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Metal by numbers: Revisiting the uneven distribution of heavy metal music

ABSTRACT

Conventional wisdom suggests, and scholarship confirms, that the distribution of heavy metal music across the world is uneven. Previous studies show there are more metal bands per capita in Europe and North America than in other regions, but it is not clear what country-level factors explain that distribution. Drawing on data from the Encyclopaedia Metallum, I replicate a 2014 study and find weak support to connect heavy metal and religion, legal history and other social factors. In this article, I present an alternative model to explain the distribution of metal bands and show that wealth and political freedom are highly predictive of metal music, not only across the world, but also within regions.

KEYWORDS

statistics
metal bands
replication
economics
metal politics
quantitative

Introduction

This article revisits the analysis of heavy metal production in volume 1, number 1 of this journal. Conventional wisdom suggests, and research confirms, that the distribution of metal bands across countries is not equal: the genre was introduced in Europe and North America before gaining popularity in Latin America, Asia and, to a lesser extent, the Middle East and Africa. Previous researchers have grappled with this distribution and the differing experiences

of metal fans and artists in non-Western settings (Harris 2000; Hsiang and de Seta 2017; Wallach et al. 2011; Weinstein 2011a). Maguire (2014) contributes to this growing literature with the field's first regression analysis of metal around the world.

Drawing on data from Encyclopaedia Metallum, known as the Metal-Archives, Maguire explores the distribution of metal bands per capita across countries with a series of models based on 55 variables. After testing several permutations of the data with a technique known as stepwise regression, Maguire finds that seven variables are correlated with metal: 'Scandinavian Legal History', latitude, the number of years under Marxist rule, the size of the youth male population, concert halls per capita and the per cent of people who are Catholic or non-religious.

In this article, I replicate Maguire's (2014) analysis and show the results are not robust to out-of-sample testing with conventional methods. I develop an alternative model and show that nearly 80 per cent of the variation in metal across the world can be explained by just four variables: income per capita, level of democracy, region of the world and a binary indicator for Nordic countries. The results are more consistent with the conventional wisdom: metal bands are concentrated in wealthy and democratic countries in the West where the genre originated. The advantage of this model is its simplicity. In contrast to Maguire's focus on the social and cultural correlates of metal, my model performs well because it focuses on the macro-level factors that are associated with a country's capacity to record and consume music of any kind.

This article proceeds as follows: I discuss the research on the distribution of metal and summarize the original article. Second, I present the data, describe the dependent variable and replicate the findings. After a discussion of the alternative model and results, the article concludes with a comment on the replication process in *Metal Music Studies*.

Background

Previous researchers have explored the global distribution of metal, including data journalists in the United States and United Kingdom. Florida and Mellander (2014) show a country's metal bands per capita is correlated with economic output, creativity and entrepreneurship (cf. Florida 2012).[1] They conclude,

> Though metal may be the music of choice for some alienated working-class males, it enjoys its greatest popularity in the most advanced, most tolerant, and knowledge-based places in the world. Strange as it may seem, heavy metal springs not from the poisoned slag of alienation and despair but the loamy soil of post-industrial prosperity.
>
> (Florida and Mellander 2014)

Maguire's analysis improves on these studies by employing multivariate regression to look for relationships between several factors at once.

Scholars have attempted to identify the social and cultural conditions that foster the genre. Although the original study refers to common assumptions about the subject, the analysis does not rest on firm theoretical ground. The process for selecting variables in the first study relied too heavily on outlier cases, especially Scandinavia, that possess far more metal bands per capita than their peers elsewhere. Metal music scholars have historically focused on the conditions that gave rise to the genre initially, but the project at hand is

1. Media reports on the distribution of metal bands include *The Atlantic* (Grandoni 2012), *Foreign Policy* (Keating 2012), *The Guardian* (30 May 2014), Invisible Oranges (8 October 2015) and *The Daily Mail* (Zolfagharifard 2014).

slightly different. We want to shed light on the contours of metal's distribution across the world, and that requires broadening our scope beyond the outliers.

