in that the length of a Broadway run can extend for years. Moreover, while movie theaters can expand the number of screens in the long run, Broadway theaters face capacity constraints. One difference in our results is that we find that the effect of a Tony win and nomination is much more long-lived than the impact of an Oscar win. In fact, Tony winners can reap the benefits of their win as late as 1 year after the win when next year's Tony Awards are being promoted.

Our estimated coefficients (from Fig. 1) indicate that winning a Tony in the week immediately following the announcement leads to an 11.5% increase in the market share of a production relative to the outside good. Given that the total weekly attendance of a production on average is 8,000 (and assuming the share of the outside good does not change substantially), this 11.5% increase in a production's market share will translate into an extra 920 tickets sold (=0.115 * 8,000) for the winning production. With an average ticket price of $66, winning a Tony Award will generate nearly $61,000 in additional revenues for the week immediately after. Using a similar calculation, receiving a Tony nomination will generate an additional $16,000 in revenues in the week immediately following its announcement (=0.03 * 8,000 * $66).

5 Survival analysis

In the previous section, we found that Tony nominations and wins benefit Broadway productions for extended periods beyond the announcement. A natural question that follows is what factors influence a production's length of run on Broadway. While our previous model estimates demand and conditions on the decision of a producer to enter and exit the market, we examine these entry and exit decisions using a survival model in this section. If surviving for an extended period in the market is necessary for reaping the full rewards from a Tony nomination or win, what factors influence the longevity of a production? We estimate a duration model to examine the probability of a production exiting.

In our survival analysis, the hazard function $\lambda(t)$ approximates the probability that a production will exit in week t given that it has survived until week $t - 1$. We estimate a Weibull duration model, since the hazard function is not constrained to be constant. In addition, this also facilitates comparison with previous work done in the live theater and motion picture industries. Under the Weibull duration model, the hazard function for production j is monotonic and given by

$$\lambda(t) = \gamma \alpha t^{\alpha-1} \quad \text{with} \ \ \gamma = \exp(X_{jt}\beta), \tag{5}$$

where X is a vector of time-varying characteristics of production j in week t. The parameters α and β are to be estimated. If $\alpha = 1$, then the hazard function is

Table 3 Hazard model: coefficients of hazard function describing a production's probability of exiting

	(1) Weibull: All	(2) Weibull: All	(3) Weibull: 1997–2006
Nomination	−1.382** (0.132)	−1.064** (0.147)	−1.137** (0.154)
Win	−1.225** (0.170)	−0.805** (0.179)	−0.712** (0.186)
Musical		−0.988** (0.146)	−0.924** (0.151)
Revival		0.100 (0.123)	0.080 (0.130)
Non-profit		−0.023 (0.177)	−0.035 (0.181)
Limited run		0.515** (0.169)	0.541** (0.174)
Number of productions	393	366	319

Standard errors in parentheses

The coefficients of the hazard function (i.e., a production's probability of exiting) are reported

Columns 1 and 2 contain the full sample. Column 3 contains all productions that opened on Broadway from 1997 to 2006

*Significant at 5%, **significant at 1%

constant over time; if $\alpha > 1$, then the hazard function is monotonically increasing, and if $\alpha < 1$, then the hazard function is monotonically decreasing.

We allow a production's probability of ending its run to depend upon its type (musical or play),[26] whether it is non-profit, the year that it began its run, whether it received a Tony nomination or win, and whether the production is a limited or open run.[27] While two previous studies have examined the duration of Broadway productions, our analysis differs in several ways. First, in contrast to Simonoff and Ma (2003), we have a large sample of shows (over 700 productions) that appear on Broadway from 1996 to 2007. Second, relative to Maddison (2004), we collect updated data from more recent years, and more importantly, we allow the covariates to vary over time. We consider a simplified model relative to our demand model where the effect of receiving a Tony nomination is allowed to differ before or after the Tony Awards, depending upon whether the show wins or loses.

Table 3 reports the results of the estimates. The independent variables include a dummy equal to one if a production is a musical and zero it if is a play, and indicators for whether the production is a revival, a non-profit and/or a limited run. The variable *TonyNom* is a dummy variable that equals one in the weeks following a Tony nomination and zero otherwise, and similarly, the variable *TonyWin* is a dummy variable that equals one in the weeks following a Tony win and zero otherwise. Columns 1 and 2 contain the results for the full sample of productions that appear in Playbill.com charts from 1996 to 2007. The full sample contains

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[26] We drop special engagements, which are very frequently limited runs. The results are qualitatively similar whether we include these observations or not.

[27] A limited run has a set end-date from the time it opens, as opposed to open runs which have no predetermined closing date. Successful limited runs very often extend, however, so the pre-announced end-date is not necessarily binding. Information on each show's run-type was collected from the Broadway World International Database (http://www.broadwayworld.com/bwidb) and reviews on the Talkin' Broadway and Curtain Up websites (http://www.talkinbroadway.com/world/past.html and http://www.curtainup.com/mastridx.html).

productions with a variety of opening dates and will include "older" productions that were released prior to 1996, but due to their success, were still running in 1996. To mitigate any selection problems, we also re-estimate the model in column 3 by restricting the sample to all productions that opened 1997–2007; this excludes productions that were released prior to 1996, when our sample begins. The results are qualitatively similar across the columns.

