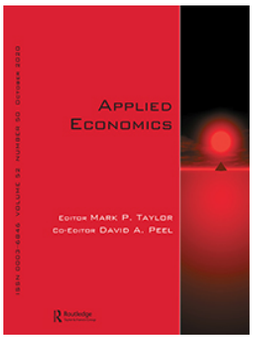

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Pricing the Groove: hedonic equation estimates for rare vinyl records

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ABSTRACT
This contribution adds to the economic literature on the market value of rarity in markets for cultural collectible goods by studying the price of rare audio recordings (chiefly vinyl) sold on the online marketplace *Discogs*. Community-based variables serve as proxies for (inverse) rarity and (potential) demand. Results show that the elasticity of price with respect to our measure of inverse rarity (demand) ranges between −0.120 and −0.140 (0.150 and 0.160). In addition, effects of hedonic characteristics such as the popularity or collectibility of an artist can be identified. Finally, the study provides evidence for premia for rarity at the top end of the distribution of prices.

KEYWORDS
Collecting; consumer behaviour; rarity; recorded music; hedonic analysis

JEL CLASSIFICATION
D12; G1; L15; Z11

I. Introduction

In June 2018, a copy of 'The Black Album' by American musician Prince was sold for 27,500 USD and hence became one of the most valuable records of all times.[1] Reports like these raise questions about how the market for rare audio recordings works and what makes people to purchase recorded music at extraordinary prices when the seemingly key feature of the good – the music – is available in a better quality at a much lower price (Cameron and Reynolds 2015).

If we want to identify the relevant characteristics that create extreme price premia in the market for rare audio recordings, the most obvious candidate is (extreme) rarity. However, a small supply alone does not cause top prices as the demand might be small as well. So there is reason to assume that the popularity of an artist also plays a role. What seems like a paradox can be explained by releases with a limited number of copies such as promo copies or mispressed records and variant packaging. Having said this, we can also observe abnormal prices for musical niches such as black metal or early avant-garde music. The common characteristics here are (genre-specific) 'cultural importance' of the artist and/or the specific piece of music, and strong narratives. For instance, in the case of 'The Black Album', Prince himself declared the album to be 'evil' and ordered his record company to destroy all copies a week before its release in December 1987. It was announced that the item sold in June 2018 is a vinyl copy which was salvaged by a pressing plant employee who kept it for himself without knowledge about its value.[2]

Generally speaking, collectible markets can be characterized by the existence of extreme price premia for rarities, the influence of non-profit-maximizing agents, and hence a comparatively high volatility (Burton and Jacobsen 1999). This contribution adds to the economic literature on pricing in markets for cultural goods by studying the price of expensive audio recordings (chiefly vinyl) sold on the online marketplace *Discogs*. The website is known for vinyl rarities, although other types of audio recordings are sold as well.

Most directly, our study relates to Koford and Tschoegl (1998) who have chosen a very fitting title for their paper: 'The market value of rarity'. The authors approximate the actual supply within their sample of rare coins of two types by their mintage (assuming constant erosion over time). Their findings indicate that rarity triggers higher collectible prices: the elasticity of price with respect to their

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[1]Cf. https://blog.discogs.com/en/top-30-most-expensive-items-sold-in-discogs-marketplace-for-june-2018/.

[2]Note that there are similar narratives related to other kinds of collectibles such as coins (e.g. the 1933 double eagle) or stamps (e.g. the Inverted Jenny).

measure of 'inverse' rarity ranges between −0.28 and −0.84. Yet, evidence for 'super-rarity' price premia is mixed.

The research on coins emphasizes the importance of rarity in price determination but research involving rarity of items produced by people such as other forms of recorded music and artistic work such as paintings has brought attention to the presence of a 'death effect' (e.g. Ekelund, Jr., Ressler, and Watson 2000; Ursprung and Wiermann, 2011; Matheson and Baade, 2004; Cameron and Reynolds, 2015).

There are also a few papers in cultural economics on collectibles of a musical nature. The work that exists is on classical manuscripts (Georges and Seçkin 2013) and instruments (i.e. guitars (Eaton 2007), violins (Graddy and Margolis 2011) with one paper on consumer end product collectibles (minidiscs using a different data source than this, see Cameron and Reynolds (2015)). This contrasts markedly with the topic of visual art where there are numerous papers including some which are only about one specific artist. As a consequence, there are no prior empirical results with which to compare directly those given here.

We find that measures of rarity and intensity of consumer demand can explain some of the price variations in the 'elite' of the most collectible musical rarities. In detail, the elasticity of price with respect to our measure of inverse rarity ranges between −0.120 and −0.140, whereas the elasticity of price with respect to our measure of intensity of consumer demand ranges between 0.150 and 0.160. Unlike Koford and Tschoegl (1998) within their sample of coins, we find substantial premia for rarity in the top end of the distribution of prices.[3] The variables used here are unique in their detail, thanks to the data source, as collecting work, in general, has few, or no measures, of the state of the market participants. There are also significant temporal effects which merit future exploration particularly with reference to the view of rare goods as investment opportunities.

The article proceeds as follows. Section 2 gives background information on the economics of music collecting. Section 3 describes the data source and presents descriptive statistics. Section 4 discusses the estimation results. Finally, Section 5 concludes.