The Metal-Archives data tell a familiar story: metal is concentrated in the West, with some variation across other regions of the world. Tables 1 and 2 show the top and bottom 25 countries according to the number of metal bands per capita. Only two of the top 25 countries are non-European, Chile and Canada, and all the Nordic countries are in the top fifteen. Just five of the top 25 metal-per-capita producers are in the top ten countries as ranked by total metal bands: Germany, Italy, Sweden, Finland and Canada. Among the

Country or region	Bands per 100,000 people	Rank by number of metal bands
Svalbard†	152	117th
Finland†	62	8th
Sweden†	43	7th
Iceland†	31	63rd
Norway†	30	20th
Liechtenstein	30	96th
Faroe Islands†	24	95th
Monaco	20	104th
Greece	16	16th
Luxembourg	15	66th
Denmark†	15	29th
Malta	14	70th
Estonia	14	51st
Gibraltar	14	114th
The Netherlands	12	14th
Austria	12	27th
Czech Republic	12	21st
Slovenia	12	45th
Germany	12	2nd
Switzerland	11	28th
Portugal	10	23rd
Belgium	10	25th
Hungary	10	26th
Chile	9	19th
Canada	9	9th
Italy	9	3rd

Note: The symbol † denotes Nordic countries and regions. Data on the number of metal bands were provided by *Metal-Archives* in May 2015. Population data from the World Bank. The values for bands per capita were rounded to the closest whole number for clarity.

Table 1: Top 25 countries by metal bands per capita.

Country or region	Number of metal bands	Bands per 100,000 people
Ethiopia	1	0.00
Afghanistan	1	0.00
Myanmar	2	0.00
Mozambique	1	0.00
Uganda	2	0.01
Zambia	1	0.01
Kenya	3	0.01
Angola	2	0.01
India	153	0.01
Cambodia	2	0.01
China	234	0.02
Uzbekistan	6	0.02
Pakistan	49	0.03
Bangladesh	46	0.03
Libya	2	0.03
Egypt	26	0.03
Jamaica	1	0.03
Iraq	11	0.04
Madagascar	9	0.04
Vietnam	40	0.04
Laos	3	0.05
Saudi Arabia	13	0.05
Nepal	17	0.06
Turkmenistan	3	0.06
Azerbaijan	6	0.06

Note: Countries with zero metal bands are excluded. Data on the number of metal bands were provided by *Metal-Archives* in May 2015. Population data from the World Bank. The values for bands per capita were rounded to the nearest hundredth.

Table 2: Bottom 25 countries by metal bands per capita.

top 25 overall metal-producing countries, just nine are located outside Europe (see Table 6 in the Appendix). In contrast, there are no European countries among the bottom 25 metal producers per capita, which are concentrated in Africa, Asia, the Caribbean, the Middle East and North Africa. These patterns suggest we should be cautious about a research strategy that over-emphasizes Western factors that are commonly associated with metal.

The proliferation of metal in the Nordic countries is an interesting pattern that scholars should continue to interrogate, but there is a limit to what we can learn about the distribution of metal in the rest of the world if our models are too narrowly focused on those exceptional cases. The first study found that the number of bands per capita is linked to 'Scandinavian Legal History', but

that result is an artefact of these cases skewing the analysis. Similarly, it is neither surprising nor helpful to learn that latitude is correlated with metal. By selecting variables based on the top 1 per cent of cases, the first study revealed little about the distribution of metal bands within Africa, the Caribbean or the Middle East, where countries have lower latitudes and no Scandinavian legal history, but also differ from Europe and North America in many other ways.

