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In fatal pursuit of immortal fame: Peer competition and early mortality of music composers☆

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ABSTRACT

We investigate the impact of peer competition on longevity using a unique historical data set of 144 prominent music composers born in the 19th century. We approximate for peer competition measuring (a) the number or (b) the share of composers located in the same area and time, (c) the time spent in one of the main cities for classical music, and (d) the quality of fellow composers. These measures suggest that composers' longevity is reduced, if they located in agglomerations with a larger group of peers or of a higher quality. The point estimates imply that, all else equal, a one percent increase in the number of composers reduces composer longevity by ~7.2 weeks. Our analysis showed that the utilized concentration measures are stronger than the personal factors in determining longevity, indicating that individuals' backgrounds have minimal impact on mitigating the effect of experienced peer pressure. The negative externality of peer competition is experienced in all cities, fairly independent of their population size. Our results are reaffirmed using an instrumental variable approach and are consistent throughout a range of robustness tests. In addition to the widely known economic benefits associated with competition, these findings suggest that significant negative welfare externalities exist as well.

"Meyerbeer has immortalized himself! But he has spent three years in Paris to get it done."

Letter by Frederic Chopin from 12th December 1831, Paris.

1. Introduction

Individuals' longevity is affected by genetic determinants, lifestyle traits and individuals' susceptibility to health-related risk factors (e.g., smoking, drug use, obesity, etc.), environmental conditions (e.g., pollution), and a mixture of socio-economic factors (e.g., income, social status, and status anxiety) (Veenhoven, 2008). This study focuses on the latter and investigates whether the adverse health effects caused by such socio-economic factors are intensified due to intense competition between peers.

Can any systematic difference be observed in the longevity of individuals who face intense competition, which is arguably greater in geographic clusters? If so, what is the causal relationship between peer competition and longevity? These questions are important, as increasing urbanization might, to some extent, explain why depression has reached such epidemic proportions (McManus et al., 2000; National Institute of Mental Health, 2007). To empirically address these questions we use longevity data for a well-identified group of individuals sharing the same specialization, who have in addition exhibited a sufficient extent of geographic clustering: music composers.

Aspiring individuals locate in large geographic clusters to take advantage of the positive externalities associated with agglomerations, primarily the employment opportunities and productivity gains (Glaeser and Mare, 2001). The high frequency of individual contact within cities fosters the spillover of technological advancements, knowledge and news, leading to higher productivity and thus wages (Glaeser et al., 1992; Black and Henderson, 1999; Mori and Turrini, 2005). The benefits of agglomeration are

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especially important to artists, whose product can be made more accessible to a wider audience via the provision of an appropriate setting, such as galleries, operas, and symphony orchestras (O'Hagan and Borowiecki, 2010). Artists can further be inspired by the aesthetics of cities, which offer a unique opportunity to interact, collaborate with, or be motivated by the work of, colleagues.

Hellmanzik (2010), for example, argues that the quality of output of artists who worked mainly in highly concentrated locations, such as Paris, peaked earlier in their career. Borowiecki (2013) demonstrates that music composers located in geographic clusters were more productive due to interactions with peers, but these clustering benefits decrease, however, with large peer groups where competition for access to limited production facilities is particularly high (Borowiecki, 2015).

Music composers of the 18th, and particularly those of the 19th century, had a remarkable entrepreneurial drive (Scherer, 2001, 2004) as Borowiecki (2012) outlined. First, composers were able to offer their product to a wider and geographically diverse, audience following the expansion of the middle class in the late 18th century. This eventually led to the creation of newly-built concert halls in the main cities for music, where concert performances could now satisfy this demand (until that point, such performances were taking place in churches). Second, technological developments and advances in manufacturing made music instruments more accessible to the emerging middle class, resulting in a greater demand for educational services from composers (e.g., piano lessons). They were not the exception to the rule though, as they were exposed to particularly intense competition with peers to access limited production facilities within a city. For example, by the beginning of the 19th century, most European and North American cities had *a single* concert hall with a domicile symphonic orchestra and *a single* opera house with a local opera company (Borowiecki, 2015). Even very large cities did not have more than one concert hall or opera house; hence only one composer at a time could have his works rehearsed and performed at a given facility.

It is likely that this limited access to production resources may have triggered increased stress levels; presumably more so in cities with a greater number of peers. Additional stress or status anxiety could have resulted from other sources, such as unfulfilled expectations or lack of recognition by one's peers, especially among music clusters where the most skilled peers are located, making it even harder for one to excel. We argue that the concentration of such talent is likely to have had adverse effects in terms of health and well-being, attributable to the continuous mental strain individuals go through in order to achieve their aspirations, which become more intensified in settings where one's peers thrive. After all, the behavioural sciences suggest that relative, not absolute, outcomes matter (Kahneman and Tversky, 1979; Rayo and Becker, 2007; Thornton, 2008).

We extract data for 144 music composers born in the 19th century and calculate four measures that approximate peer competition: (1) the average number of peers residing in the same location and time; (2) the lifetime average share of peers located in the same location and time; (3) the share of a composer's life spent in one of the main locations for music, where peer group size, and thus competition, is potentially at its highest; and (4) the quality of fellow composers (calculated as the sum of quality indices of all composers located in the same location and time). Across these measures we find evidence pointing towards a negative and nonlinear association between peer competition and composer longevity. Our results are robust to a variety of additional specifications that control for additional background variables, including measures of composer's quality, illnesses and incidences of pandemics.

An instrumental variable (IV) model subsequently estimated in an attempt to tackle potential endogeneity and omitted variables issues, the instrument being the average geographic distance between composers' place of birth and the two main cities for music, Paris and Vienna. We find that composer's centrality of birth is negatively associated with all four competition measures. The IV-identification strategy helps to determine whether disclosed associations between the employed proxies for competition and longevity are plausibly causal.

Section 2 provides an overview of the relevant literature. Section 3 describes our data and methodology. The results of our analysis are presented in Section 4. Section 5 discusses our findings and offers concluding remarks.

2. Literature review

The relevant literature draws from studies relating socio-economic status with health, and those focussing on the health-related advantages and disadvantages of cities. The literature examining the relationship between socio-economic status and health has mainly focused on the effect of income, with some scholars suggesting a causal link stemming from income and job status to health (Ettner, 1996; Attanasio and Emmerson, 2003). The Whitehall studies, for example, document an inverse relationship between mortality risk and job seniority among British civil servants, with lower ranked employees facing mortality rates three times higher than as those of more senior positions (Marmot et al., 1984, 1991). Similar patterns have been observed when switching the socio-economic variable to education (Feldman et al., 1989; Lahelma and Valkonen, 1990) and when focussing on the unemployed, who experience shorter lives (Iversen et al., 1987; Morris et al., 1994). Others argue that causality runs from health to socio-economic status (Smith, 1998, 1999; Meer et al., 2003; Cutler et al., 2006).

