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Music, Death, and Profits: Variables Contributing to the Surge in Sales After an Artist's Death

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Abstract

The passing of notable artists such as Prince, David Bowie, and Tom Petty has generated a surge in music sales associated with them. However, the impact of the death of these artists on sales that follows their deaths is not well understood. We aim to understand what happens to long-term effects on post-death sales and whether there is a return to pre-death levels. We use standard fixed effects panel estimations to assess the impact of an artist's death on the sales of the artist's albums and the rate at which album consumption decreases thereafter. We leverage a dataset of daily album sales for 81 artists, associated with 109 bands, who died between January 31, 2015 and December 1, 2017. Our findings show that the rate of sales does not return to pre-death levels but instead is in most instances persistently higher even several years after the death shock occurs.

Keywords: music consumption, artist death, death shock, after-death music sales, posthumous music sales, portfolio management

Introduction

The recent passing of notable recording artists such as Prince, David Bowie, Tom Petty, and Chuck Berry has generated a surge in music sales associated with those artists. The sales gains following the death of an artist are often so great that the artist's albums re-enter the charts. Prince's

album sales surged by 16,000% following his death placing in seven of the ten top slots in the charts (Pallotta 2016), while Tom Petty's song sales surged nearly 6,800% when he died (Caulfield 2017). That such a surge in sales occurs the days after an artist's passing is by no means a surprise. But how long does that surge last? Or to be more specific, at what point in time does this surge in sales abate and revert to its pre-death levels, or does it ever return to those levels? We strive to answer those questions by estimating the impact of the number of days since an artist has passed away on individual album sales for that artist by using standard fixed effects panel estimations.

The academic literature related to the post-death effect of a superstar is sparse. Some studies focus on scientists who are considered "superstars" and what effects their death has on their co-authors (Azoulay, Graff Zivin, and Wang 2010, 549). Others focus on the non-scalable nature of painters and the effect of their deaths on driving art prices (Ekelund, Ressler, and Watson 2000, 283; Ursprung and Wiermann 2011, 697). Yet another study has covered the surge in sales in memorabilia (Radford and Bloch 2013, 43-55). Radford and Bloch observed the auction activities on eBay for seven celebrities, including Johnny Cash, and demonstrated that a celebrity's death exerted a powerful influence on auction activity. However, thus far, only one published study has tackled the issue of death shock effect of a superstar in the context of the music industry, titled "Death-Related Publicity As Informational Advertising: Evidence From The Music Industry" and published in 2016 in *Marketing Letters*, which suggests that death-related publicity serves primarily as informational advertising that attracts new customers who buy the artist's best albums after death (Brandes, Nüesch, and Franck 2016, 143-157). Brandes, Nüesch, and Franck used weekly sales data for 446 music albums of 77 artists who died between 1992 and 2010. They observed seven weeks pre-death and seven weeks post-death for each artist and were able to show that album sales increased on average by 54.1% after death and that the relative increase in sales is higher for the artist's better albums. However, their study did not assess the long-term effects that an artists' death has on music consumption. We intend to contribute to this sparse literature by producing a study that aims to understand what happens to long-term sales of an artist post-death and whether there is a return to pre-death levels.

Methodology

The empirical evidence for our study comes from running standard fixed effects panel estimations on a unique dataset acquired from *Buzz-Angle Music* that allows us to understand the long-term effects on music consumption that follows the surge in sales after an artist's death and to assess if and at what point in time those sales revert to their pre-death levels, or whether they ever return to those levels. This dataset includes daily album sales for 3,101 albums from 81 artists, associated with 109 bands, who passed away between January 31, 2015 and December 1, 2017 for a total of 1,056 days. The albums captured include both the sale of physical copies and digital downloads (see Figure 1 for the relevance of album sales during the period observed). A detailed list of artists along with date of death, age when they died, and cause of death is available in Table 1. For a list of associated bands with those artists please refer to Table 2.

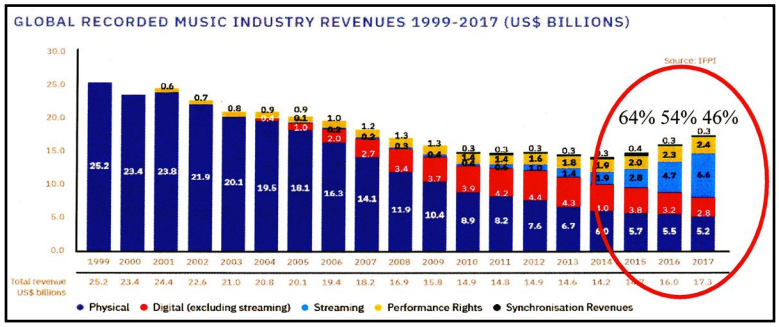

Figure 1. Relevance of albums sales for the observed sample January 31, 2015 to December 1, 2017 (source: IFPI 2018).