Without a stronger theoretical foundation for the link between religion and metal, it was inappropriate to include these variables in the original study. In particular, the cross-sectional nature of the data does not allow us to speculate about how people behave over time. To be sure, the first study could not test the claim that Catholic metalheads leave their religion at lower rates than Protestant metalheads (Maguire 2014: 163). The per cent of people who have no religion is a plausible correlate of metal if secular societies tolerate more extreme forms of music, but that claim was not tested before the variable was included in the model. Other factors, such as liberal democracy, are also associated with tolerance for extreme views even in countries where rates of secularism are low. Both happen to be concentrated in the West.

Of the seven variables, the number of concert halls per capita is the most plausible explanatory variable, but it is unclear to what extent the venues counted in the dataset, such as Carnegie Hall and the Royal Academy of Music, are ever used by metal bands. Given that metal music is often labelled extreme and underground (Kahn-Harris 2006), we might even expect the number of concerts halls to be unrelated to the production of metal music if artists are eschewing mainstream venues for unconventional ones. Either way, the capacity to build infrastructure for musical performances is correlated with other factors, like wealth, that are more plausible.

Data

I followed the instructions in the original article and compiled data from over 50 sources. It was difficult to know if the new dataset matched the original without access to the author's data.[2] As will be discussed later, I was able to approximately replicate the results from the specifications favoured by Maguire (2014), models 36 and 44. After replicating the results, I added the new data for metal bands per country (Table 7 in the Appendix shows the summary statistics). As Maguire points out, we should consider the limitations in the Metal-Archives data.[3] In this section, I focus on three limitations of the dataset: the cumulative nature of the dependent variable, the unit of analysis and the absence of countries with zero bands.

The dataset counts all bands a country has produced without regard for how many of those bands are currently active. This is a problem because not all countries produced bands during the full range covered in the data set, 1964–2015, and a country's measures of metal bands per capita may differ from year to year. To illustrate this limitation, consider two hypothetical cases: Country A has 100 bands that have existed for 30 years and have each released one album a year, totalling 3000 albums. Country B also has 100 bands but each band existed for one year and produced one album each, totaling 100 albums. The dataset would measure A and B the same, although we might think their metal scenes are qualitatively different.

It is also important to note that the unit of analysis, country, is not clearly defined in the original data. The dataset includes polities that could be coded as part of another country including Guam, Puerto Rico, Svalbard, Gibraltar,

2. The author offered to clarify the instructions for compiling the data, but declined to share the original dataset.

3. Encyclopaedia Metallum is maintained by a team of moderators with discretion over the admission process, and the true count of metal bands per country is no doubt larger than reported. Maguire (2014) notes that bands in the Japanese genre Visual Kei are not listed in the archives. Other noteworthy genres that are absent include nu-metal (Slipknot, Linkin Park), glam rock and hair metal, core bands, and metal-adjacent genres like gothic rock (HIM, The 69 Eyes) and industrial rock (Rammstein).

the Faroe islands and Greenland. The Metal-Archives dataset also includes semi-autonomous polities like the Isle of Man and Åland Islands, which are dependent upon Great Britain and Finland, respectively, but are not considered 'countries'. This article presents the dependent variable as-is to avoid the debate for now, but it is worth noting that coding the data differently could change the results: three semi-autonomous regions, three European microstates and Luxembourg are among the top 25 metal-per-capita producing countries.

In addition to updating the count of metal bands, I have expanded the dataset to account for polities that do not have any bands. At least 67 of 203 countries/polities were not included in the original dataset because they did not have any bands. Sixty-one of those countries had zero bands as of 2017, and six were found to have at least one: Mauritius, Zambia, Afghanistan, Ethiopia, Cambodia and Trinidad and Tobago. These cases take on the minimum value of our variable of interest, and it is important to include them in the statistical analysis in order to properly account for variation at the low end of the distribution.