II. Economics of music collecting

Scarcity plays a key role in causing what are seen as 'high' prices and hence it inevitably features in collectible research. However, its chief importance is in the more specific form of 'rarity' (see e.g. Stoller 1984) where the supply cannot be replenished. Thus, a rare recording is different from a food shortage as we can expect that in the future the scarce food may appear again and the new products will be seen as identical to the old ones. Reissues of a rare recording will not satisfy the demand for collectors of some of the versions that already exist. Specifically for vinyl recordings, the issue of a track on a cd compilation or its provision as a digital download is distinct from the existence of an acetate (test pressing) which can be highly prized by collectors. The end of the rarity of the musical work per se does not end the rarity of the test pressing format and thus collector valuations will be totally unaltered.[4]

On the demand side, the typical economist would start with the neoclassical approach and move on to more socially embedded treatments. All demand must come from some underlying notion of utility or value in the objects. The theory of consumer choice assumes that people have exogenous given wants for music which (along with prices and incomes) form the constraints on their utility maximization. It is assumed that people have perfect knowledge of their own preferences over the different musical products on offer. We can enhance the model with Lancaster's good characteristic theory (Lancaster 1966) where utility is derived indirectly from the 'characteristics' that inhere in goods. Rarity as in the case of rare musical items would tend to not be sought by the mainstream consumer as they do not value highly the added characteristics that are in them: for example, even if they intensely like a specific Elvis Presley song they get no added value from owning a rare Swedish pressing with a slightly different sleeve.

[3]With reference to Rosen (1981), Koford and Tschoegl (1998) use the notion of 'superstars' to identify the subsamples of extremely rare coins. We prefer not to use it as the transfer of the theory developed by Rosen to a physical object collection is not obvious.

[4]The extreme case of rarity is uniqueness where there is only one genuine authentic version of the item such as a fine art painting by a great artist. This typically leads to such items being sold at auctions in the hope of capturing the maximum willingness to pay a rarity premium.

Hedonic pricing equation studies which seek to establish the impact of rare characteristics are common for works of art but can also be found in the market for American comic books (Wyburn and Roach 2012) and that for classical music manuscripts (Georges and Seçkin 2013). The market for these does differ somewhat from others in that the rarity may also have production consequences as well as consumption ones.[5]

Such cases are focussed on the value of an individual item which is deemed to be 'collectible'. Such a term implies that the purchaser may be forming a collection although they could be speculatively investing in the hope of profiting from sales to a collector. It is important to take account of collecting as a style of consumption which adds further elements beyond the obvious driving force of rarity and uniqueness (Bianchi 1997; Troilo 1999). So for collectors and 'fans' we seem to need more socially embedded elements as these may be unusual or deviant activities where there is excessive spending on one item relative to most people's behaviour.

The extreme of collecting as a style of consumption is where someone must have all items in a 'set' but they must, of course, define what the 'set' is. For recorded music, there is a strong degree of social convention in forming the idea of sets – for example, prices rose rapidly in response to the creation of retro engineered genres like 'Northern Soul' where membership of the set is informally authorized by group interaction (Brewster and Broughton 2014). In such circumstances, the price may be heavily influenced by the presence of a marginal buyer meaning that if they drop out (through death, loss of interest or finding the item elsewhere) the price could collapse quite dramatically even though rarity has not notably diminished. Conversely, there could be extremely rare items that have little or no value because the conventions of the collecting groups have not attributed a rarity premium from collectability to them. Given the fluidity of such conventions, an item may suddenly acquire value even though its rarity has not changed when it is given access to membership of a highly valued set by a change in group conventions. Moreover, set completion can lead to escalating willingness to pay by an individual collector (Carey 2008). That is, an otherwise identical person may want to pay more for the same 'missing' item if they have a 99% complete collection versus a 25% complete one.[6] There is some academic literature on the psychology of music collecting which gives an insight into what looks like obsessiveness (such as Straw (1997, 2000), Reynolds (2004), Giles, Pietrzykowski, and Clark (2007), Moist (2008)). Specifically, Belk (1995) recounts the case of a man whose whole house was filled with vinyl records including a fridge and a stove.

The collector of music may also be motivated by the exchange with like-minded people or feelings of exclusivity leading to snobbery and Veblen effects.[7] Positioning effects of this type are perhaps shown in the revival of attention to vinyl records.

Finally, it should be noted that a fan is likely to be a collector, given their nature, but we can have collectors who are not fans. Likewise, not all fans become intense collectors which is why we may deem it a potentially deviant activity. The non-fan collector would be involved in speculative arbitrage. Individuals can purchase collectibles in the anticipation of making a profit by re-selling them to collectors. As in all the data which is used to study collectible pricing, we are not able to identify separately any trading activity which is motivated by arbitrage. Clearly increased presence of arbitrageurs will tend to drive up the price as they seek to extract the maximum economic rent from the demand agents.

III. Data and descriptive statistics

The data used in this study come from *Discogs* (short for 'discographies') which works as an online platform that connects (professional and private) buyers and sellers on a worldwide level using posted prices. Next to *eBay*, it is the largest online marketplaces for used records (Rosenblatt 2018). To illustrate the importance, note that the

[5]This is because manuscripts may contain interpretive marginalia from the composer which can be used in attempts to reconstruct arrangements and performances designed to deliver the work as the composer intended. These elements may contribute to the rarity premium attached to the item.

[6]Note that the present article only deals with price effects in the form of willingness to pay a very high price for an individual item as we do not have any data on the characteristics of the individuals whose wants appear in the data set.

[7]In the case of *Discogs*, the website includes a `community' section with forums and groups. Here, threads titled 'What's your most valuable record?', 'Most valuable record you `used' to own', and/or 'What's your most prized piece?' are frequently used.

average *Discogs* price is a widespread reference for the valuation of used vinyl. Since 2014, when *Discogs* starts to publish marketplace results on its blog, the number of transactions grows from 5,019,632 to 10,912,527 in 2018. Typical market frictions such as the reliability of players and the value of a piece are countered with a user rating system, the traditional 'Gold standard' used for grading the condition of an item (with 'mint' meaning absolutely perfect in every way), and a 12-month view of historical sales data.[8]

As a special feature, the website presents the 30 most expensive items sold on a monthly basis. Similar to Sonnabend (2019), all available entries were collected between the years 2010 and 2018, 3,099 observations altogether.[9] Besides the price, the data set contains further information about the record (artist, record title), the format and the release (date, country, label). Table 1 shows that the vast majority of items are vinyl of some type.[10]

Furthermore, Figure 1 reveals a steady growth in (nominal) sales values over time. We can also observe a similar development for the monthly top sellers, see Figure A.1 in the Appendix. The distribution of prices in Table 2 and B.2 as well as the quantile plot illustrated in Figure 2 documents the presence of strong outliers.