In a study examining the impact of status on well-being, Redelmeier and Singh (2001a) found that Oscar-winning actors and actresses outlive their nominated peers by 3.6 years. Interestingly, the opposite holds for Oscar-winning screenwriters (Redelmeier and Singh, 2001b). Further support for this causal relationship is provided by Rablen and Oswald (2008), who observed that Nobel Prize winners outlive their nominated peers by 1.5 years. These outcomes, to some extent, may be attributed to increased stress levels caused by competition in the workplace (i.e., job strain). The relationship between stress levels and health outcomes appear to have an inverted U-shape; at optimal levels individuals balance capabilities and challenges, yet deviations beyond that point, especially if accompanied by long duration (i.e., chronic stress), lead to adverse health outcomes (Selye, 1936; Meglino, 1977; Allen et al., 1982; Garhammer, 2002). Carr-Hill et al. (1996), for example, found that GP consultations in the UK increase significantly amongst the unemployed, but especially so for those who recently lost their jobs. Kuhn et al. (2009) find that demand for physical health treatments does not increase following job loss, but document significant increases in expenditures for antidepressants and treatments of mental health problems. These effects are more pronounced amongst men. Browning and Heinesen (2012) find that job loss leads to increased risk of mortality (attempted) suicide, and hospitalization, as well as death attributed to mental illness, alcohol consumption, and traffic accidents. In agreement with Browning and Heinesen (2012), Vandoros et al. (2014) also document increased levels of traffic accidents following bad financial news.

Furthermore, anxiety is positively correlated with the occurrence of hypertension (Jonas and Lando, 2000), which is in turn positively correlated with depression and negatively correlated with subjective well-being (Ostir et al., 2001; Joynt et al., 2003; Blanchflower and Oswald, 2008; Steptoe et al., 2008). Huppert and Whittington (1995) estimate that those with lower scores on a general health questionnaire eliciting psychiatric symptoms are more likely to be deceased over a 7-year period. Depression and psychological distress have been found to be significant determinants of coronary heart disease and type II diabetes, amongst other health outcomes (Golden et al., 2004; Everson-Rose and Lewis, 2005). In line with this evidence, Steptoe et al. (2005) argue that positive affect can lead to stabilisation of neuroendocrine, inflammatory and cardiovascular activity.

The relationship between cities – and geographical clusters in general – and health is mixed. On one hand, the 'urban health penalty' suggests that the health of individuals living in cities is worse than those living in non-urban areas, mainly due to higher pollution levels (Jedrychowski et al., 1997; Crimi et al., 1999; Freudenberg et al., 2005). Others argue that cities not only offer, on average, better public services, including better provision of health and access to health care, but generally provide: (a) better and more diversified provision of consumption goods (e.g., restaurants, theatres); (b) transportation speed, which not only relates to time spent commuting to and from work, but also impacts on the cost and frequency of social contact (Costa and Kahn, 2000); and (c) aesthetics (e.g., architectural beauty, physical setting). These aspects give urban residents a welfare advantage (Glaeser et al., 2001; Sorgaard et al., 2003). Despite these advantages, there is empirical evidence to suggest that stress is exacerbated in cities, such that individuals living in urban areas report decreased levels of subjective well-being compared to those living in rural areas (Hudson, 2006; Gerdtham and Johannesson, 2001; Hayo, 2004).

Against this background, this study examines the impact of peer competition, stemming from the concentration of individuals in large geographic clusters, on longevity using data of music composers born in the 19th century.

3. Data and methodology

The results of this study depend heavily on the objectivity and reliability of the sample of composers. With this objective in mind, we gather data on prominent composers based on Murray (2003), who studied human accomplishment in several fields/disciplines, including western music, listing 144 composers born between 1800 and 1899. This sample of composers is derived after much care and consideration and is based on a number of international references.

Previous sources have been argued to be less reliable. For example, a sample of important composers by Gilder and Port (1978) is heavily biased towards English-speaking countries (O'Hagan and Borowiecki, 2010). The risks of bias due to country or marketing in Murray's (2003) selection of composers are arguably reduced, and can be attributed to the procedure followed. Murray reduces an initial list of eminent composers by referring to a number of international music dictionaries and encyclopedic sources and, subsequently, derives an index score based on the amount of space allocated to the artist in those reference works. This score is then normalised for all individuals listed in each discipline, so that the lowest score is one and the highest is 100. Murray's methodical approach in deriving this 'human accomplishment list' has been established as a recognised source of famous creators and has been used extensively in past academic research (e.g., Ko and Kim, 2008); Hellmanzik, 2010; Borowiecki, 2013).

For our sample of composers, we extract detailed background information from Grove Music Online (2009), the leading online source for music research. This source dictionary is detailed enough to track composers' lifetime migration patterns and, hence, useful in obtaining measures to gauge size of peer group size in various cities over their lifetime. The data were obtained manually and constitute an accurate record of the lives of composers. Any (unlikely) error by the biographers or during data extraction, given the sample size ($n = 144$), can be regarded as negligible as long as it is not systematic. The emerging sample with key background indicators is presented in Table A1 in the Appendix.

The source dictionary also documents whether family members were engaged in musical activities of any importance. Music involvement within a composer's family could potentially imply inherited skills and provide some rough indication on his innate ability for music, or alternatively, family members involved in a music-related activity might be capable of providing better training to a young composer or enable superior access to relevant professional networks. It is reasonable to assume that composers' quality is positively correlated with music-involvement of his family members. Therefore, we also utilise music-related engagement of composers' family members as a measure of quality (e.g., whether mother played the piano, father acted as conductor, etc.) in addition to their Murray's index score.

In order to empirically investigate the association between experienced peer competition among composers' during their lifetime and longevity we use the following pooled cross-sectional model:

$$Longevity = \beta_0 + \beta_1 Competition + \beta_2 (Competition)^2 + \beta_3 TBirth + \beta_4 CBirth + u \quad (1)$$

That is, we regress composer's longevity on measures of experienced peer competition (including a squared term to account for non-linearity), and a set of dummy variables indicating the composer's half-century birth period (*TBirth*) and region of birth (*CBirth*). Controlling for the birth period is necessary to allow for changes in longevity due to overall improvements in life conditions. Similarly, controlling for the country of birth (fixed effects) is important to account for longevity differences between nations; given the size of the sample we group all countries into one of eight geographic regions (see Table 1). Robust standard errors are clustered at the level of the main destination of a composer in order to mitigate biases arising due to geospatial autocorrelation.

Peer competition in Equation (1) is measured in four distinct ways. First, for each composer we calculate the average number of other composers based in the same location and year (*Number of Composers*). Second, we calculate the average share of composers resident in the same location and year (*Share of Composers*) – this measure essentially expresses the *Number of Composers* in relation to all observed composers in a given year, offering some indication on the relative extent of geographic concentration. Third, we count the share of life a composer spent in one of the geographic clusters with largest composer populations, namely Paris and Vienna (*Relative Time spent in Clusters*). Our results are robust for Paris and Vienna separately, and if we extend the list of main centers for music by including London, Moscow and Berlin. This measure partially accounts for the quality of fellow composers, since the best are typically located in geographic clusters (Borowiecki, 2013). Nonetheless, we complement this measure with a variable that reflects the aggregated quality of other composers based in the same location and year (*Quality of Composers*). To calculate this variable we sum the Murray's index scores for all fellow

Table 1
Summary of background variables for the included composers.