Analysis

I employ the same cross-sectional linear regression model in the original article, where Y is the number of metal bands per capita, β_0 is the intercept term, β_i is the coefficient on independent variable X_i for i number of variables, and ϵ_i is the error term.

$$Y_i = \beta_0 + \beta_1 * X_1 + \cdots + \beta_i * X_i + \in_i$$

The technique employed in the first study is known as stepwise regression and involves testing several model specifications by systematically adding and removing independent variables and comparing the goodness of fit. We should interpret these results carefully, and this strategy is sometimes derided as data mining or star seeking. Stepwise regression at this stage should be considered exploratory, and we should avoid making claims about what the data can tell us about causality (see Harrell 2015).

One reason we should be cautious about stepwise regression is that models tend to perform poorly out of sample. If the data for any of the variables were to change, the results may not be robust. This is true of any data analysis, but we should be especially concerned here about overfitting: if we pick the best fitting model based on one set of data, we risk losing the ability to describe data outside of the set. The stepwise method does not perform well when the model is applied to data outside the sample. That is to say, the six variables that appeared significant in regression #36 with the 163 observations may be null when we include the other thirteen countries in the original dataset and the 27 additional countries I identified as missing.

Setting aside our concerns about the validity of stepwise regression, the analysis as described was not carried out systematically *enough* to say that all 'significant' variables were found. The protocol calls for adding and removing variables that return a p value of 0.05 or less in an iterative series of models that can include up to fifteen variables. There are nearly 12 trillion possible combinations of fifteen variables from a pool of 55 variables, but fewer than 100 models were estimated in the original study. Perhaps one of the variables that was dropped early in the analysis because it did not achieve a p value of 0.05 in the first set of specifications could have achieved significance in one of the several trillion specifications that were not run. The second round of eliminations based on a p value of 0.03 was also unconventional and arbitrarily applied.

Another way to compare models is the R^2 statistic, a measure of how much of the total variance in the dependent variable is explained by the model. The stepwise regression technique has a major pitfall, especially with model specifications with up to fifteen variables: the inclusion of more variables tends to bias the R^2 statistic upward. Models that are not parsimonious can achieve high R^2 values by chance, in which case the adjusted R^2 metric may be more appropriate.

Tables 3 and 4 show the replicated models 36 and 44, respectively. The results are approximately the same given slight differences in how the data

	Dependent variable		
	Bands per 100,000 people	**Bands per 100,000 people**	
	2013	**2015**	
	(1)	**(2)**	**(3)**
Scandinavian legal history	**24.64*****	**28.49*****	**27.44*****
	(2.25)	(2.01)	(2.10)
Catholic, per cent of pop.	**0.04*****	**0.04*****	**0.03****
	(0.01)	(0.01)	(0.01)
Concert halls per 100,000 people	**0.01**	**0.03**	**0.03**
	(0.02)	(0.02)	(0.02)
Latitude (absolute value)	**0.06***	**0.08*****	**0.01**
	(0.03)	(0.02)	(0.03)
No religion, per cent of pop.	**0.05**	**0.04**	**0.07****
	(0.04)	(0.03)	(0.03)
Years of Marxist rule	**−0.03**	**−0.03**	**−0.01**
	(0.02)	(0.02)	(0.02)
Male youths, per cent of pop.	**−0.86*****	**−0.86*****	**−0.28**
	(0.27)	(0.23)	(0.29)
GDP per capita (avg. 2008–13)			**0.00**
			(0.00)
Democracy			**0.22**
			(0.21)
Constant	**6.73****	**6.42****	**0.97**
	(3.21)	(2.51)	(3.34)
Region fixed effects			✓
Observations	126	191	159
R^2	0.71	0.75	0.81
Adjusted R^2	0.70	0.74	0.79

Note: Coefficients in bold. Standard errors in parenthesis.

*p<0.1; **p<0.05; ***p<0.01.

Table 3: Replication of model 36.