Unfortunately, the bestseller list does not include information about the actual number of available copies of each item so far. This is important, however, as rarity triggers higher collectible prices (see e.g. Koford and Tschoegl (1998)), and because collectors are typically well informed about the number of worldwide copies and even of owners. To solve this problem, this study leverages another *Discogs* feature. The website does not only work as a selling platform but also as a crowdsourced database which gives users the opportunity to feed their collection into the system ('have-list') and to list their desired items ('want-list') in order to get informed in case the item is available on the Discogs marketplace. So for each item, information is given about how many users possess ('number possessed') a copy and how many users want it ('number of buyers').[11] Thus, these community-based variables serve as proxies for rarity and potential demand.[12]

It is important to note that the dataset does not include information about the condition of the good sold.[13] However, while the highest-selling items are typically graded as 'sealed' or 'mint', we should not expect much variation here.[14]

While more than half of the observations are unique sales, there are also some frequently traded items reflecting a stability of demand for rare classics (see Table 2 and B.2). Figure A.2 in the Appendix plots sales of the five most frequent traded items over time. For instance, the two most frequent traded items in the sample are the debut album by English rock band Led Zeppelin with turquoise lettering (14 observations, average price of 1237.76 Euros) and the short-lived first press of the 'Please Please Me' debut album by The Beatles characterized by a black label with gold print (13 observations, average price of 1168.70 Euros).[15] Having said this, it should be noted that there are also pieces among the top

Table 1. Formats.

Format	No.	%
Acetate	13	0.4
CD	128	4.1
CD Box Set	81	2.6
Cassette	17	0.5
Cassette Box Set	10	0.3
DVD Box Set	14	0.5
DVD-V	2	0.1
Diverse Box Set	54	1.7
Flexi-disc	7	0.2
Memory Stick	1	0.0
Shellac	3	0.1
VHS	1	0.0
Vinyl 10 inch	9	0.3
Vinyl 12 inch	100	3.2
Vinyl 7 inch	469	15.1
Vinyl Box Set	206	6.6
Vinyl LP	1,984	64.0
Total	3,099	100.0

[8]Note that *Discogs* also strictly prohibits the trade of items which violates its selling terms such as bootlegs and counterfeits (e.g. Helfet 2017).
[9]Unfortunately, due to a bug on the website, some entries are missing.
[10]Table B.1 in the Appendix indicates that rare storage media like Shellac or Acetate show a considerable higher share among the 95 percentile.
[11]The actual overall number of users was 481,618 in September 2019. See https://www.discogs.com/stats/contributors for current figures.
[12]Note that Koford and Tschoegl (1998) approximate the actual supply within their sample of two rare coins by their mintage.
[13]Generally, the data contain no information on any individual buyer personal characteristics nor on the specific individual records being traded.
[14]See Hunter-Tilney (2018) for an example of how deviations from 'sealed' or 'mint' condition trigger a rapid price drop.
[15]In general, there is a significant proportion of debut albums (we have 258 items where the artist name equals the record name) which underlines the rarity aspect because bands naturally suffer from low reputation when they start so debuts are typically produced in small numbers.

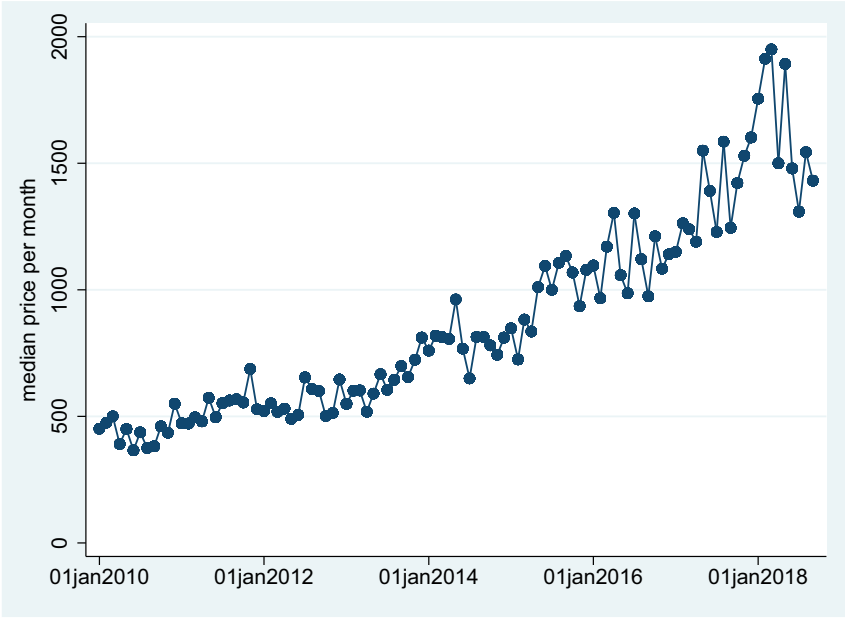

Figure 1. Median (nominal) prices of the 30 most expensive items sold on *Discogs* across time.

Table 2. Summary statistics (whole sample).