#	Artist	Date of Death	Age Died	Cause of Death
1	A.J. Pero	3/20/2015	56	Heart Attack
2	Al Jarreau	2/12/2017	76	Respiratory Failure
3	Andy Fraser	3/16/2015	63	Atherosclerosis
4	Andy White	11/2/2015	85	Heart Attack
5	B.B. King	5/14/2015	89	Vascular Dementia
6	Ben E. King	4/30/2015	76	Natural Causes
7	Billy Joe Royal	10/6/2015	73	Natural Causes
8	Bobby Taylor	7/22/2017	83	Leukemia

#	Artist	Date of Death	Age Died	Cause of Death
9	Bruce Hampton	5/1/2017	70	Collapsed on Stage
10	Buddy Emmons	2/23/2015	72	Undisclosed Illness
11	Carey Lander	10/11/2015	33	Osteosarcoma
12	Charles Bradley	9/23/2017	68	Stomach Cancer
13	Charmayne Maxwell	2/28/2015	46	Accident
14	Chester Bennington	7/20/2017	41	Suicide
15	Chinx	5/17/2015	32	Shot
16	Chris Cornell	5/18/2017	52	Suicide
17	Chris Squire	6/28/2015	67	Leukemia
18	Chuck Berry	3/18/2017	90	Cardiac Arrest
19	Chuck Loeb	7/31/2017	61	Cancer
20	Cilla Black	8/1/2015	72	Stroke
21	Clark Terry	2/21/2015	94	Natural Causes
22	Clyde Stubblefield	2/18/2017	73	Congestive Heart Failure
23	Cuba Gooding, Sr.	4/20/2017	72	Drug Overdose
24	Daron Norwood	7/23/2015	50	Non-Disclosed
25	Dave Rosser	6/27/2017	50	Colon Cancer
26	David Bowie	1/10/2016	69	Liver Cancer
27	Debbie Reynolds	12/28/2016	84	Intracerebral Hemorrhage
28	Diane Charlemagne	10/28/2015	51	Cancer
29	Eddy Louiss	6/30/2015	74	Cataract
30	Errol Brown	5/6/2015	72	Liver Cancer
31	Fats Domino	10/24/2017	89	Natural Causes
32	Frankie Ford	9/28/2015	76	Natural Causes
33	Gary Richrath	9/13/2015	66	Non-Disclosed
34	Geoff Nicholls	1/28/2017	68	Lung Cancer
35	George Martin	3/8/2016	90	Natural Causes
36	George Michael	12/25/2016	53	Dilated Cardiomyopathy
37	Glen Campbell	8/8/2017	81	Alzheimer's Disease
38	Glenn Frey	1/17/2016	67	Pneumonia
39	Graham Brazier	9/4/2015	63	Heart Attack
40	Greg Lake	12/7/2016	69	Cancer
41	Gregg Allman	5/27/2017	67	Liver Cancer
42	Harold Battiste	6/19/2015	84	Natural Causes

#	Artist	Date of Death	Age Died	Cause of Death
43	Ian Fraser Kilmister	12/28/2015	70	Cancer
44	Jack Ely	4/28/2015	72	Skin Cancer
45	James Horner	6/22/2015	62	Aviation Accident
46	Jeremy Brown	3/30/2015	34	Non-Disclosed
47	Jim Ed Brown	6/11/2015	81	Lung Cancer
48	Joan Sebastian	7/12/2015	64	Bone Cancer
49	Joey Feek	3/4/2016	41	Cervical Cancer
50	John Berry	5/19/2016	52	Frontal Lobe Dementia
51	John Renbourn	3/26/2015	70	Heart Attack
52	Johnny Kemp	4/16/2015	56	Natural Causes
53	Juan Gabriel	8/28/2016	66	Heart Attack
54	Justin Lowe	7/21/2015	32	Fallen to Death
55	Koopsta Knicca	10/9/2015	40	Stroke
56	Larry Coryell	2/19/2017	73	Congestive Heart Failure
57	Leonard Cohen	11/10/2016	62	Leukemia
58	Lesley Gore	2/16/2016	68	Lung Cancer
59	Lil' Chris	3/23/2015	24	Suicide
60	Lynn Anderson	7/31/2015	68	Heart Attack
61	Michael Burgess	10/28/2015	70	Cancer
62	Mike Porcaro	3/15/2015	59	Amyotrophic Lateral Sclerosis (ALS)
63	Nick Menza	5/21/2016	51	Congestive Heart Failure
64	Ortheia Barnes-Kennerly	5/15/2015	71	Heart Failure
65	Paul Kantner	1/28/2016	74	Organ Failure
66	Percy Sledge	4/14/2015	75	Liver Cancer
67	Pete Huttlinger	1/15/2016	54	Stroke
68	Phife Dawg	3/23/2016	45	Diabetes
69	Prince	4/21/2016	57	Drug Overdose
70	Randy Howard	6/11/2015	65	Shot
71	Scott Weiland	12/3/2015	48	Drug Overdose
72	Sean Price	8/7/2015	43	Non-Disclosed
73	Steve Mackay	10/11/2015	66	Blood Poisoning
74	Steve Strange	2/12/2015	55	Heart Attack
75	Sylvia Moy	4/15/2017	78	Pneumonia

#	Artist	Date of Death	Age Died	Cause of Death
76	Theodore Bikel	7/21/2015	91	Natural Causes
77	Tom Petty	10/2/2017	66	Cardiac Arrest
78	Tommy Overstreet	11/2/2015	78	Non-Disclosed
79	Vanity (Denise Matthews)	2/15/2016	57	Sclerosing Encapsulating Peritonitis
80	Walter Becker	9/3/2017	67	Esophageal Cancer
81	Wendell Holmes	6/19/2015	93	Pneumonia

Table 1. List of selected artists for the observed sample from January 31, 2015 to December 1, 2017.