	Mean	Standard deviation
	A: Background Information	
Life span (years)	68.63	14.63
Duration of career (years)	45.13	14.70
Murray's index score[a]	8.30	11.39
Father engaged in music	0.33	0.47
Mother engaged in music	0.26	0.44
Another other family member engaged in music	0.22	0.41
	B: Covered Period[b]	
Period 1800–1849	0.14	0.26
Period 1850–1899	0.42	0.26
Period 1900–1949	0.38	0.28
Period 1950–1999	0.07	0.12
	C: Birth Country	
British Isles (England, Scotland, Ireland and Wales)	0.09	0.29
France	0.23	0.42
Germanic Countries (Germany, Austria and Switzerland)	0.19	0.40
Italy	0.06	0.24
Russia	0.14	0.35
Eastern Europe (except Russia)	0.10	0.30
Rest of Europe	0.08	0.28
Rest of World	0.10	0.31
	D: Peer Competition	
Number of composers in the same location and year[c]	6.06	5.55
Share of composers (%)[d]	11.63	11.68
Relative Time Spent in Clusters[e]	21.51	27.19
Quality of Composers[f]	49.97	41.24
	E: City Population	
Average city population (millions)	2.27	1.89
Relative time spent in cities that exceed average population (%)	74.80	24.31

Notes.
[a] Murray's index score gauges lifetime achievement (1 is lowest and 100 highest).
[b] Time period spans from birth until death.
[c] Measures the lifetime average of composers located in the same city.
[d] Share of composers expresses the number of composers in relation to all observed composers in a given year.
[e] Measures the share of a composer's life that he spent in Paris or Vienna.
[f] Measured as the sum of Murray's index scores of composers located in the same time and place expressed as the lifetime average.
Sources: Data on composers are obtained from Grove Music Online (2009).

composers and, as before, express this variable as the lifetime average.

We estimate Equation (1) via ordinary least squares (OLS), yet this does not resolve potential biases due to the potential endogeneity of the competition variables. This could be true for two reasons: First, cities with a high number of composers might attract new composers of higher quality who potentially have superior access to health care or better nutrition. Second, omitted variables, such as the overall life quality in the geographical clusters considered here, could drive or intensify the incidence of both clustering and longevity. One measurable factor that is, to some extent, related to the overall quality of health in geographic clusters during this period, is city size. We discuss the implications of city size in the robustness section.

In an attempt to address these concerns, we implement additional analyses using an IV-model. We use the average “air-line” geographic distance between composers' place of birth and the two main cities for music: Paris and Vienna. The analysis is conducted during a time-period when travelling, although being fairly possible, was still very constrained and markedly expensive in terms of cost and time; therefore, distance mattered. This is not to say that the covered composers have not been mobile, in fact, famous composers have exhibited remarkable migration patterns (O'Hagan and Borowiecki, 2010; Borowiecki and O'Hagan, 2012). Our hypothesis is, however, that the destinations from their moves were influenced by geographic distance. The validity of the IV is high as long as a composer's longevity depends on his experienced concentration intensity or time, and the birth centrality variable impacts his longevity only through its impact on the concentration measures. As a composer residing in the vicinity of Paris and Vienna might experience spill-over effects resulting from proximity (e.g., better access to health care), we treat all locations within a radius of 80 km from Paris or Vienna as the geographic cluster itself.

Our proposed IV-identification seems to satisfy the condition of a random assignment: birth location cannot be influenced by the individual after he was born and births are, to some extent, uniformly dispersed over geographical space. Furthermore, there is relatively little parental choice over location of birth, perhaps due to the nature of the time period when migration was difficult. This argument is supported in Borowiecki (2013), who finds that the number of composers born to parents with a music background is not significantly larger in “music hubs”. To test the robustness of our IV-instrument, we present a reduced form model in the latter part of this study and find that birth centrality has no direct significant relationship with longevity (see Table 4); providing further support for the validity of the instrument.

An alternative IV could be the total number of civil war years that affected the country of each location in a 50-year time interval *before* the composer was born. This alternative IV-specification delivers very similar results to the ones presented here (not reported).

Formally, the first-stage regression in the IV-specification is given by:

Table 2
Longevity and geographic clustering.[a]

	Ordinary least squares estimates[b]			
	(1)	(2)	(3)	(4)
Number of Composers[c]	−2.28*** (0.733)			
(Number of Composers)^2	0.072** (0.034)			
Share of Composers[d]		−0.987** (0.475)		
(Share of Composers)^2		0.013 (0.01)		
Relative Time Spent in Clusters[e]			−0.527*** (0.183)	
(Relative Time Spent in Clusters)^2			0.007*** (0.002)	
Quality of Composers[f]				−0.219* (0.115)
(Quality of Composers)^2				0.001 (0.001)
Time of Birth Effects	Yes	Yes	Yes	Yes
Country of Birth Effects	Yes	Yes	Yes	Yes
Observations	144	144	144	144
R^2	0.138	0.132	0.118	0.112

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Notes: The dependent variable is longevity. Regressions are Ordinary Least Squares (OLS).
[a] Robust standard errors clustered at the geographic level are reported in parentheses. Each specification contains a constant (not reported).
[b] Estimates are based on the four measures of peer competition and their quadratic term: (i) Number of Composers, (ii) Share of Composers, (iii) Relative Time Spent in Clusters, and (iv) Quality of Composers.
[c] Measures the lifetime average of composers located in the same city.
[d] Measures the lifetime average share of composers located in the same city.
[e] Measures the share of a composer's life that he spent in Paris or Vienna.
[f] Measured as the sum of Murray's index scores of composers located in the same time and place, expressed as the lifetime average.

Table 3
Longevity and geographic clustering controlling for heterogeneity between composers.

	Panel A: Composer background Variables				Panel B: Average city population			
	OLS estimates[a,b]				OLS estimates[a,b]			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Number of Composers[c]	−2.248*** (0.768)				−2.936*** (0.721)			
(Number of Composers)^2	0.069* (0.035)				0.096*** (0.035)			
Share of Composers[d]		−0.984* (0.499)				−1.217*** (0.439)		
(Share of Composers)^2		0.013 (0.011)				0.017* (0.01)		
Relative Time Spent in Clusters[e]			−0.538*** (0.187)				−0.506** (0.219)	
(Relative Time Spent in Clusters)^2			0.007*** (0.002)				0.007** (0.003)	
Quality of Composers[f]				−0.23* (0.134)				−0.309*** (0.108)
(Quality of Composers)^2				0.001 (0.001)				0.001* (0.0007)
Murray's Index Score	−0.023 (0.14)	−0.033 (0.141)	0.012 (0.133)	0.073 (0.166)				
Father's Music Engagement	−1.349 (2.197)	−1.138 (2.099)	−0.709 (2.171)	−1.415 (2.187)				
Mother's Music Engagement	−0.567 (2.652)	−1.238 (2.694)	−0.631 (3.144)	−1.213 (2.7)				
Family's Music Engagement	−0.927 (2.512)	−0.605 (2.504)	−1.912 (2.395)	−0.672 (2.473)				
Average City Population (thousands)					6.828** (3.375)	5.418 (3.297)	4.843 (3.147)	6.133* (3.499)
(Average City Population)^2					−0.537 (0.429)	−0.365 (0.42)	−0.392 (0.387)	−0.499 (0.433)
Time of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144	144	144	144	139	139	139	139
R^2	0.142	0.136	0.122	0.118	0.197	0.181	0.146	0.165

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Notes: The dependent variable is longevity. Regressions are Ordinary Least Squares (OLS).
[a] Robust standard errors clustered at the geographic level are reported in parentheses. Each specification contains a constant (not reported).
[b] OLS estimates are based on the four measures of peer competition and their quadratic term: (i) Number of Composers, (ii) Share of Composers, (iii) Relative Time Spent in Clusters, and (iv) Quality of Composers.
[c] Measures the lifetime average of composers located in the same city.
[d] Measures the lifetime average share of composers located in the same city.
[e] Measures the share of a composer's life that he spent in Paris or Vienna.
[f] Measured as the sum of Murray's index scores of composers located in the same time and place, expressed as the lifetime average.