Variable	Obs	Mean	Std. Dev.	Min	Max	P25	P50	P75	P95	P99
Items per artist	3099	7.885	15.613	1	75	1	2	6	41	75
Repeated sales	3099	1.465	2.455	0	14	0	1	2	7	11
Price	3099	1062.961	1021.561	300	27,500	568.3	842	1250	2260	4773
Age (of record)	3047	31.933	14.574	0	83	22	34	44	51	58
Number possessed	3075	138.718	569.48	0	12,228	18	37	87	353	1707
Number of buyers	3075	495.743	548.006	5	4870	190	328	567	1520	3097
Bestseller	3099	0.091		0	1	0	0	0	1	1
Collectability (artist)	3099	0.105		0	1	0	0	0	1	1
Wikipedia entry (release)	3099	0.193		0	1	0	0	0	1	1
Wikipedia entry length (release)	3099	1583.747	5703.122	0	74,767	0	0	0	9602	27,124

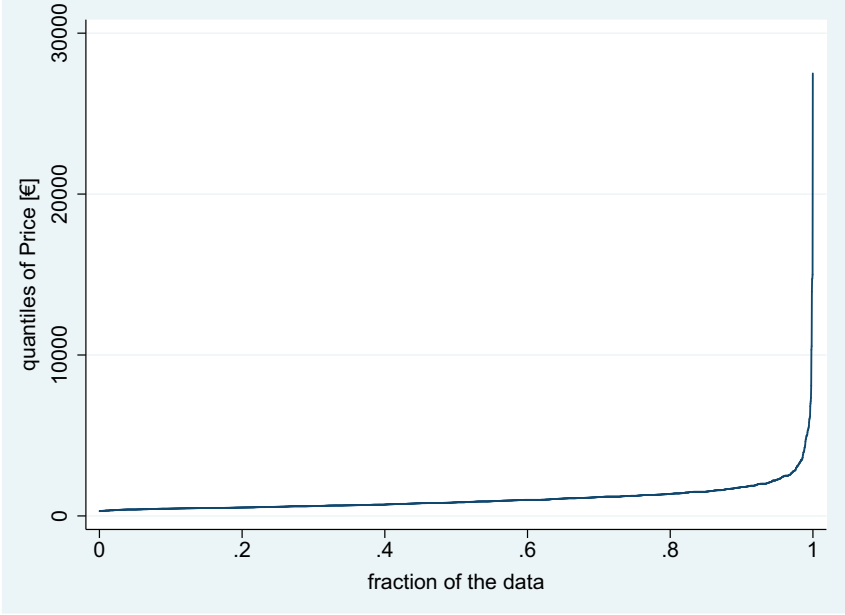

Figure 2. Quantiles of the price variable.

five of the most actively traded items, the Bathory debut and an early EP of Burzum, which clearly belong to a musical niche, i.e. the genre of black metal. Again there are strong narratives surrounding these vinyl records. For instance, the EP cover of the black metal pioneers Burzum shows a church burned to the ground. The band's founder, 'Varg' Vikernes, a convicted murderer whose doings have been subject to the 'Lords of Chaos' book and film, was suspected of having started the fire and taken the photo. Initially, each copy was packaged with a lighter. Several further church burnings ascribed to the Norwegian black metal scene followed.[16]

To capture both the visibility of a recording and the extreme popularity of some artists, we created two additional measures. First, we define an item to be of higher visibility if it has an entry in the Wikipedia Encyclopaedia. Furthermore, we measure the extent of importance by the length of the entry (in bytes). Second, we define an artist to be extremely popular if he or she appears on the Wikipedia list of best-selling music artists with 75 million or more (claimed) record sales.[17] Moreover, we define an artist to be highly collectable if he or she is listed among the 'Top 30 collectable artists' chosen by the *Record Collector* music magazine.[18]

Table 2 presents summary statistics for the whole sample. Statistics restricted to 'vinyl only' can be found in Table B.2 in the Appendix. The table indicates that there are outliers in the top end of the distributions related to price, age, and our measure of inverse rarity (*Number possessed*). We account for it in the empirical analysis.

IV. 'Death effect'

There is some evidence for the existence of a 'death effect' in our sample. But since this effect also hinges on availability and rarity of the recordings, it appears only infrequently in the monthly top-selling item list. For instance, while the death of Amy Winehouse was perceived as tragic, aroused much attention, and definitely ended supply, there is no observation in the sample. We thus refrain from a systematic analysis and leave it to prominent examples listed in Table B.3 in the Appendix.

V. Empirical analysis and results

Similar to Koford and Tschoegl (1998), the regressions are based on the log-log model:

$$\begin{aligned} ln\left(P_{i,t,a}\right) = {} & \beta_0 + \beta_1 ln\left(NumPossessed_{i,a} + 1\right) \\ & + \beta_2 ln\left(NumBuyers_{i,a}\right) + \beta_3 age_{i,t,a} \\ & + \beta_4 bestseller_a + \beta_4 wikientry_i + \gamma' X \\ & + YR + \epsilon_{i,t,a} \end{aligned} \tag{1}$$

where $P_{i,t,a}$ is the price of an item i (created by artist a) sold at date t.

Our variables of interest to explain the price of an item are 'inverse' rarity (measured by the number of copies in *have*-lists of *Discogs* users, *NumPossessed*), potential demand (measured by the number of copies in *want*-lists, *NumBuyers*), the time span between the date of release and the date of sale of an item (*age*), popularity/collectibility (measured by a dummy variable which equals to one if the artist appears on the list of best-selling music artists/most collectible artists, *bestseller/collectability*), and visibility of an item (measured by a dummy variable which equals to one if the item has an entry on the Wikipedia Encyclopaedia (*wikientry*) and a variable which accounts for the length of the entry (*wikicat*)).[19] Additionally, X is a vector of further hedonic characteristics (genre, format, country of release), YR is a vector of year dummy variables that control for possible time trended effects, and $\epsilon_{i,t,a}$ is the error term which captures all other effects that influences $P_{i,t,a}$.[20]