#	Bands and Associated Acts	#	Bands and Associated Acts
1	A Tribe Called Quest	56	Joey + Rory
2	After the Burial	57	Joey Feek
3	Al Jarreau	58	John Berry
4	Andy White	59	John Renbourn
5	B.B. King	60	Johnny Kemp
6	Ben E. King	61	Juan Gabriel
7	Billy Joe Royal	62	King Crimson
8	Black Sabbath	63	Koopsta Knicca
9	Bobby Taylor	64	Larry Coryell
10	Brownstone	65	Leonard Cohen
11	Bruce Hampton	66	Lesley Gore
12	Buddy Emmons	67	Lil' Chris
13	Camera Obscura	68	Linkin Park
14	Charles Bradley	69	Lynn Anderson
15	Chinx	70	Megadeth
16	Chris Cornell	71	Michael Burgess
17	Chris Squire	72	Mike Porcaro
18	Chuck Berry	73	Mudcrutch
19	Chuck Loeb	74	Ortheia Barnes
20	Cilla Black	75	Paul Kantner
21	Clark Terry	76	Pentangle
22	Clyde Stubblefield	77	Percy Sledge
23	Daron Norwood	78	Pete Huttlinger

#	Bands and Associated Acts	#	Bands and Associated Acts
24	David Bowie	79	Phife Dawg
25	Dead by Sunrise	80	Prince
26	Debbie Reynolds	81	REO Speedwagon
27	Eddy Louiss	82	Randy Howard
28	Errol Brown	83	Scott Weiland
29	Fats Domino	84	Sean Price
30	Fourplay	85	Soundgarden
31	Frankie Ford	86	Steely Dan
32	Free	87	Steps Ahead
33	French Montana	88	Steve Mackay
34	Gary Richrath	89	Stevie Wonder
35	George Martin	90	Temple of the Dog
36	George Michael	91	The Afghan Whigs
37	Glen Campbell	92	The Beatles
38	Glenn Frey	93	The Browns
39	Graham Brazier	94	The Holmes Brothers
40	Greg Lake	95	The Kingsmen
41	Gregg Allman	96	The Legionnaires
42	Hampton Grease Band	97	The Main Ingredient
43	Harold Battiste	98	The Stooges
44	Hello Sailor	99	Theodore Bikel
45	Heltah Skeltah	100	Three 6 Mafia
46	Hot Chocolate	101	Tommy Overstreet
47	Ian Fraser	102	Toto
48	Jack Ely	103	Twisted Sister
49	James Brown	104	Urban Cookie Collective
50	James Horner	105	Vanity 6
51	Jefferson Airplane	106	Visage
52	Jefferson Starship	107	Walter Becker
53	Jeremy Brown	108	Wendell Holmes
54	Jim Ed Brown	109	Wham!
55	Joan Sebastian		

Table 2. List of bands and associated acts in alphabetical order for the observed sample from January 31, 2015 to December 1, 2017.

To treat our dataset, we use standard fixed effects panel estimations. Panel data, also known as longitudinal data, consists of repeated observations and measurements on the same cross-section over time (Wooldridge 2010, 169; Greene 2012, 384). Panel data contains observations of multiple phenomena obtained over multiple time periods for the same firms or individuals (in this case artists and albums). Please note that in panel data, the same cross-sectional unit is surveyed over time, so in summary, we have data, which is pooled over space and time.

We have chosen to use panel estimations because panel data can take explicit account of individual-specific heterogeneity ("individual" here means the artist/band). Fixed effects panel estimation allows us to control for any time-invariant artist and/or album characteristics that may impact sales. For example, the quality of the songs on the album or the age of the artists when they died. Also, by combining data in two dimensions, panel data gives more data variation, less collinearity and more degrees of freedom. It is better suited than cross-sectional data for studying dynamics of change and behavioral models, which is a good fit for our long-term music consumption analysis. In addition, it is better in detecting and measuring the effects, which cannot be observed in either cross-section or time-series data when used independently. Finally, this methodology helps us minimize the effects of aggregation bias such as aggregating album sales into broad groups (Bell and Jones 2015, 138).

Figure 2 shows a graphical example of a balanced panel of observations where there are N cross-sectional observations (i.e., albums in our analysis) each observed for T periods (i.e., each day from January 1, 2015 through December 31, 2017). We have an unbalanced panel at the album/day level because we have different length time series for each album as

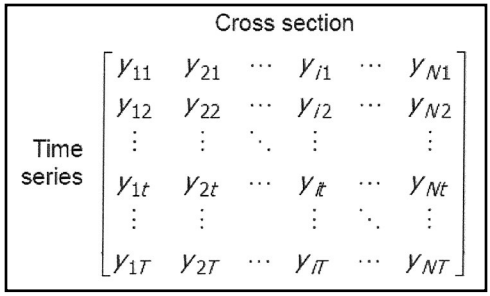

Figure 2. Example of balanced panel data (source: Mishra 2018)

some albums do not sell in each period over the analysis time frame. This does not impact the interpretation of the estimations—it is straightforward to adjust the standard formulas for balanced panel analysis to take into account the unbalanced nature of the data (Bell and Jones 2015, 145).

Please note that we only used observations with positive sales. In addition, our data was selected as follows:

1. We exclusively used the "main band" or "bands" associated with each artist. For example, for Prince, we included all of Prince's albums releases, but we did not include a compilation album, say, if Prince was added on a track of another artist's album. Thus, we focused on the main band(s) associated with the dead artist.
2. Our dataset started on January 1, 2015 and ended on December 31, 2017. However, we only used artists who died at least one month after the time frame started (so had to die after January 31, 2015) or one month before the end of the time frame (so had to die before December 1, 2017). This ensures that we observed at least a month's worth of pre-death observations and also have at least a month of post-death observations for each artist. If we would have chosen to observe an artist who died on January 1, 2015, we would have observed him or her only being dead and would have nothing to compare it to. Thus, our results are not biased by artists who have always been dead (i.e., they die very early on within the time frame) or have always been alive within the time frame (i.e., they die very late within the time frame).