Table 4
Results from the instrumental variable approach on longevity and geographic clustering.

Dependent Variable	Number of composers	Longevity	Share of composers	Longevity	Relative time spent in clusters	Longevity	Sum of Indices of fellow composers quality	Longevity
Birth Centrality[a]	0.097* (0.048)		0.194* (0.106)		0.344** (0.131)		0.545 (0.384)	
Number of Composers[b]		−3.182* (1.719)						
Share of Composers[c]				−1.598* (0.917)				
Relative Time Spent in Clusters[d]						−0.787** (0.35)		
Quality of Composers[e]								−0.568 (0.416)
Time of Birth Effects	Yes		Yes		Yes		Yes	
Country of Birth Effects	Yes		Yes		Yes		Yes	
Observations	144		144		144		144	
R^2	0.772		0.743		0.702		0.700	
Under Identification Test[f]	2.248		2.062		2.804		1.366	
Weak Identification Test[g]	33.424		25.473		16.966		14.354	

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Notes: Robust standard errors are reported in parentheses. Each specification contains a constant which is not reported.
[a] Birth Centrality measures the average distance between a composer's place of birth and the two main destinations for music (Paris and Vienna).
[b] Measures the lifetime average of composers located in the same city.
[c] Measures the lifetime average share of composers located in the same city.
[d] Measures the share of a composer's life that he spent in Paris or Vienna.
[e] Measured as the sum of Murray's index scores of composers located in the same time and place, expressed as the lifetime average.
[f] Instrumental Variable first-stage results presented in uneven columns. Kleibergen-Paap LM statistic is reported.
[g] Instrumental Variable first-stage results presented in uneven columns. Cragg-Donald minimum eigenvalue statistic is reported; values exceeding the critical value (16.38) reduce the risk of weak instrument bias.

$$Competition = \alpha_0 + \alpha_1 Dis\tan ce_{Birthplace,Main\ Cities} + \alpha_3 TBirth + \alpha_4 CBirth + \varepsilon \quad (2)$$

4. Empirical results

Composer characteristics are summarised in Table 1, and include: place of birth, longevity, career duration, ability (i.e., Murray's index score), and indicators for the presence of music-related engagement of family members (Panel A). In Panels B and C, we report the frequency of time period covered and country of birth. Panel D provides statistics on the experienced concentration and clustering measures. There were an average of six additional composers based in the same city in each given year. The relative share of fellow composers located in the same city is 11.6 percent, meaning that nearly 12% of prominent composers were based in the same city in a given year. Composers spent almost a quarter of their life (22%) in one of the two main clusters: Paris and Vienna. The relative share of fellow composers located in the same city increases to ~30% if geographical clustering expands to incorporate London, Moscow and Berlin. The sum of Murray's index scores of fellow composers based in the same location and time (i.e., *the Quality of Composers*) is equal to 50. Panel E provides information on the overall population of cities visited by composers. The average city size was about 2.3 million, and composers' spent nearly three-fourths (74.8%) of their working life in larger cities, with greater than the average city visited.

It is noteworthy that important cluster locations were selected using a ranking system based on the number of occurrences a city was identified as a composer's primary destination (i.e., where he spent the longest period of his working life). Paris is the single most important location in this time-period, followed by Vienna, and then by London, Moscow and Berlin (see Table A2 in the Appendix).

The main results are presented in Table 2. Columns (1)–(4) provide OLS estimates based on Equation (1) for each of the four measures of peer competition: (i) *Number of Composers*, (ii) *Share of Composers*, (iii) *Relative Time Spent in Clusters*, and (iv) *Quality of Composers*. Peer competition has a negative and statistically significant impact on longevity, irrespective of how it is measured. The quadratic term, which is statistically significant in two of the four cases, is always positive, indicating the effects of peer competition on longevity are non-linear. Geographic concentration is detrimental to the longevity of a composer, but the effect decreases in its strength at higher concentrations. According to these estimates, an additional composer located in the same city throughout life reduces longevity on average, by 2.2 years. This marginal increase is very large considering there were only six composers, on average, located in the same city at the same time (Table 1). In other words, an increase of one percent in composers' population is associated with a decrease in longevity by 7.2 weeks. The second measure implies that a one percentage point increase in composers located at the same place and time throughout a composer's life reduces his longevity by almost one year. Also here the average composer share of 11.6 percent is relatively low, implying that a one percentage point increase constitutes actually a very large change. Alternatively, one could recalculate the effect as a response to a one percent increase in the average share of composers; yielding a sizable longevity decrease of about 5.9 weeks. The third measure indicates that an extra year spent in one of the predominant clusters for music reduces longevity by about six months. Finally, an increase by one point on Murray's index score of fellow composers located in the same time and place is associated with a drop in longevity by around 2.6 months.

Next, to control for the heterogeneity between composers, we repeat estimations based on Equation (1) by including all available composer records (Table 3, Panel A). The estimates of the peer-concentration measures are robust across specifications. Interestingly, Murray's index score and family members' engagement in music are not significant in any of our models. Simply put, the concentration measures overwhelm all other potential personal factors in determining longevity, in particular, individuals' background variables have the least impact on mitigating the effect of experienced peer pressure. Nonetheless, it is important to note that the limited availability of individual level variables could mean that this finding may not be generalisable.

Notably, a source of imprecision arising from unobserved variables could come from variation in the overall city size. For example, the risk of disease contagion may be higher in large cities and therefore the average citizen would suffer from agglomeration diseconomies in terms of poorer health and, consequently, longevity. To account for this, we include additional data on city population collected from Mitchell (1975, 1988), with statistics available for most of the cities covered (typically for the years 1800, 1850, 1900 and 1950). The series was interpolated for the years not covered, and linked with our data on the work location of each composer in every year of his life as an estimate of the average city population each composer experienced.

Results are reported in Table 3, Panel B. In two out of the four specifications the average city population estimate is positive, offering some evidence that composers lived longer in larger cities. This result may be attributable to the presence of large city amenities, such as health care infrastructure. The association is estimated at a decreasing rate, although the estimates of the quadratic term are not statistically significant. Even so, the four variables measuring peer competition are estimated with equally high, if not greater, statistical precision and remain robust in terms of strength and direction. These results remain consistent if average city population is measured at logs instead, or if alternative city population measures are included (e.g., the share of a composer's working life spent in cities greater than the average). Overall, these results support the view that – beyond the, arguably, positive impact large cities have on longevity – peer competition experienced in cities constitutes a negative externality on a composer's well-being.