The use of a single equation model is justified on the grounds that it seems likely that there is no threat of an endogeneity issue that would necessitate an SEM model. First, while some owners of rare copies might react to top prices by putting them for sale, the transaction occurs within the system. Consequently, we would expect no variation in our measure of (inverse) rarity. Second, *NumBuyers*

[16]See Campion (2005) and Barber (2019) for further information.
[17]This list can be found here: https://en.wikipedia.org/wiki/List_of_best-selling_music_artists. It has been used before in academic literature (e.g. McKay (2018)). While there might be a discussion about the exact numbers, it is out of the question that the artists listed are worldwide superstars.
[18]See https://recordcollectormag.com/articles/pure-gold-the-30-most-collectable-artists-of-our-time.
[19]The *wikientry* variable was constructed by using categories according to percentiles of the entry length (0, 25th percentile, 50th percentile, 75th percentile).
[20]We created a `rare country' dummy which equals one if the record was released in a country below the 10th percentile of the items-per-country distribution of our sample.

reflects the number of users in the community with a *general* intention to purchase an item (date of access: January 2019) and thus does not rest on reservation prices (at least not in a way the textbook demand does).

For this reason, and because more than half of the observations are unique sales, we estimate model (1) using the pooled least squares method and cluster-robust standard errors (clustered on item level). Since the logarithm appears on the left side of equation (1), the impact of all right-hand side variables will be interactive – a unit change in any individual variable will not be represented by the point estimate independently of the values of all the other variables. Moreover, the coefficient β_1 directly gives the elasticity of the price with respect to our measure of inverse rarity.[21] The same applies to our measure of (potential) demand. Finally, we can multiply the point estimate by 100 to give us percentage impacts of the factors represented in the dummies.

Since *bestseller, wikientry* and *collectability* are correlated (correlation coefficients of 0.2852, 0.3098 and 0.7810), the variables are presented in separate estimations in order to disentangle the effects. Separate regressions are offered for the whole sample and for samples restricted to vinyl recordings of any type and the vinyl LP format.[22]

Furthermore, as Table B.2 and Figure 2 indicate, our measure of (inverse) rarity shows some outliers which might bias the estimates. These are mainly first pressings in excellent conditions of popular works such as 'The Dark Side of the Moon' by Pink Floyd or 'Unknown Pleasures' by Joy Division. We account for it by excluding values above the 99th quantile in our preferred specification.

Finally, the presence of price outliers raises the question whether these items which come from the upper tail of the distribution follow their own economic rules. We, therefore, carry out quantile regression analysis to provide further evidence on this issue.

VI. Results

Table 3 presents regression results of pricing equation (1) for our preferred specification, that is, the 'vinyl only' setting without the outliers of *age* and *NumPossessed*.[23] Results for a sample including all kind of formats can be found in Table B.4 in the Appendix.

Firstly, we can confirm the Koford and Tschoegl (1998) finding that the price of an item increases in rarity. The estimated β_1 has a value slightly below −0.140. This result is robust across the many specifications considered. Unlike K/T, we additionally provide evidence for premia for rarity at the top end of the distribution of prices in Table 4. While column (1) in this table corresponds to column (1) in Table 3 and therefore works as a reference, it can be seen that the $\hat{\beta}_1$ is higher in the segment of most expensive records.

Secondly, the price correlates positively with our measure of (potential) demand, i.e. the elasticity varies around 0.150. In other words, a 1% change in the consumer interest for an item increases the price by about 0.150%. Table 4 shows that this effect is again stronger at the top end of the distribution.

Thirdly, the estimated β_3 is different from zero in only some cases and small in size. We, therefore, conclude an item's age is less important in the market for rare audio records if controlled for further hedonic characteristics.

Fourthly, Table 3 also reveals that the popularity and collectibility of an artist correlate positively with the price (columns (4) and (5)). These effects are much stronger than the effect related to the visibility of the item (columns (2) and (3)). Even if the sample is restricted to non-superstars (column (6)), this effect remains comparable small.

Fifthly, prices are lower for audio recordings released in rarely traded countries (e.g. African countries).

Finally, we can observe the effects of formats and genres, see Figure A.4 in the Appendix. For instance, compared to items categorized as 'Vinyl LP', CDs in our sample were sold at around 12% higher prices. Yet, the estimates for 'Memory Sticks' and 'Shellac' should be treated with care because of the small number of observations (1 and 3, respectively (see Table 1)).

[22]Note that seemingly unrelated regressions (SUE) combined with tests for the equality of the basic coefficients across 'vinyls' and 'non-vinyls' indicate that the null has to be rejected.
[23]Including the outliers, however, virtually does not change results. Regression outputs can be made available upon request.

Table 3. Regression results of pricing equation (1) (vinyl formats only).

	(1)	(2)	(3)	(4)	(5)	(6)
ln(NumPossessed+1)	−0.134***	−0.137***	−0.135***	−0.134***	−0.135***	−0.140***
	(0.0135)	(0.0138)	(0.0136)	(0.0134)	(0.0135)	(0.0138)
ln(NumBuyers)	0.157***	0.155***	0.148***	0.158***	0.152***	0.146***
	(0.0181)	(0.0179)	(0.0177)	(0.0178)	(0.0170)	(0.0174)
age (of record)	0.00145	0.00164*	0.00176*	0.00137	0.00145	0.00182**
	(0.000995)	(0.000986)	(0.000975)	(0.000976)	(0.000958)	(0.000902)
rare country	−0.0822***	−0.0818***	−0.0805***	−0.0890***	−0.0835***	−0.0657***
	(0.0232)	(0.0233)	(0.0233)	(0.0240)	(0.0235)	(0.0241)
wikientry		0.0411**				
		(0.0171)				
wikicat			0.0381**			0.0294*
			(0.0152)			(0.0163)
bestseller				0.141**		
				(0.0581)		
collectability					0.180***	
					(0.0603)	
Constant	6.041***	6.053***	6.009***	6.010***	6.040***	6.231***
	(0.188)	(0.191)	(0.191)	(0.194)	(0.192)	(0.208)
Observations	2567	2567	2567	2567	2567	2419
R^2	0.626	0.627	0.629	0.629	0.632	0.643
Year FE	✓	✓	✓	✓	✓	✓
Format FE	✓	✓	✓	✓	✓	✓
Genre FE	✓	✓	✓	✓	✓	✓

- Dependent variable: ln(Price)
- Coefficients are estimated in an OLS regression framework.
- Robust standard errors in parentheses (clustered on the item level), *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
- In column (6), the sample is restricted to observations with *bestseller* = 0.