Our results are consistent with the previous literature on Broadway theaters. We find that Tony nominations and wins both decrease a production's likelihood of exiting. Musicals are less likely to exit than plays, limited runs are, as expected, more likely to exit than open runs, and revivals are more likely to exit than original productions (although this coefficient is not statistically significant).

Our estimated parameter for α is 1.45 with a standard error of 0.06. We find that the hazard function is monotonically increasing; Broadway productions that have lasted for extended periods are more likely to exit in the next period. De Vany and Walls (1996) similarly find that for the motion picture industry, the hazard function for movies is an increasing function of the number of weeks following their release. Our result differs from Maddison (2004); he finds that the hazard function falls as the number of performances rises. The difference in our results may be due to the time period of analysis. Maddison uses a dataset with productions from 1960 to 2003. This time period includes the entire runs of famously long-lived shows such as *Cats* (1982–2000), *Les Miserables* (1987–2003), *A Chorus Line* (1975–1990), and *Miss Saigon* (1991–2001). However, our results on the effects of Tony wins are consistent with Maddison; we both find that receiving a Tony award increases the longevity of a production.

We have translated our results for the hazard model into a graph of the survival function for a "typical" production released in 2005. Figure 3 plots the survival functions for a Tony winner and non-nominee with identical characteristics over a
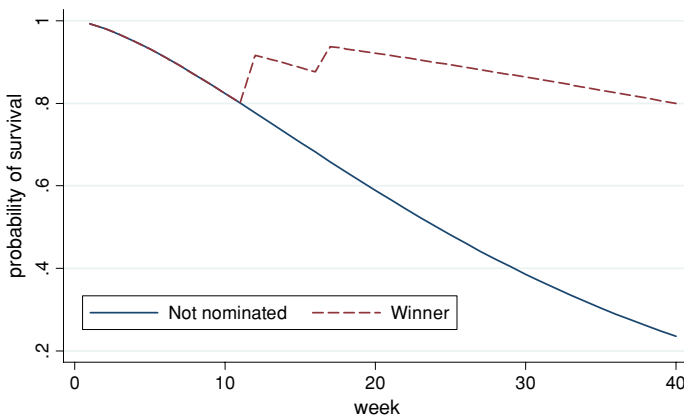

Fig. 3 Survival function for a "typical" Broadway musical. *Notes*: This is the estimated survival function for a "typical" musical released in 2005. The vertical axis measures a production's probability of survival, and the horizontal axis measures the number of weeks the production has been running. Please see text for accompanying calculations. The Tony nominees are announced in the 12th week of this production's run, and the Tony Awards occur in the 17th week of the run

period of 40 weeks (the average run of a production). The representative show is an original, for-profit musical with an open-ended run. For each week t, we calculate the probability that the production will "survive" to at least t weeks. We assume that Tony nominations are announced in the 12th week of the run (the average number of weeks between the first performance and a Tony nomination announcement for eventual nominees), and we allow 5 weeks between the announcement of the nomination and the Tony ceremony (so the win happens in the 17th week). As seen in the graph, the probability of survival increases at each of the announcements for a winning show. The non-nominated show has a steeper hazard function in the weeks following the Awards.

6 Conclusion

The Annual Tony Awards ceremony is the highlight of the Broadway season, recognizing excellence in professional American theater. Producers celebrate the receipt of Tony nominations, and they expect a Tony win to significantly impact a show's popularity and longevity. Quantifying such an impact is important from an economic policy standpoint, since the influence of an award on the demand facing a production also potentially determines the efficiency of the market for Broadway theater.

We estimate the impact of a Tony Award nomination and win on the demand for a Broadway production and on the duration of a production's Broadway run. Our model of demand is a discrete choice model that accounts for the strength of competition in a given week, and it allows the impact of a Tony nomination or win to vary across the weeks of the Broadway season. We find that the effect of a nomination or win for a production is consistent with a story of informational cascades, where the transmission of information spreads gradually over time, and this effect may persist for extended periods due to theaters' capacity constraints. The estimated effect of a Tony nomination is positive in the week of the announcement and gradually increases in the weeks leading up to the Awards, but nominees who do not win suffer a penalty after the Awards are announced. Winners experience an increase in demand which rises in the weeks immediately following the Awards, presumably due to publicity and word-of-mouth. The positive demand effect of a win varies over the weeks of the subsequent season, peaking approximately 4 months after the Awards and again 1 year later when the Awards are publicized for the following season. Using our demand estimates, we find that for a "typical" production, winning a Tony Award will generate nearly \$61,000 in additional revenues for the week immediately after, and receiving a Tony nomination will generate an additional \$16,000 in revenues in the week immediately following its announcement.

In addition to modeling demand, we utilize a Weibull duration model to measure the determinants of longevity for the productions in our dataset. In keeping with previous studies, we find that for the Broadway seasons in our dataset, both Tony nominations and wins decrease the probability that a show will exit the market.

This study establishes that a Tony win has a substantial influence on consumer demand for a Broadway production, and it documents the evolution of that effect over time. As mentioned previously, this further implies that the Awards have substantial potential to influence the efficiency of the market for theater in the United States. Depending upon whether Tony winners are more or less artistic or innovative than other shows, the Awards will have the effect of either increasing or decreasing artistic quality on Broadway.

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