In an attempt to account for the potential endogeneity of the peer concentration variables, we use the average geographic distance between composers' place of birth and the two main cities for music, i.e., Paris and Vienna, as an IV. Since we have just one instrument, we are forced to restrict the model to one endogeneous variable, which allows us to shed light only on the existence of a linear effect. Table 4 presents the first- and second-stage results for the IV-identification. As can be viewed in the odd-numbered columns, birth centrality is a significant determinant of the first three concentration measures (i.e., Number of Composers, Share of Composers, and Relative Time Spent in Clusters). This supports our *a priori* hypotheses due to the expensive nature of travelling long distances during this time period. Of note, due to the relatively small number of observations, the 10% significance level is considered appropriate and was used in this study.

The identification strategy would be considered invalid if the IV had a direct impact on longevity; however, a reduced form model of the IV on longevity does not return any statistically significant estimates (see Table A3 in the Appendix). While this is not a perfect test for the fulfilment of the exclusion restriction, it does provide some support of its validity. To determine the quality of the instrument, we examine the results of the Under Identification and Weak Identification Tests (Table 4). In two cases, the Kleibergen-Paap LM statistic is just at the significance border, whereas in the strongest specification for the relative time spent in Paris or Vienna, it indicates the model to be well identified. In the Weak Identification Test, we report Cragg-Donald minimum eigenvalue statistic, which have the critical value of 16.38 for a model with one endogenous regressor and one instrument (Stock and Yogo, 2005). The reported Cragg-Donald eigenvalue statistics, reported at the bottom of each of the initial three models, exceed the critical values and hence mitigate the risk of weak instrument bias.

The even columns in Table 4 present the instrumented coefficients, which are negative and statistically significant. As a result of a one percentage increase in the number of composers located in the city, a composer's life would be shortened by 10 weeks. The causal effect of a one percent increase in the average share of composers would yield a sizable longevity decrease of about 9.6 weeks. Again, due to the low mean value for the *Share of Composers* variable, we express the change in longevity as *one percent* rather than one percentage point. Finally, the third measure indicates that an extra year spent in one of the predominant clusters for music reduces longevity by about nine months.

To ensure the validity of the main OLS findings we perform a series of robustness checks, reported in Tables A4 and A5 in the Appendix. Our findings do not depend on the inclusion of composers who suffered a long-term illness (i.e., Frederic Chopin, Anatol K. Liadov, Albert Roussel, and Maurice Ravel). They also do not depend on a composer having spent the majority of his life in locations where his Murray's index score was below average, which is in line with the argument that relative (under-) performance may have been most related to the well-being of a person. Nor do they depend on whether a composer enjoyed early success in his career, defined as the number of important pieces written by the age of 30, using Gilder and Port's (1978) sub-sample of 97 composers listed in Murray (2003). Moreover, these findings do not depend on inclusion of composers who were located in a city where a large epidemic occurred, such as the cholera outbreak in Paris in 1832, or those who were located in a country where a war occurred (Alban Berg, Henry Cowell, Nikolay Myaskovsky, Carl Orff, Richard Wagner and Ralph Vaughan Williams served in the army during war). Finally, we estimate our models using the composer's exact date of birth in addition to controlling for the half-century of birth (Table A4). Here we find that composers born later in time live longer, a trivial result given the advancement of medical care, nutrition and public health interventions (e.g., public hygiene, sanitation, water purity) that occurred over time (Meeker, 1972; Condran and Crimmins-Gardner, 1978; Fogel, 2004). In all cases the statistical significance of the coefficients of the main variables of interest remains unaffected, and the estimates change marginally.

As already mentioned, 19th century composers were often involved in other music-related occupations. Indeed, Grove Music Online (2009) only lists 48% as 'composers' only, while the remaining composers are listed with additional occupations (of historical significance): 21% are listed as performers (usually pianists or violinists), 19% as conductors, and 20% as teachers. Other occupations too infrequently to be explored statistically; for example, nine were critics, two were poets, and two were publishers/editors. Several composers held more than one additional occupation; therefore the percentages do not sum to 100%. The main results of the competition measures remain robust after controlling for these additional occupations (Table A5 in the Appendix). In one specification the coefficient for performers is negative and statistically significant, implying that performers may have lived shorter lives, on average. For conductors and teachers the coefficients are consistently positive, and in some cases significant. It is difficult to assess whether being these occupations are conducive to longevity, or do these findings indicate that those who lived long enough became involved in such activities; after all, these occupations require a certain degree of composer maturity.

In a final robustness test, we consider the interaction between the peer competition measures and the composer's own quality (Table A5). Encouragingly, the main results regarding the impact of competition on longevity are not affected. The interaction terms between the competition measures and quality are negative with some reaching statistical significance. Keeping in mind that our sample covers "winners" only (i.e., prominent composers), our interpretation suggests that in order to become "better" (i.e., obtain a higher index score), one needs to strive particularly hard to achieve prominence, which may have adverse health implications and decreased longevity.

5. Discussion

This study provides an analysis of the relationship between longevity and location in highly concentrated centers, where job aspirations and competition between peers are arguably at their peak. The lack of adequately disaggregated data on the geography of well-being is overcome by focussing on historical data for individuals belonging to a specific profession: 19th century music composers. The use of several measures approximating for peer competition delivers consistent results, implying that composers' longevity was significantly reduced in dense agglomerations for music. These findings results are consistent to a range of robustness tests, including specifications accounting for individual level characteristics, such as composer's quality, city population, and the occurrence of other life events, including wars or pandemics. We shed some light on the plausibly causal relationship between geographic clustering and longevity by applying an IV-approach. All in all, our results support previous studies in the literature focussing on the relationship between peer effects and health outcomes (Redelmeier and Singh, 2001a; Rablen and Oswald, 2008), but our results contribute beyond the existing literature by considering a spatial dimension of these effects.

Anecdotal evidence supporting our results can be found in the biographies of composers who were located in the main locations for music, among other historical records. For example, one of Wagner's rehearsals in Paris was attended by Berlioz, his rival in opera composition. Wagner recalls this encounter in his memoires: "*What is certain is that at that time I felt like a little schoolboy next to Berlioz; (…) Berlioz (…) remained silent throughout; he neither encouraged nor discouraged me, but only sighed with a weary smile that 'things in Paris were difficult'*." The complex and evolving relationship between the two composers lasted, and was independent of their actual location. Nonetheless, it originated from the incidence of locating at the same place and time. Interestingly, this particular relationship points at a further source of distress: while Wagner did acknowledge Berlioz's genius and his debt to him, Berlioz, for most of his life, withheld from Wagner the recognition that he craved.

The fierce competition between peers often led to depression and nervous breakdowns, as was the case for Maurice Ravel, who was diagnosed with neurasthenia in 1912 immediately after the gruesome failure of his ballet 'Daphnis et Chloe'. Presumably, it was because Ravel's performance had been overshadowed by an unrivalled concert ten days earlier of Debussy's 'Prelude to the Afternoon of a Faun'. In addition to serious mental health issues, peer competition often turned friends to rivals. For example, Chopin and Liszt, once considered close friends, became "frenemies" (Roy, 2014). Their interactions, plausibly due to the competitive nature of the city, turned into "*singularly unpleasant and vindictive*".