We aim to estimate the impact of the number of days since an artist has passed away on individual album sales for the artists. We use the following functional form for sales of album *i* for artist *j* in period *t*:

1. Our first estimation uses a dummy variable for each day we observed after an artist died:

$$\ln(\textit{Daily Album Sales}_{ijt}) = \textit{Album Fixed Effects} + \textit{Period Fixed Effects} + \textit{Days Since Artist Passed Away Dummies} + \varepsilon_{ijt}$$

2. Our second estimation uses a categorical variable setup for the days since an artist passed away configured for 50 day increment (interval):

$$\ln(\textit{Daily Album Sales}_{ijt}) = \textit{Album Fixed Effects} + \textit{Period Fixed Effects} + \textit{Days Since Artist Passed Away (}50\textit{ Day Increment) Dummies} + \varepsilon_{ijt}$$

Next, we focus on the artists level data that sums up all the album sales they had in each day. The following two equations allowed us to estimate how the *album portfolio* of an artist performs when he or she dies. Indeed, if an artist had three albums that had positive sales in a day, that interaction was then summed up into one observation. This is the exact same equation as we have above except that the dependent variable is now 1n(*Artist's Total Daily Album Sales*$_{jt}$) and thus, the error term in the equation changes to ε_{jt}. This is because those two estimations are at the artist level (j) and not at the album level (i) thus, we lose the i subscript:

1. Our first estimation uses a dummy variable for each day we observed after an artist died:

$$\ln(\textit{Artist's Total Daily Album Sales}_{jt}) = \textit{Album Fixed Effects} + \textit{Period Fixed Effects} + \textit{Days Since Artist Passed Away Dummies} + \varepsilon_{jt}$$

2. Our second estimation uses a categorical variable setup for the days since an artist passed away configured for 50 days intervals:

$$\ln(\textit{Artist's Total Daily Album Sales}_{jt}) = \textit{Album Fixed Effects} + \textit{Period Fixed Effects} + \textit{Days Since Artist Passed Away (50 Day Increment) Dummies} + \varepsilon_{jt}$$

In summary, to understand the long-term effects of an artist's death on music consumption, we run four sets of estimations as discussed earlier.

Analysis and Results

Table 3 offers a summary of the statistics at the Album/Day level data for our sample observed, $N = 573{,}655$. In our sample of 3,101 albums associated with 109 acts, on average, individual albums sold 21.59 units per day with one album showing an extreme 102,687 sales in a day. Also, Table 3 tells us that we observed each dead artist for an average of 157.69 days. You will notice that there is a difference between the number of observations in Table 3 and our first estimations table showing the impact of days since an artist passed away on natural log of daily album sales in Table 4, which shows a slightly smaller sample, N=573,318. That is due to the album fixed effects that eliminated some observations when there was only one day during our sample when the album had positive sales (called a singleton). Thus, the fixed effects eliminated albums with only one observation over the time frame. In addition, we take the natural log of

album sales because the data is highly skewed. The fixed effects by album allow us:

1. To control for artist fixed effects as well as album fixed effects because albums are nested with the artists.
2. To make sure that album fixed effects control for any time-invariant album level observable including album quality, number of songs, album release date, etc.

We also included period fixed effects by using a dummy variable that equals 1 for each day in the dataset. The period fixed effects help us to control for several variables:

1. It controls for any day-specific shocks that impact all album sales.
2. Because of this, it also controls for any seasonality/day of year (day/week/month) effects.
3. Finally, it controls for any linear trend in album sales.

	Mean	St Dev	Min	Max
Daily Album Sales:	21.5949	299.8766	1.0000	102,687.0000
LN (Daily Album Sales):	1.4876	1.4531	0.0000	11.5394
Days Since Artist Passed Away:	157.6962	231.4823	0.0000	1,011.0000
Days Since Artist Passed Away (50 Day Categories)				
0-49	0.0715	0.2576	0.0000	1.0000
50-99	0.0539	0.2258	0.0000	1.0000
100-149	0.0454	0.2082	0.0000	1.0000
150-199	0.0417	0.2000	0.0000	1.0000
200-249	0.0384	0.1921	0.0000	1.0000
250-299	0.0345	0.1825	0.0000	1.0000
300-349	0.0292	0.1683	0.0000	1.0000
350-399	0.0272	0.1626	0.0000	1.0000
400-449	0.0251	0.1564	0.0000	1.0000
450-499	0.0241	0.1534	0.0000	1.0000
500-549	0.0227	0.1490	0.0000	1.0000
550-599	0.0212	0.1441	0.0000	1.0000
600-649	0.0182	0.1335	0.0000	1.0000

	Mean	St Dev	Min	Max
650-699	0.0139	0.1170	0.0000	1.0000
700-749	0.0114	0.1062	0.0000	1.0000
750-799	0.0107	0.1031	0.0000	1.0000
800-849	0.0094	0.0967	0.0000	1.0000
850-899	0.0065	0.0802	0.0000	1.0000
900-949	0.0037	0.0604	0.0000	1.0000
950-999	0.0013	0.0364	0.0000	1.0000
1,000-1,011	0.0001	0.0071	0.0000	1.0000
Number of Artists	**109**			
Number of Albums	**3,101**			

Table 3. Summary statistics at the album/day level. *N* = 573,655.