	Dependent variable		
	Bands per 100,000 people	Bands per 100,000	
	2013	2015	
	(1)	(2)	(3)
Catholic, per cent of pop.	**0.02**	**0.02**	**−0.03**
	(0.02)	(0.01)	(0.02)
Concert halls per 100,000 people	**0.11*****	**0.13*****	**0.10*****
	(0.03)	(0.03)	(0.04)
Latitude	**0.16*****	**0.16*****	**0.12****
	(0.04)	(0.03)	(0.05)
No religion, per cent of pop.	**−0.03**	**−0.04**	**−0.05**
	(0.05)	(0.04)	(0.05)
Years of Marxist rule	**−0.06***	**−0.06****	**−0.02**
	(0.03)	(0.03)	(0.03)
Male youths, per cent of pop.	**−0.58**	**−0.62***	**0.44**
	(0.39)	(0.32)	(0.42)
GDP per capita (avg. 2008–13)			**0.00*****
			(0.00)
Democracy			**0.59***
			(0.30)
Constant	**2.11**	**3.12**	**−8.06***
	(4.50)	(3.61)	(4.84)
Region fixed effects			✓
Observations	126	191	159
R^2	0.42	0.47	0.58
Adjusted R^2	0.39	0.45	0.53

Note: Coefficients in bold. Standard errors in parenthesis.
*p<0.1; **p<0.05; ***p<0.01.

Table 4: Replication of model 44, excluding the Nordic cases.

were compiled: the original model 36 explained approximately 80% of the variation in the dependent variable, and the replication model explains about 75% (according to the R^2 statistic). Model 44 explained approximately 72% of variation and the replication model explains between 42 and 47%. Most of the models in the first study explain between 70 and 80% of the variance, but it is not clear that any particular model performs better than any other without theory to guide us.

Alternative model

Next I test an alternative model of the global distribution of metal. For variable selection, I rely on Florida (2012) and Florida and Mellander (2014) who find

	Dependent variable			
	Bands per 100K	Updated bands per 100K		
	(1)	(2)	(3)	(4)
GDP per capita	**0.00****	**0.00*****	**0.00****	**0.00*****
	(0.00)	(0.00)	(0.00)	(0.00)
Democracy	**0.56****	**0.46****	**0.66****	**0.44*****
	(0.24)	(0.19)	(0.27)	(0.11)
Nordic country	**21.35*****	**25.73*****	**25.58*****	
	(1.92)	(1.85)	(2.15)	
Constant	**−3.04***	**−2.09****	**−3.94***	**−2.02*****
	(1.82)	(0.96)	(2.04)	(0.55)
Region fixed effects	✓	✓	✓	✓
Observations	118	163	122	158
R^2	0.77	0.79	0.78	0.73
Adjusted R^2	0.74	0.77	0.76	0.71

Note: Model (3) excludes countries with zero bands. Model (4) excludes the Nordic countries.

*p<0.1; **p<0.05; ***p<0.01.

Table 5: Alternative models.

that metal bands per capita are positively correlated with economic conditions. Table 5 shows the results of the model with regional fixed effects and just three variables: income per capita, democracy and an indicator variable for Nordic countries. Income is measured by the average annual GDP per capita averaged over 2008–13, and democracy is measured from 1 to 10 (*The Economist* 2013). Model (1) uses the 2013 measure of metal bands per capita, model (2) uses the 2015 measure, model (3) excludes the countries with zero bands and model (4) excludes the Nordic countries.

The alternative model performs as well as the published result according to R^2, explaining 73 to 79 per cent of variation, but it has several advantages. The model is more parsimonious, my dataset includes more countries including the zero band cases and I account for the Nordic outliers without dropping them from the analysis altogether. Regional fixed effects also allow us to account for the difference in metal bands per capita due to differences between regions of the world. When we include regional fixed effects, rather than latitude, the coefficients for other variables can be interpreted as the variation that occurs within regions.[4]

Economic and political conditions that relate to a country's capacity to record and consume music appear to be better predictors of metal bands per capita than social factors like religion, young males and legal history. These results are more consistent with Florida and Mellander (2014) than Maguire (2014).