It is well established that peer effects associated with geographic clusters have positive externalities, such as knowledge spill-over. The first fundamental theorem of welfare economics also argues that competition is indispensable in producing Pareto-optimal outcomes. This study however, suggests that the allocative advantages associated with competition could come at a non-negligible cost of a shorter life. This study provides the lower bound of this negative externality; it is possible that peer competition had an adverse effect on numerous other composers who died young and never reached their aspired level of success. To the extent that they published any music work, these composers could be identified via special music libraries, such as the Petrucci Music Library. Yet, tracking down their biographical details, including information on their geographical movements and time spent in music clusters is not as trivial. Hence, these composers remain unobserved in this research. Another possibility is that prospective composers eventually switched careers because of intense peer competition and related difficulties in succeeding as a composer. The possibility that composers were well aware of the potentially negative effects of relocation on longevity cannot be overlooked either. It might well be the case that these individuals, who were predominantly driven by their aspirations and work-related goals, and also placed little value on their future states of health (Fuchs, 1982).

5.1. Limitations

This study does not come without limitations. The IV-specification does not account for non-linear effects, and it is extremely likely that some of the detrimental effects work at a decreasing rate. Moreover, despite conducting additional robustness tests, the coefficients of the concentration variables, at times, were rather large. These observations could be attributed to other, unobservable factors that underlie the well-being of composers in each of the cluster locations. It is plausible that the higher level of competition affects not only the emotional state of each composer, but also their economic well-being. With a greater number of composers in a music agglomeration, the artists may experience increased difficulty in finding employment opportunities, which in part, could be due to the limited cultural infrastructure found in any typical city at the period studied. Furthermore, alternative income sources, such as private music tuition, may have been relatively unattractive due to the over-supply of music teaching services. The fact that artists earn minimal income has been documented before (Abbing, 2002) and it is likely exacerbated in a dense agglomeration. Finally, the evidence presented is in this study is based on a specific sample of working individuals over a focused historical time-period. Thus, any generalizations of the findings of this study should be attempted with caution.

5.2. Conclusion

This study presents novel and robust evidence on the adverse effects of peer competition on longevity. Remarkably, the results imply little variation in the competition effect across composers covered, indicating that individuals' background, including social standing or quality, may have minimal impact on mitigating the effect of experienced peer pressure. These results suggest that competition, besides the widely known economic benefits, may lead to significant negative welfare externalities as well.

Appendix

Table A1
Individual Summary of Key Background Variables for Each Included Composer.

Name	Birth year	City of birth	Primary work location	Longevity	Share of composers	Number of composers	Relative time spent in Paris or Vienna
Adam, Adolphe	1803	Paris	Paris	53	36.6	11.9	0.53
Albeniz, Isaac	1860	Camprodon	Barcelona	49	3.3	1.9	0.02
Alfano, Franco	1875	Posillipo	Turin	79	1.8	1.2	0.00
Arensky, Anton Stepanovich	1861	Novgorod	Moscow	45	5.1	3.0	0.00
Auric, Georges	1899	Lodève	Paris	83	20.0	9.9	0.84
Balakirev, Mily Alekseyevich	1836	Nizhniy Novgorod	St Petersburg	74	9.2	4.5	0.00
Bartok, Bela	1881	Nagyszentmiklos	Budapest	64	5.0	3.4	0.06
Bax, Sir Arnold	1883	Streatham	London	70	5.9	4.5	0.00
Bellini, Vincenzo	1801	Catania	Milan	34	17.3	5.5	0.09
Benoit, Peter	1835	Harlebeke	Antwerp	65	5.2	2.0	0.02
Berg, Alban	1885	Vienna	Vienna	50	7.6	5.8	0.48
Berlin, Irving	1888	Mogilyov	New York	99	10.5	5.8	0.00
Berlioz, Hector	1803	Cote-Saint-Andre	Paris	66	38.1	13.1	0.53
Bizet, Georges	1838	Paris	Paris	37	38.3	14.6	0.43
Bliss, Sir Arthur	1891	London	London	84	5.2	2.6	0.00
Bloch, Ernest	1880	Geneva	San Francisco	79	2.5	1.9	0.01
Boito, Arrigo	1842	Padua	Milan	75	3.7	2.1	0.00
Borodin, Aleksandr	1833	St Petersburg	St Petersburg	54	11.2	4.7	0.00
Brahms, Johannes	1833	Hamburg	Vienna	64	7.4	3.5	0.56
Bruch, Max	1838	Cologne	Berlin	82	3.0	2.2	0.00
Bruckner, Anton	1824	Linz	Vienna	72	4.1	2.0	0.40
Bruneau, Alfred	1857	Paris	Paris	76	27.0	18.4	0.68
Busoni, Ferruccio	1866	Empoli	Berlin	58	5.2	3.6	0.02
Casella, Alfredo	1883	Turin	Rome	64	10.3	7.7	0.20
Chabrier, Alexis	1841	Ambert	Paris	53	36.0	16.2	0.62
Chausson, Ernest	1855	Paris	Paris	44	30.3	16.9	0.43
Chavez, Carlos	1899	Mexico City	Mexico City	79	0.8	0.5	0.00
Chopin, Fryderyk Franciszek	1810	Warsaw	Paris	39	39.4	13.6	0.23
Cornelius, C. Peter	1825	Mainz	Munich	49	1.9	0.7	0.12
Cowell, Henry	1897	California	Berkeley	68	6.1	2.5	0.00
Cui, Cesar	1835	Vilnius	St Petersburg	83	8.7	4.4	0.00
Dargomizhsky, Aleksandr Sergeyevich	1813	Troitskoye	St Petersburg	56	6.4	2.2	0.00
David, Felicien	1810	Cadenet	Paris	66	39.3	13.8	0.62
Debussy, Claude	1862	St Germain-en-Laye	Paris	56	27.0	17.4	0.70
Delibes, Clement	1836	St Germain du Val	Paris	54	38.5	15.7	0.70
Delius, Frederick	1862	Bradford	Paris	72	17.5	11.8	0.38
Dohnanyi, Ernst von	1877	Bratislava	Budapest	83	4.1	2.8	0.00
Dukas, Paul	1865	Paris	Paris	70	26.0	18.2	0.70
Duparc, Henri	1848	Paris	Paris	84	37.2	15.4	0.20
Durey, Louis	1889	Paris	St. Tropez	89	2.8	2.2	0.08
Dvorak, Antonin	1841	Nelahozeves	Prague	63	5.2	2.9	0.02
Elgar, Edward	1857	Worcester	London	77	7.4	5.3	0.00
Ellington, Duke	1899	Washington	New York	74	10.4	4.6	0.00
Enesco, Georges	1881	Liveni Virnav	Paris	74	21.3	14.7	0.69
Falla, Manuel de	1876	Cadiz	Granada	70	4.6	3.7	0.11
Faure, Gabriel	1845	Pamiers	Paris	79	29.7	17.4	0.72
Fibich, Zdenek	1851	Všebo?ice	Prague	50	5.7	2.7	0.02
Flotow, Friedrich Freiherr von	1812	Toitendorf	Paris	71	21.0	7.1	0.32
Franck, Cesar	1822	Liege	Paris	68	39.1	15.3	0.71
Franz, Robert	1815	Halle	Leipzig	77	0.0	0.0	0.00
Gade, Niels Wilhelm	1817	Copenhagen	Copenhagen	73	3.2	1.2	0.00
Gerhard, Roberto	1896	Valls	Cambridge	74	0.2	0.0	0.00
Gershwin, George	1898	New York	New York	39	8.7	6.6	0.00
Glazunov, Aleksandr Konstantinovich	1865	St Petersburg	St Petersburg	71	9.5	6.4	0.11
Glier, Reingol'd Moritsevich	1875	Kiev	Moscow	81	3.6	2.3	0.00
Glinka, Mikhail Ivanovich	1804	Novospasskoye	St Petersburg	53	19.8	6.4	0.17
Gottschalk, Louis	1829	New Orleans	Paris	40	9.7	3.0	0.05
Gounod, Charles-Francois	1818	Paris	Paris	75	36.7	14.6	0.60
Granados, Enrique	1867	Lerida	Barcelona	49	5.3	4.0	0.00
Grieg, Edvard Hagerup	1843	Bergen	Bergen	64	0.4	0.2	0.00
Haba, Alois	1893	Vizovice	Prague	80	3.7	2.0	0.05
Harris, Roy	1898	Chandler	Stockton	81	2.3	0.9	0.01
Hauer, Josef	1883	Wiener Neustadt	Vienna	76	5.4	3.7	0.63
Hindemith, Paul	1895	Frankfurt	Blonay, Switzerland	68	1.8	1.2	0.00
Holst, Gustav	1874	Cheltenham	London	60	8.1	6.1	0.00
Honegger, Arthur	1892	Le Havre	Paris	63	22.2	14.5	0.63