Table 4. Quantile regressions (vinyl formats only).

	(1)	(2)	(3)	(4)
	Basic	75% Quant	95% Quant	99% Quant
ln(NumPossessed+1)	−0.134***	−0.183***	−0.329***	−0.265***
	(0.0135)	(0.0194)	(0.0390)	(0.0576)
ln(NumBuyers)	0.157***	0.202***	0.412***	0.468***
	(0.0181)	(0.0225)	(0.0510)	(0.0945)
age (of record)	0.00145	0.00217*	0.00199	−0.000843
	(0.000995)	(0.00118)	(0.00292)	(0.00555)
rare country	−0.0822***	−0.102***	−0.195**	−0.0361
	(0.0232)	(0.0342)	(0.0832)	(0.165)
Constant	6.041***	6.378***	6.595***	5.540***
	(0.188)	(0.345)	(0.536)	(0.527)
Observations	2567	2567	2567	2567
R^2	0.626			
Pseudo R^2		0.3723	0.3089	0.3510
Year FE	✓	✓	✓	✓
Format FE	✓	✓	✓	✓
Genre FE	✓	✓	✓	✓

- Dependent variable: ln(Price)
- Coefficients are estimated using bootstrapped quantile regressions.
- Standard errors in parentheses, *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

VII. Concluding remarks

In this article, we have explored, for the first time, the determinants of pricing for collectible musical consumer products in the form of vinyl records. This is the format which attracts most general and music press interest as a growth area and possibly lucrative form of speculative investment. For present purposes, we have focused solely on the determinants of price setting in one specific (large) sector of the music collecting market. However, we have not looked at some other significant forums for trading such goods (chiefly *eBay* which has a large number of items some at very high prices but also physical meetings at music fairs) and thus some caution needs to be exercised in generalizing our results. It would be impossible to replicate the actual work reported here on *eBay* due to the data poverty of its information provision from a researcher's point of view. For the sellers and buyers, *eBay* provides little information other than a very limited reputation measure and some history of

activity. These variables are not very useful for the study of collectibles and the variables we would want are not present. Having said this, there still remains the possibility of coefficient bias if there is some selectivity factor at work determining whether a buyer uses *Discogs* or a different online marketplace such as *eBay* or *Reverb LP* (assuming they do not use different platforms for the same item).

Future development of the present work requires more exploration of the role of specific artist or genre on price movements through additional variable construction. Also, it would be interesting and insightful to look in more depth at the temporal movement of prices with a view to generating rate of return on investment measures in line with the large amount of work on artwork sales.

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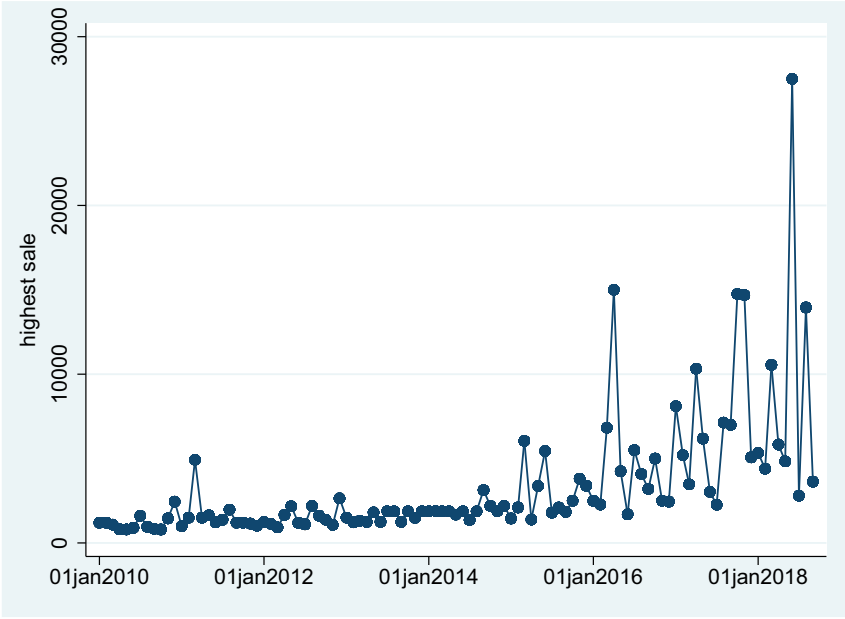

Figure A1. Prices of top-selling items per month across time.