We are most interested in the coefficients on the dummy variables for days since an artist died in Table 4. Also, since we included period fixed effects, and because we take the natural log of album sales as the dependent variable, the dummy variables on the days since an artist died are interpreted as the increase in average album sales compared to the artist being alive. For example, the dummy variable on days the artist is dead = 0 (i.e., the day the artist died) is the average percent increase in album sales on the day the artist died, whereas the dummy variable on days dead = 1 (i.e., the day after the artist died) is the average percent increase in album sales one day after the artist died, and so on. This way we have the potential to estimate a large number of dummy variables (one for each day we observe after an artist dies) (see Figure 3). Thus, if we observe album sales for an artist 700 days after that artist died, then we have a dummy variable for that. We have listed the first 11 dummy variables in Table 4 (e.g., the impact on sales in the day the artist died, and then 10 days after). Then we skipped and listed the coefficient for 100 days, 200 days, 300 days, and so on. In between, we included the number of coefficients that were significant. So, did being dead increase album sales relative to being alive? Generally, yes, especially early on, but we get some less significant effects at around 400/500/600 days and toward the end at 900+ days. Note that individual album sales per artist on the day that the artist dies surge by 145.3%.

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
0	1.453***	0.060
1	1.972***	0.058
2	1.773***	0.056
3	1.523***	0.052
4	1.456***	0.053
5	1.328***	0.052
6	1.294***	0.052
7	1.257***	0.052
8	1.239***	0.051
9	1.108***	0.047
10	1.116***	0.049
11 ~ 99 suppressed for brevity. 89 out of 89 (100%) of coefficients significant at 5% or 1% level.		
100	0.392***	0.040
101 ~ 199 suppressed for brevity. 99 out of 99 (100%) of coefficients significant at 5% or 1% level.		
200	0.218***	0.048
201 ~ 299 suppressed for brevity. 99 out of 99 (100%) of coefficients significant at 5% or 1% level.		
300	0.401***	0.062
301 ~ 399 suppressed for brevity. 90 out of 99 (90.91%) of coefficients significant at 5% or 1% level.		
400	0.141**	0.057
401 ~ 499 suppressed for brevity. 59 out of 99 (59.60%) of coefficients significant at 5% or 1% level.		
500	0.143**	0.060
501 ~ 599 suppressed for brevity. 26 out of 99 (26.26%) of coefficients significant at 5% or 1% level.		
600	0.162**	0.074
601 ~ 699 suppressed for brevity. 58 out of 99 (58.59%) of coefficients significant at 5% or 1% level.		
700	0.318***	0.090
701 ~ 799 suppressed for brevity. 97 out of 99 (97.98%) of coefficients significant at 5% or 1% level.		
800	0.197**	0.095
801 ~ 899 suppressed for brevity. 59 out of 99 (59.60%) of coefficients significant at 5% or 1% level.		

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
900	0.182	0.128
901 ~ 999 suppressed for brevity. 49 out of 99 (49.49%) of coefficients significant at 5% or 1% level.		
1,000	0.273	0.290
1,001 ~ 1,011 suppressed for brevity. 2 out of 11 (18.18%) of coefficients significant at 5% or 1% level.		
Album Fixed Effects	✓	
Period (Day) Fixed Effects	✓	
N	573,318	
R^2 (within)	0.1188	
*** and ** indicate significance at 1% and 5%, respectively. Standard errors robust to clustering at the album level.		

Table 4. Impact of days since artist passed away on natural log of daily album sales. *N* = 573,318.

Figure 3 gives a different perspective based on the results in Table 4. It presents a scatter graph showing the predicted percentage increase in daily album sales by day since the artists sampled passed away. This graph shows how the percentage increase in daily album sales fluctuates as the time since death increases. Please note: insignificant coefficients have been set to 0. In short, post-death sales start very high and quickly decrease and takes about a year to level off. But surprisingly, those sales never go back to 0, which would represent pre-death sales. It looks like the death effect persists even after the artist has been dead a while. We also estimated the average of all of the significant coefficients after an artist has been dead for over a year (365 days after death) and based on our results it yielded a persistent and astonishing 15.24% increase in daily album sales compared to pre-death levels!

Our second estimation outputs are available in Table 5 and Figure 4 and provide 21 categorical dummy variables instead of over 1,000 dummy variables as was showcased in Table 4. In Table 5 and Figure 4, we observe how much daily album sales increase when someone has been dead from 0 to 49 days, from 50 to 100 days, and so forth. Thus, we are consolidating our results in 50-day increments. However, the results shown in Table 5 are very similar to what was delivered previously in Table 4. We see very significant results at first with a sharp decrease especially early