Table A1 (*continued*)

Name	Birth year	City of birth	Primary work location	Longevity	Share of composers	Number of composers	Relative time spent in Paris or Vienna
Humperdinck, Engelbert	1854	Siegburg	Berlin	67	4.8	3.3	0.03
Ibert, Jacques	1890	Paris	Paris	72	20.7	12.4	0.56
Ives, Charles Edward	1874	Danbury	New York	80	7.4	4.7	0.00
Janacek, Leos	1854	Hukvaldy	Brno	74	0.4	0.2	0.00
Kern, Jerome	1885	New York	New York	60	8.3	6.1	0.00
Kjerulf, Halfdan	1816	Oslo	Oslo	52	0.0	0.0	0.00
Kodaly, Zoltan	1882	Kecskemet	Budapest	85	3.2	1.9	0.00
Koechlin, Charles	1868	Paris	Paris	82	22.7	16.1	0.65
Lalo, Edouard	1823	Lille	Paris	69	38.8	15.5	0.67
Lanner, Josef	1801	Vienna	Vienna	41	12.5	3.8	0.59
Lecocq, Charles	1832	Paris	Paris	86	30.1	15.5	0.71
Leoncavallo, Ruggero	1857	Naples	Milan	62	14.1	8.3	0.21
Liszt, Franz	1811	Raiding	Weimar	75	0.5	0.2	0.00
Lortzing, Albert	1802	Berlin	Leipzig	48	4.2	1.4	0.04
Macdowell, Edward	1860	New York	New York	48	2.2	1.5	0.00
Mackenzie, Alexander	1848	Edinburgh	London	86	5.7	4.0	0.00
Mahler, Gustav	1860	Iglau	Vienna	51	4.2	2.7	0.22
Malipiero, Gian Francesco	1882	Venice	Venice	91	3.0	1.6	0.01
Martin, Frank	1890	Geneva	Amsterdam	84	2.3	0.6	0.00
Martinu, Bohuslav	1890	Policka	Paris	69	13.7	8.9	0.22
Mascagni, Pietro	1863	Livorno	Rome	82	4.5	3.0	0.02
Massenet, Jules Emile Frederic	1842	Montaud	Paris	70	31.3	16.7	0.67
Milhaud, Darius	1892	Marseilles	Paris	82	19.1	10.7	0.57
Musorgsky, Modeste Petrovich	1839	Karevo	St Petersburg	42	12.3	4.9	0.00
Myaskovsky, Nikolay	1881	Modlin	Moscow	69	4.1	2.8	0.00
Nielsen, Carl	1865	Sortelung	Copenhagen	66	2.3	1.5	0.02
Novak, Vitezlsav	1871	Kamenice nad Lipou	Prague	78	3.2	2.3	0.00
Offenbach, Jacques	1819	Cologne	Paris	61	41.1	14.6	0.75
Orff, Carl	1895	Munich	Munich	87	0.0	0.0	0.00
Parker, Horatio	1864	Auburndale	New Haven, CT	55	0.6	0.4	0.00
Pfitzner, Hans	1869	Moscow	Munich	79	1.5	1.0	0.00
Pijper, Willem	1895	Zeist	Rotterdam	53	0.3	0.3	0.00
Piston, Walter	1894	Rockland	Boston	82	4.7	2.2	0.02
Pizzetti, Ildebrando	1880	Parma	Rome	88	2.6	1.3	0.00
Poulenc, Francis	1899	Paris	Paris	64	21.1	12.7	0.70
Prokofiev, Sergey	1891	Sontsovka	St Petersburg	62	11.3	8.2	0.18
Puccini, Giacomo	1858	Lucca	Torre de Lago	66	1.8	1.4	0.00
Rachmaninoff, Serge	1873	Oneg	Moscow	70	11.7	8.6	0.19
Ravel, Maurice	1875	Ciboure	Paris	62	25.2	19.2	0.50
Reger, Max	1873	Brand	Leipzig	43	1.1	0.9	0.00
Respighi, Ottorino	1879	Bologna	Rome	57	3.5	2.6	0.00
Reyer, Ernest	1824	Marseilles	Paris	84	35.3	15.9	0.73
Rimsky-Korsakov, Nikolay Andreyevich	1844	Tikhvin	St Petersburg	64	10.3	5.5	0.02
Roussel, Albert	1869	Tourcoing	Paris	68	12.3	9.5	0.22
Ruggles, Carl	1876	East Marion	Arlington, VT	95	1.1	0.8	0.00
Saint-Saens, Camille	1835	Paris	Paris	86	32.1	16.9	0.74
Satie, Erik	1866	Honfleur	Paris	59	26.3	18.2	0.61
Schmitt, Florent	1871	Blâmont	Paris	87	20.2	13.3	0.60
Schoenberg, Arnold	1874	Vienna	Vienna	77	6.6	4.6	0.34
Schreker, Franz	1878	Monaco	Vienna	55	7.1	5.2	0.47
Schumann, Robert	1810	Zwickau	Leipzig	46	5.1	1.7	0.02
Scryabin, Alexander	1872	Moscow	Moscow	42	7.6	5.2	0.07
Sessions, Roger	1896	New York	Princeton	89	0.4	0.3	0.00
Sibelius, Jean	1865	Hämeenlinna	Helsinki	92	0.6	0.4	0.01
Sinding, Christian	1856	Kongsberg	Oslo	85	0.3	0.2	0.00
Smetana, Bedrich	1824	Litomysl	Prague	60	3.5	1.4	0.00
Stanford, Sir Charles Villiers	1852	Dublin	London	72	6.7	4.7	0.00
Strauss, Johann (Jr.)	1825	Vienna	Vienna	74	8.5	3.8	0.77
Strauss, Richard	1864	Munich	Vienna	85	4.8	3.5	0.26
Stravinsky, Igor	1882	St Petersburg	Los Angeles	89	11.4	7.2	0.15
Sullivan, Sir Arthur	1842	London	London	58	5.9	3.0	0.03
Szymanowski, Karol	1882	Tymoszowka	Warsaw	55	7.2	5.6	0.15
Taneyev, Sergei	1856	Vladimir	Moscow	59	4.4	2.7	0.00
Tchaikovsky, Pyotr Il'yich	1840	Kamsko-Votkinsk	Moscow	53	3.7	1.8	0.00
Thomas, Ambroise	1811	Metz	Paris	85	36.7	14.5	0.73
Thomson, Virgil	1896	Kansas City	New York	93	22.5	6.9	0.16
Varese, Edgard	1883	Paris	New York	82	14.3	8.9	0.16
Vaughan Williams, Ralph	1872	Down Ampney	London	86	4.9	3.1	0.00
Verdi, Giuseppe	1813	Roncole	Milan	88	10.8	4.5	0.11
Villa-Lobos, Heitor	1887	Rio de Janeiro	Rio de Janeiro	72	8.0	4.7	0.22
Vogel, Wladimir	1896	Moscow	Zurich	87	5.5	1.8	0.00