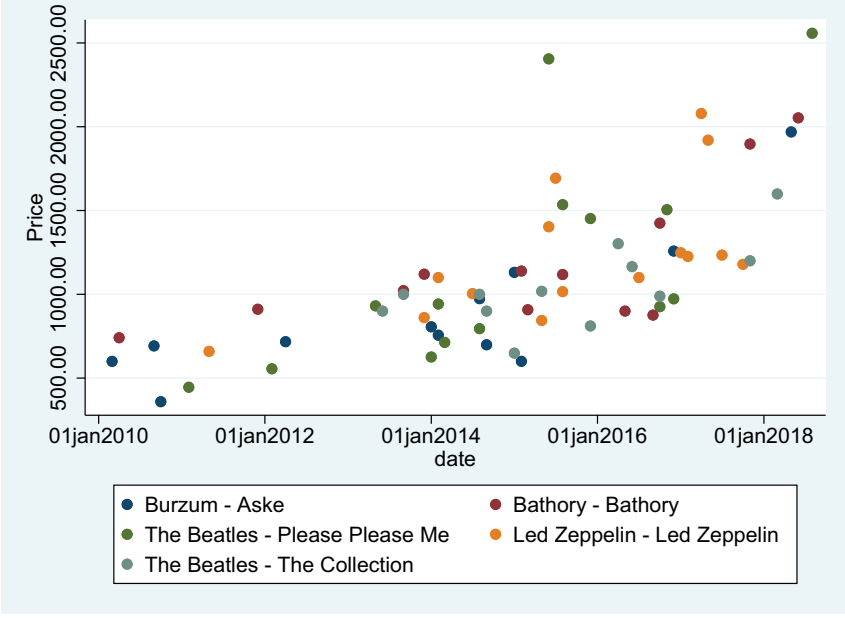

Figure A2. Sales of the five most frequently traded items.

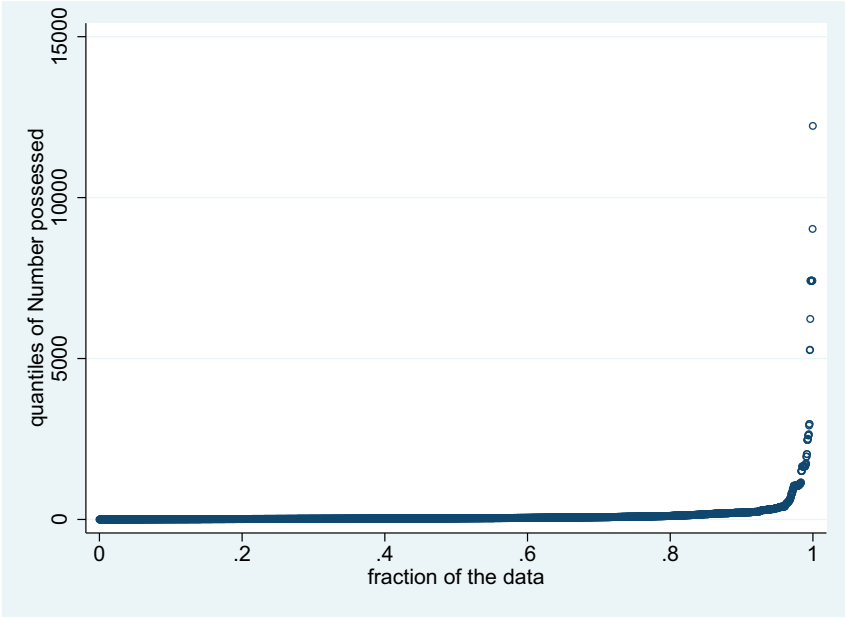

Figure A3. Quantiles of the rarity measure.

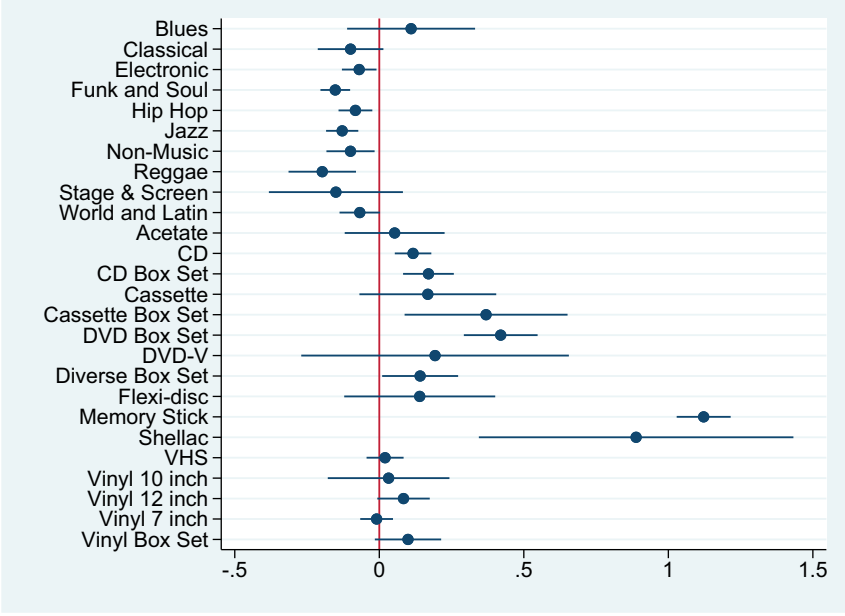

Figure A4. Point estimates and their confidence intervals for genres and formats.
Notes: Estimates are taken from Table B.4, column (1). Base categories: 'Pop/Rock' and 'Vinyl LP'

Table B1. Formats at the 95 percentile.

Format	No.	%
CD Box Set	1	0.6
Cassette	1	0.6
Cassette Box Set	1	0.6
Flexi-disc	2	1.3
Memory Stick	1	0.6
Shellac	2	1.3
Vinyl 10 inch	3	1.9
Vinyl 12 inch	8	5.2
Vinyl 7 inch	63	40.9
Vinyl Box Set	5	3.2
Vinyl LP	67	43.5
Total	154	100.0

Table B2. Summary statistics (vinyl records only).