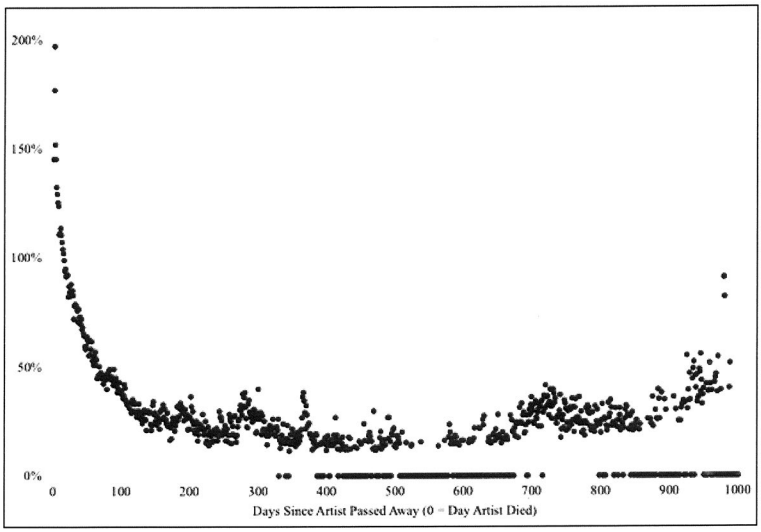

Figure 3. Predicted percentage increase in daily album sales by day since artist passed away. (Please note: predicted percentage increase from coefficients based on day dummies from Table 4. Predicted percentage increase equals zero if coefficient is not significant at 1% or 5% level.)

on, but similarly to Table 4, we get some less significant effects between 500 to 650 days, around 850 days, and over 1,000 days after death. Note that in the first 50 post-death days, the average of individual album sales per artist (band) surges by 98.7%.

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
0-49	0.987***	0.043
50-99	0.490***	0.038
100-149	0.317***	0.036
150-199	0.272***	0.037
200-249	0.225***	0.039
250-299	0.265***	0.041
300-349	0.207***	0.046
350-399	0.200***	0.046
400-449	0.137***	0.050

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
450-499	0.153***	0.053
500-549	0.103*	0.057
550-599	0.105*	0.061
600-649	0.151**	0.065
650-699	0.212***	0.069
700-749	0.313***	0.073
750-799	0.271***	0.081
800-849	0.249***	0.082
850-899	0.221**	0.092
900-949	0.310***	0.099
950-999	0.344***	0.120
1,000-1,011	0.268	0.294
Album Fixed Effects	✓	
Period (Day) Fixed Effects	✓	
N	573,318	
R^2 (within)	0.0969	
***, **, and * indicate significance at 1%, 5%, and 10%, respectively. Standard errors robust to clustering at the album level.		

Table 5. Impact of days since artist passed away in 50-day increments on natural log of daily album sales.

Figure 4 shows a visual representation in line graph format with a 95% confidence interval based on the results of Table 5. Grounded on the 50-day increments on daily album sales, the estimation of the average of all of the significant coefficients after an artist has been dead for over a year (350 days after-death and on) yields a 19.77% increase in daily album sales compared to pre-death levels. In summary, we are seeing very similar results from our previous estimation.

Approaching our estimations from a different angle, we are now observing Artist (Band)/Day level data instead of Album/Day level data. That is, for each artist or associated bands, we summed up all the album sales they had in each day. For example, if one had three albums that had

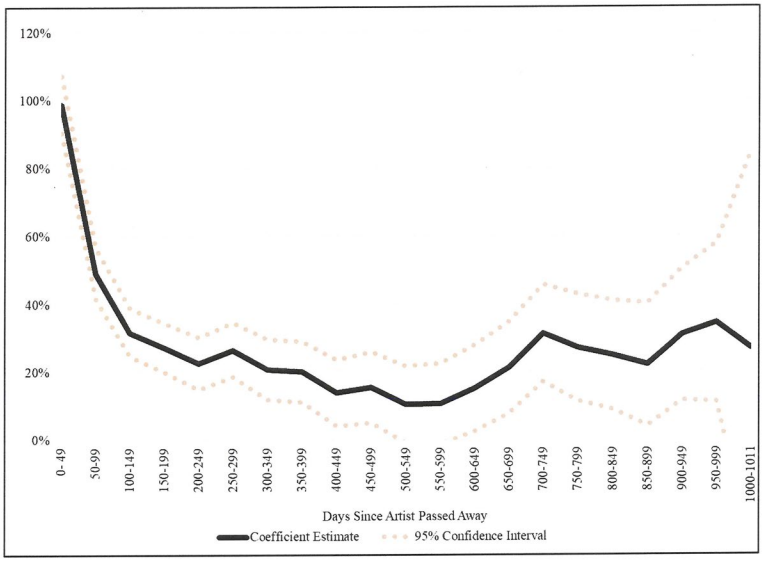

Figure 4. Predicted percentage increase in daily album sales by day since artist passed away (50-day increment categories). (Please note: graph shows predicted percentage increase and confidence intervals from coefficients and standard errors on day category dummies from Table 5.)

positive sales in a day, those are now summed up into one observation. So, basically, this is a measure of how the *album portfolio* of an artist changes after death. Table 6 gives a summary of the statistics at the Artist (Band)/Day Level data for our sample observed, $N = 65{,}163$. The portfolio perspective yields higher statistics results because of the aggregated bundled album sales. Indeed, our sample now shows artist album portfolios sold on average a combined 190.38 units per day with one album portfolio generating a maximum of 194,435 sales in a day. Also, Table 6 indicates that we observed each artist for an average of 203.52 days since the artist died.