(*continued on next page*)

Table A1 (*continued*)

Name	Birth year	City of birth	Primary work location	Longevity	Share of composers	Number of composers	Relative time spent in Paris or Vienna
Wagner, Richard	1813	Leipzig	Zurich	70	5.0	1.6	0.04
Webern, Anton	1883	Vienna	Vienna	62	5.6	4.1	0.47
Wellesz, Egon	1886	Vienna	Oxford	88	3.4	2.6	0.34
Wolf, Hugo	1860	Windischgraz	Vienna	43	7.9	4.6	0.47
Wolf-Ferrari, Ermanno	1876	Venice	Venice	72	1.0	0.7	0.00
Zemlinsky, Alexander von	1872	Vienna	Vienna	69	6.6	4.5	0.35
d'Indy, Vincent	1851	Paris	Paris	81	27.9	18.0	0.70

Table A2
Important Cities for Music Composers.

Primary destination (in composers)	
Paris	38
Vienna	13
London	8
Moscow	7
Berlin	6
Milan	4
Leipzig	4
Prague	4
Rome	4
Budapest	3

Table A3
Longevity and Birth Centrality (Reduced-Form).

	Longevity[a]
Birth Centrality	0.019 (4.862)
Time of Birth Effects	Yes
Country of Birth Effects	Yes
Observations	144
R^2	0.127

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Notes.
[a] Longevity is the dependent variable; regressions are estimated using ordinary least squares (OLS). Standard errors are clustered at the main destination level and reported in parentheses. Each specification contains a constant which is not reported.

Table A4
Robustness Checks on the Main Measure of Competition: Longevity.[a]

	Longevity							
	Migration history	Illness	Below-average quality	Important output (age <30 yr)	Pandemics	War controls	Composers served in army excluded	Birth year
Number of Composers [b]	−2.417*** (0.71)	−2.293*** (0.7898)	−2.097** (0.873)	−2.212** (0.885)	−2.319*** (0.719)	−2.266*** (0.71)	−2.003*** (0.702)	−2.146*** (0.63)
(Number of Composers)^2	0.079** (0.033)	0.081** (0.037)	0.068 (0.047)	0.084* (0.042)	0.069* (0.034)	20.071** (0.033)	0.059* (0.032)	0.08*** (0.029)
Number of moves across countries	0.189 (0.239)							
Majority of Share of Life spent as ‘below average composer’			−3.372 (2.989)					
Important Works Written (Age <30 year)				0.256 (0.286)				
Number of years composer exposed to active war						1.178 (4.129)		
Birth Year								0.267*** (0.06)
Time of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Country of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144	140	144	97	141	144	138	144
R^2	0.14	0.129	0.147	0.131	0.147	0.139	0.126	0.204

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Notes: The dependent variable is longevity.
[a] Robust standard errors clustered at the geographic level are reported in parentheses. Each specification contains a constant (not reported).
[b] Measures the lifetime average of composers located in the same city; quadratic term.

Table A5
Longevity and Geographic Clustering: Additional Tests for Robustness.

	Panel A: Additional occupation[a,b]				Panel B: Competition × quality interaction[a,b]			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Number of Composers [c]	−1.981** (0.787)				−2.2*** (0.73)			
(Number of Composers)^2	0.061* (0.036)				0.08** (0.033)			
Share of Composers [d]		−0.958** (0.472)				−0.968* (0.482)		
(Share of Composers)^2		0.013 (0.01)				0.015 (0.011)		
Relative Time Spent in Clusters [e]			−0.489** (0.183)				−0.501*** (0.174)	
(Relative Time Spent in Clusters)^2			0.007*** (0.002)				0.007*** (0.002)	
Quality of Composers [f]				−0.219* (0.116)				−0.252* (0.141)
(Quality of Composers)^2				0.001 (0.001)				0.001 (0.001)
Occupation: Performer	−5.734 (3.821)	−6.108 (4.122)	−8.309** (3.512)	−6.499 (3.878)				
Occupation: Conductor	3.513* (1.960)	3.172 (2.029)	3.857* (2.162)	2.819 (2.126)				
Occupation: Teacher	4.365 (2.94)	4.491 (2.707)	3.889 (2.676)	5.002* (2.863)				
Murray's Index					0.09 (0.107)	0.074 (0.013)	0.055 (0.123)	0.205 (0.34)
Number of Composers × Index					−0.021** (0.008)			
Share of Composers × Index						−0.009** (0.003)		
Relative Time Spent in Clusters × Index							−0.002 (0.003)	
Quality of Composers × Index								−0.002 (0.004)
Time of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of Birth Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144	144	144	144	144	144	144	144
R^2	0.16	0.145	0.172	0.112	0.147	0.14	0.12	0.115

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Notes: The dependent variable is longevity.
[a] Regressions are Ordinary Least Squares (OLS); OLS estimates are based on the four measures of peer competition and their quadratic term: (i) Number of Composers, (ii) Share of Composers, (iii) Relative Time Spent in Clusters, and (iv) Quality of Composers.
[b] Robust standard errors clustered at the geographic level are reported in parentheses; each specification contains a constant (not reported).
[c] Measures the lifetime average of composers located in the same city.
[d] Measures the lifetime average share of composers located in the same city.
[e] Measures the share of a composer's life that he spent in Paris or Vienna.
[f] Measured as the sum of Murray's index scores of composers located in the same time and place, expressed as the lifetime average.

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