Variable	Obs	Mean	Std. Dev.	Min	Max	P25	P50	P75	P95	P99
Items per artist	2776	7.022	14.512	1	75	1	2	4	41	75
Duplicates	2776	1.421	2.401	0	14	0	1	2	6	13
Price	2776	1090.111	1055.379	300	27,500	580	877	1299.5	2325	4836
Age (of record)	2727	34.154	13.297	0	65	27	36	44	52	58
Have	2756	144.926	600.009	0	12,228	18	36	85.5	383	1953
Want	2756	529.292	565.93	10	4870	207	360	595	1601	3097
Wikipedia entry (release)	2775	0.538		0	1	0	1	1	1	1
Wikipedia entry length (release)	2775	1393.154	5210.588	0	74,767	0	0	0	8074	25,907
Bestseller	2776	0.086		0	1	0	0	0	1	1
Collectability (artist)	2776	0.097		0	1	0	0	0	1	1

Table B3. The death effect.

Artist	Release	Date	Format	Price (Euros)
Prince	Black Album	09–2014	Vinyl LP	700
(died in Apil 2016)	Black Album	09–2014	Vinyl LP	2250
	Black Album	04–2016	Vinyl LP	15,000
	The Versace Experience	08–2016	Cassette	4087
	Black Album	05–2017	Vinyl LP	1293
	Black Album	01–2018	Vinyl LP	5332
	Black Album	01–2018	Vinyl LP	27,500
David Bowie	The Man Who Sold The World	11–2013	Vinyl LP	695
(died in January 2016)	David Bowie	02–2015	Vinyl LP	1500
	David Bowie	02–2015	Vinyl LP	699
	The Man Who Sold The World	10–2015	Vinyl LP	1550
	David Bowie	10–2015	Vinyl LP	1671
	Man Of Words/Man Of Music	03–2016	Vinyl LP	1000
	David Bowie	03–2016	Vinyl LP	6826
	The Prettiest Star	03–2016	Vinyl 7″	1138
	David Bowie	11–2016	Vinyl LP	1371
	Rubber Band	06–2017	Vinyl 7″	1954
	The Man Who Sold The World	07–2017	Vinyl LP	1574
	David Bowie	07–2017	Vinyl LP	1182
	Pinups	11–2017	Vinyl LP	1568
	The Man Who Sold The World	04–2018	Vinyl LP	1325
	The Man Who Sold The World	06–2018	Vinyl LP	2796
	The World Of David Bowie	08–2018	Vinyl LP	1298
Motörhead	Motörhead	02–2016	Vinyl LP	984
(Lemmy died in December 2015)				
AC/DC	AC/DC	08–2013	Vinyl LP	620
	AC/DC	07–2014	Vinyl LP	600
(Angus Young died in November 2017)	If You Want Blood You've Got It	01–2018	Vinyl LP	1978

Table B4. Regression results of pricing equation (1) (all formats).

	(1)	(2)	(3)	(4)	(5)	(6)
ln(NumPossessed+1)	−0.120***	−0.123***	−0.122***	−0.121***	−0.121***	−0.129***
	(0.0120)	(0.0122)	(0.0122)	(0.0119)	(0.0120)	(0.0126)
ln(NumBuyers)	0.140***	0.138***	0.133***	0.140***	0.136***	0.133***
	(0.0159)	(0.0158)	(0.0156)	(0.0157)	(0.0151)	(0.0156)
Age (of record)	0.00154	0.00173*	0.00181*	0.00151	0.00157*	0.00194**
	(0.000951)	(0.000941)	(0.000936)	(0.000936)	(0.000915)	(0.000876)
Rare country	−0.0659***	−0.0651***	−0.0640***	−0.0717***	−0.0675***	−0.0490**
	(0.0216)	(0.0218)	(0.0217)	(0.0223)	(0.0219)	(0.0226)
Wikientry		0.0419***				
		(0.0162)				
Wikicat			0.0297**			0.0223*
			(0.0126)			(0.0130)
Bestseller				0.118**		
				(0.0479)		
Collectability					0.153***	
					(0.0501)	
Constant	6.007***	5.990***	5.960***	5.973***	5.981***	6.152***
	(0.156)	(0.156)	(0.163)	(0.162)	(0.165)	(0.188)
Observations	2877	2877	2877	2877	2877	2679
R^2	0.630	0.631	0.632	0.632	0.634	0.645
Year FE	✓	✓	✓	✓	✓	✓
Format FE	✓	✓	✓	✓	✓	✓
Genre FE	✓	✓	✓	✓	✓	✓

• Dependent variable: ln(Price)
• Coefficients are estimated in an OLS regression framework.
• Robust standard errors in parentheses (clustered on the item level), *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
• Model (4) is restricted to items with bestseller = 0.

Table B5. Quantile

	(1)	(2)	(3)	(4)
	Basic	75% Quant	95% Quant	99% Quant
ln(NumPossessed+1)	−0.120***	−0.164***	−0.266***	−0.269***
	(0.0120)	(0.0172)	(0.0477)	(0.0542)
ln(NumBuyers)	0.140***	0.183***	0.322***	0.433***
	(0.0159)	(0.0181)	(0.0504)	(0.0805)
Age (of record)	0.00154	0.00272**	0.000272	−0.00179
	(0.000951)	(0.00121)	(0.00288)	(0.00491)
Rare country	−0.0659***	−0.0923***	−0.0857	0.00313
	(0.0216)	(0.0352)	(0.105)	(0.149)
Constant	6.007***	6.123***	6.749***	5.590***
	(0.156)	(0.232)	(0.596)	(0.450)
Observations	2877	2877	2877	2877
R^2	0.630			
Pseudo R^2		0.3723	0.3089	0.3510
Year FE	✓	✓	✓	✓
Format FE	✓	✓	✓	✓
Genre FE	✓	✓	✓	✓

• Dependent variable: ln(Price)
• Coefficients are estimated using bootstrapped quantile regressions.
• Standard errors in parentheses, *p < 0.1, ** p < 0.05, *** p < 0.01.