	Mean	St Dev	Min	Max
Artist's Total Daily Album Sales:	190.3773	1,488.5540	1.0000	194,435.0000
LN (Artist's Total Daily Album Sales):	3.2604	2.0519	0.0000	12.1779
Days Since Artist Passed Away:	203.5280	265.9758	0.0000	1,011.0000
Days Since Artist Passed Away (50 Day Categories)				
0-49	0.0560	0.2299	0.0000	1.0000
50-99	0.0489	0.2157	0.0000	1.0000
100-149	0.0437	0.2044	0.0000	1.0000
150-199	0.0406	0.1974	0.0000	1.0000
200-249	0.0368	0.1883	0.0000	1.0000
250-299	0.0345	0.1825	0.0000	1.0000
300-349	0.0312	0.1740	0.0000	1.0000
350-399	0.0296	0.1695	0.0000	1.0000
400-449	0.0284	0.1660	0.0000	1.0000
450-499	0.0279	0.1646	0.0000	1.0000
500-549	0.0271	0.1625	0.0000	1.0000
550-599	0.0266	0.1609	0.0000	1.0000
600-649	0.0247	0.1552	0.0000	1.0000
650-699	0.0217	0.1458	0.0000	1.0000
700-749	0.0203	0.1410	0.0000	1.0000
750-799	0.0185	0.1347	0.0000	1.0000
800-849	0.0154	0.1230	0.0000	1.0000
850-899	0.0114	0.1063	0.0000	1.0000
900-949	0.0079	0.0884	0.0000	1.0000
950-999	0.0033	0.0575	0.0000	1.0000
1,000-1,011	0.0002	0.0147	0.0000	1.0000
Number of Artists	109			
Number of Albums	3,101			

Table 6. Summary statistics at the Artist/Day level. *N* = 65,163.

Table 7 shows that the album portfolio produces significant results (at 1% significance level) all the way up to 800+ days after death. Of note, on the day the artist died (day 0), the album portfolio sales per artist (band)

surge on average by 226.6%. In addition, the mean of all of the significant coefficients after an artist has been dead for over a year (365 days after death) yields an incredible 27.61% average increase for the album portfolio. For a visualization of the output from Table 7, please refer to Figure 5. Once again, the results are very similar to the previous two estimations.

Days Since Artist Passed Away	Coefficient	Robust Standard Error
0	2.266***	0.202
1	3.036***	0.173
2	2.793***	0.159
3	2.384***	0.149
4	2.193***	0.137
5	2.042***	0.134
6	2.046***	0.128
7	1.790***	0.124
8	1.746***	0.120
9	1.721***	0.121
10	1.644***	0.115
11 ~ 99 suppressed for brevity. 89 out of 89 (100%) of coefficients significant at 5% or 1% level.		
100	0.700***	0.102
101 ~ 199 suppressed for brevity. 99 out of 99 (100%) of coefficients significant at 5% or 1% level.		
200	0.521***	0.095
201 ~ 299 suppressed for brevity. 99 out of 99 (100%) of coefficients significant at 5% or 1% level.		
300	0.621***	0.111
301 ~ 399 suppressed for brevity. 97 out of 99 (97.98%) of coefficients significant at 5% or 1% level.		
400	0.331***	0.116
401 ~ 499 suppressed for brevity. 94 out of 99 (94.95%) of coefficients significant at 5% or 1% level.		
500	0.421***	0.128
501 ~ 599 suppressed for brevity. 58 out of 99 (58.59%) of coefficients significant at 5% or 1% level.		
600	0.374***	0.116
601 ~ 699 suppressed for brevity. 60 out of 99 (60.61%) of coefficients significant at 5% or 1% level.		

Days Since Artist Passed Away	Coefficient	Robust Standard Error
700	0.272***	0.098
701 ~ 799 suppressed for brevity. 87 out of 99 (87.88%) of coefficients significant at 5% or 1% level.		
800	0.621**	0.244
801 ~ 899 suppressed for brevity. 64 out of 99 (64.65%) of coefficients significant at 5% or 1% level.		
900	0.389*	0.219
901 ~ 999 suppressed for brevity. 41 out of 99 (41.41%) of coefficients significant at 5% or 1% level.		
1,000	0.196	0.381
1,001 ~ 1,011 suppressed for brevity. 4 out of 11 (36.36%) of coefficients significant at 5% or 1% level.		
Artist Fixed Effects	✓	
Period (Day) Fixed Effects	✓	
N	65,158	
R^2 (within)	0.1857	
***, **, and * indicate significance at 1%, 5%, and 10%, respectively. Standard errors robust to heteroskedasticity.		

Table 7. Impact of days since artist passed away on natural log of artist's total daily album sales.

Finally, we are estimating the post-death artist album portfolio using our 50-day increment dummy variables (see Table 8 and Figure 6). Over the first 50 days after an artist dies we observe a surge in album portfolio sales of 143.4% per day. In this estimation, sales once again surge after death and decrease quickly. We see significant results up to about 400 days post-death. After that point our estimation does not yield significant results. However, the mean of all of the significant coefficients after an artist has been dead for over a year (350 days after death) yields 23.67% average increase for the album portfolio. For a visualization predicting the percentage increase in daily album sales by day since the artist passed away using our 50-day increment categorical variable, please refer to Figure 6.