> [While] new musical forms may spring from disadvantaged, disgruntled, or marginalized groups, it is the most advanced and wealthy societies

4. The regions are Africa, Asia, Europe, the Caribbean, Central America, South America, North America, Middle East and North Africa, and Oceania.

> that have the media and entertainment companies that can propagate new sounds and genres, as well as the affluent young consumers with plenty of leisure time who can buy it.
>
> (Florida and Mellander 2014)

Conclusion

A number of scholars have expressed doubts about whether the field of metal studies can build a space where researchers revisit and expand upon each other's work (Kahn-Harris 2011). The trajectory of metal studies, thus far, 'has not usually been the result of a concern with building upon previous academic work […] the literature that metal studies proposes to gather up and extend does not display a line of development towards a theoretical synthesis or the systematic compounding of mutually criticized and systematically interrelated research studies' (Weinstein 2011b: 244).

This article looks back with a critical eye. Conventional methods with updated data give us results that are consistent with what most of us know intuitively: metal flourishes in wealthy and politically open countries. Additional research is needed to confirm and expand these results, and both quantitative and qualitative researchers should continue exploring the nuances of the global distribution of metal. To that end, I will provide the data and replication file for this article (available on IngentaConnect) so that readers may corroborate and extend this analysis. I also encourage the field of metal studies to adopt this practice for quantitative studies in the future.

Appendix

Country or region	Bands per 100,000 people	Rank by bands per capita
United States	7	33rd
Germany	12	19th
Italy	9	26th
Brazil	2	57th
France	7	4th
United Kingdom	6	35th
Sweden†	43	3rd
Finland†	62	2nd
Canada	9	25th
Poland	8	30th
Russia	2	58th
Spain	6	37th
Mexico	2	65th
The Netherlands	12	15th
Australia	9	27th

Table 6 (Continued)

Country or region	Bands per 100,000 people	Rank by bands per capita
Greece	16	9th
Argentina	4	48th
Japan	1	73rd
Chile	9	24td
Norway†	31	5th
Czech Republic	12	17th
Colombia	3	55th
Portugal	10	21st
Indonesia	0.5	82nd
Belgium	10	22nd

Note: The symbol † denotes Nordic countries and regions. Data on the number of metal bands were provided by *Metal-Archives* in May 2015. Population data from the World Bank. The values for bands per capita were rounded to the closest whole number for clarity.

Table 6: Top 25 countries by total metal bands.

Statistic	*N*	Mean	St. Dev.	Min	Max
Metal bands (2013)	135	616.61	1811.73	1	17,25
Metal bands (2013) per 100,000 people	135	4.41	8.37	0.00	53.20
Metal bands (2015)	203	504.05	1842.29	0	21,43
Metal bands (2015) per 100,000 people	203	4.10	12.88	0.00	152.28
Young men as per cent of total population	201	8.81	1.765	4.70	14.71
Years of socialism	202	8.19	17.29	0	69
Latitude	201	26.02	17.69	0	78
Democracy (1–10)	167	5.52	2.19	1.08	9.93
Corruption (2012)	177	42.67	20.10	0.00	90.00
Protestant (per cent)	192	14.70	20.24	0.00	96.00
Catholic (per cent)	192	27.92	30.67	0.00	96.00
Orthodox (per cent)	192	6.87	20.06	0.00	94.70
Judaism (per cent)	192	0.44	5.28	0.00	73.10
Islam (per cent)	192	25.00	36.15	0.00	99.56
No religion (per cent)	192	7.23	11.63	0.00	75.75
Concert halls per capita	203	10.931	17.98	1	64
Annual GDP per capita (avg 2008–13)	192	13,784.56	21,595.56	202.21	165,164.70

Table 7: Summary statistics for key variables.

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