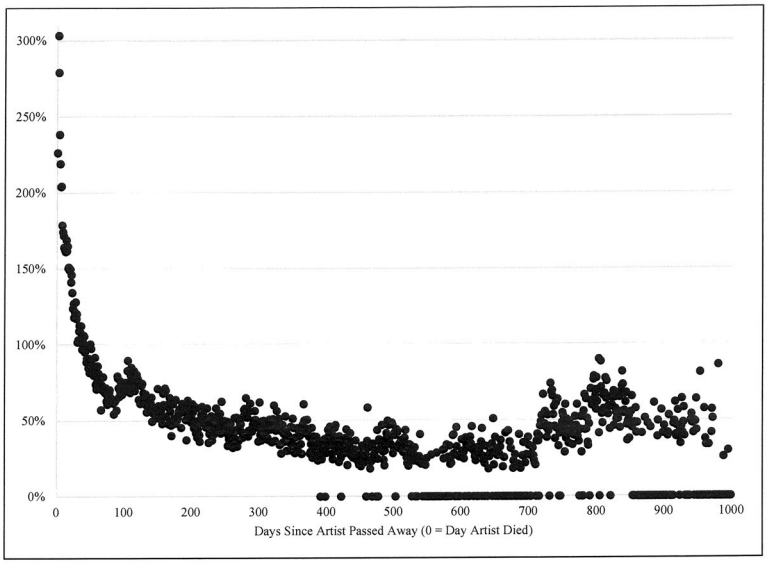

Figure 5. Predicted percentage increase in daily album sales by day since artist passed away. (Please note: predicted percentage increase from coefficients based on day dummies from Table 7. Predicted percentage increase equals zero if coefficient is not significant at 1% or 5% level.)

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
0-49	1.434***	0.151
50-99	0.728***	0.131
100-149	0.695***	0.145
150-199	0.567***	0.121
200-249	0.499***	0.123
250-299	0.474***	0.128
300-349	0.446***	0.132
350-399	0.372***	0.140
400-449	0.338**	0.143
450-499	0.329**	0.138
500-549	0.291**	0.143
550-599	0.212	0.162
600-649	0.280	0.170
650-699	0.236	0.173

Days Since Artist Passed Away	Coefficient	Cluster Robust Standard Error
700-749	0.436**	0.212
750-799	0.500**	0.222
800-849	0.611**	0.240
850-899	0.373	0.244
900-949	0.438*	0.243
950-999	0.232	0.307
1,000-1,011	0.326	0.489
Artist Fixed Effects	✓	
Period (Day) Fixed Effects	✓	
N	65,158	
R^2 (within)	0.1575	
***, **, and * indicate significance at 1%, 5%, and 10%, respectively. Standard errors robust to clustering at the artist level.		

Table 8. Impact of days since artist passed away in 50-day increments on natural log of artist's total daily album sales.

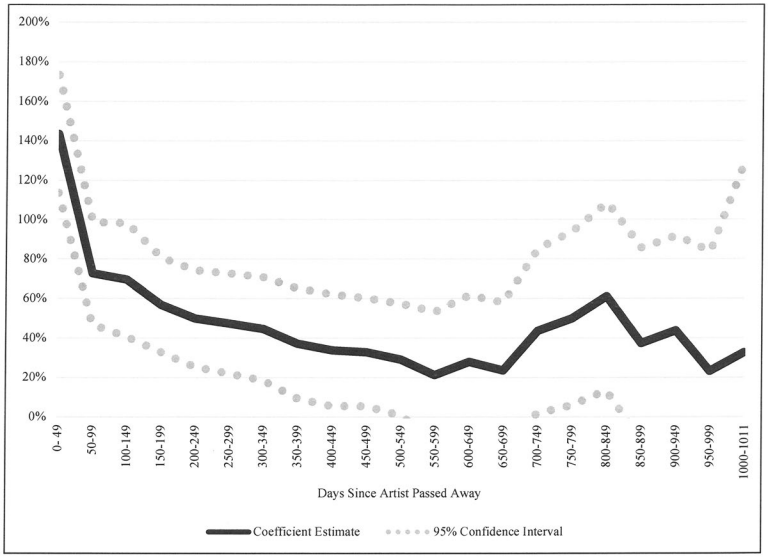

Figure 6. Predicted percentage increase in daily album sales by day since artist passed away (50-day increment categories).

Using standard fixed effect panel estimations, we were able to assert, much to our surprise, that album sales following an artist's death do not tend to revert to pre-death levels but instead show persistent and significant increases in sales even a year past the artist's death. We were able to document what happens to long-term music consumption post-death at both the individual album level as well as at the album portfolio level. We used estimations with dummy variables for daily observations as well as 50-day increment observations. The summary of the results of our analysis is presented in Table 9.

Estimation	Focus	Dummy Variable	Surge on Day of Death	Mean Percent Increase After One Year Post-Death
1	Album/Day	Daily Sales	145.30%	15.24%
2	Album/Day	50-Day Increment	98.70%	19.77%
3	Artist/Day	Daily Sales	226.60%	27.61%
4	Artist/Day	50-Day Increment	143.40%	23.67%

Table 9. Summary of results.

Conclusion

This is the first study of its kind to show long-term effects of artist deaths on music consumption from the individual album as well as at the album portfolio perspectives. We were able to document, much to our surprise, that album sales that follow an artist's death do not tend to revert to pre-death levels but instead show persistent and significant increases in sales even beyond a year post-death. Our research has immediate applicability to the recorded music industry and portfolio management, and future sales of album portfolios that may be of interest to record labels. It can also inform retailers that the surge in music consumption after an artist's death can be valuable information for their retail marketing communication. Finally, we feel that standard fixed effect panel estimations may be an intriguing methodology for catalog valuation experts on the music publishing side as it might add another dimension to the current net publisher's share (NPS) multiplier method and the regression/cash flow model (Gonas et al. 2015, 104-116).

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