Geographic Clustering and Productivity: An Instrumental Variable Approach for Classical Composers

Karol Jan Borowiecki

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Karol Jan Borowiecki
Trinity College Dublin

ABSTRACT

It is difficult to estimate the impact of geographic clustering on productivity because of endogeneity issues. I use birthplace-cluster distance as an instrumental variable for the incidence of clustering of prominent classical composers born between 1750 and 1899. I find that geographic clustering strongly impacts the productivity of the clustering individuals: composers were approx. 33 percentage points more productive while they remained in a geographic cluster. Top composers and composers who migrated to the cluster are the greatest beneficiaries of clustering. The benefit depends on the clustering intensity and has a long-term impact.

Keywords: geographic concentration, cities, mobility, productivity, urban history, composer
JEL Classifications: D24, J24, J61, N90, O47, R11, Z19

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Contact: Trinity College Dublin, Department of Economics, Dublin 2, Ireland. E-Mail: borowiek@tcd.ie.

1. Introduction

The best are located in geographic clusters. In locations with a high concentration of individuals or firms, workers earn more (e.g. Glaeser and Mare, 2001), firms perform better (e.g. Nickell, 1996), visual artists peak earlier (Hellmanzik, 2010); but knowledge on causality is still limited. Are geographic clusters attracting the best or are individuals and firms who cluster the best because of positive externalities associated with cluster locations? In other words, is self-selection driving the empirical evidence on better performance in geographic clusters, or does a clustering benefit exist? This question is of considerable importance not only for individuals or firms that are located in geographic clusters, but also for policymakers who try to replicate the success stories of clusters such as Silicon Valley and create, for example, special economic zones in their regions. However, without knowledge of the causal relationship between clustering and productivity, interventionism can cause harmful distortions to the market (Desrochers and Sautet, 2004).

There is a large body of literature that highlights the association between geographic clustering (or more in general – locating in cities) and productivity (see Rosenthal and Strange, 2004, for a review). However, the existing literature does not always adequately address the endogeneity of clustering to productivity and thus does not convincingly establish a causal relationship. Apart from endogeneity issues, omitted variables (e.g. city size and wealth or the quality of local infrastructure) may drive both clustering and economic outcomes, producing misleading estimates. A further problem arising is that individuals are not homogeneous and it is essential to take account of individual characteristics (Glaeser and Mare, 2001). Ciccone and Hall (1996) tackled first the endogeneity problems and have used macroeconomic series as instrumental variables. However, with the aggregated data series used here it is not possible to control for heterogeneous effects of individuals.[2]

This study addresses both identification issues. The analysis is based on a unique individual-level data set that allows control for individual's heterogeneity and to employ valid individual-based instruments to account for endogeneity and omitted-variable bias. I use exogenous geographic birthplace-cluster distance as an instrumental variable for the incidence of clustering in order to estimate the impact of locating in geographic clusters on productivity. The instrumental variable method makes it credible to assert that the association between clustering and productivity is a causal relationship rather than simply a correlation.

[2] The instrumental variables used, for example, by Ciccone and Hall (1996) are: presence or absence of a railroad in the state in 1860, population of the state in 1850, population density of the state in 1880 and distance from the eastern seaboard of the U.S.

One would expect geographic distance to be a determinant for location choice in historical time periods when traveling was constrained. I therefore chose for the analysis the time period roughly associated with the beginnings and duration of the industrial revolution. In the late 18th and 19th centuries, due to technological inventions such as the railway or the steamboat, travelling was possible, however still very expensive in terms of time and price (see Clark, 2007).[3] I also focus, for several reasons, on only one specific group of individuals – on classical composers. First, as argued by O'Hagan and Borowiecki (2010), composers were highly mobile individuals with a marked need to cluster in order to exploit economies of scale. Composers needed either a symphony orchestra or opera company and the complementary infrastructure, such as concert hall or opera house, in order to perform and test their compositions. Second, composers in the period analyzed were very independent artists with a remarkable entrepreneurial drive (Scherer, 2001); they became market oriented and can be regarded as producers who supply cultural goods (new compositions) and provide certain services, such as teaching, organising tours, performing etc. (Borowiecki, 2010a). Third, the period encompasses many of the most influential composers hence data is relatively available and reliable. A further implicit advantage of the time period chosen is that it covers only deceased composers hence a study of a whole life-time output becomes possible.

The data set employed is extracted from large music dictionaries and it covers a global sample of 116 prominent classical composers born between 1750 and 1899. The emerging picture indicates that in the time period analyzed Paris was the predominant geographic cluster for classical music, followed by Vienna and London. Using valid instruments for the incidence of clustering I explore the causal relationship between working in a cluster and the number of influential compositions. The findings suggest a high and positive cluster effect on composers' productivity who located in the geographic cluster studied (i.e. Paris, Vienna and London). As a result of the positive externalities associated with geographic clusters, composers were up to 33% more productive (i.e. one additional work every four years). Further, I find heterogeneity in the returns: the productivity of the top composers increased by roughly 200% (i.e. 1.5 additional works per annum) and composers who moved to a geographic cluster (i.e. migrant individuals) wrote around 67% more compositions (i.e. one additional work every two years). I further investigate the impact of geographic clustering on composers' lifetime music-related accomplishments (measured with

[3] In the Identification Section I provide further evidence on how geographic distance uniquely determines location choice in historical time periods.

an index score proposed by Murray (2003)) and confirm the results. I also find that the benefit increases with clustering intensity and that the presence of other composers was the most important determinant of the associated productivity gains.

Given the finding that migrant individuals are the greatest beneficiaries of clustering, this study relates also to the elite migration literature (see Commander et al., 2004, for review). The migration of skilled individuals is regarded to be costly for the sending country, because of lost investment in education, high fiscal costs and labor market distortions. Individuals who migrate must experience a sufficiently higher benefit in order to cover the associated cost of moving. Nevertheless usually research “cannot adjudicate on whether migration improves (...) productivity” (Hunter et al., 2009). This article relates also to cultural economics research. Several recent studies demonstrated remarkable clustering patterns of visual artists (O’Hagan and Hellmanzik, 2008) or classical composers (O’Hagan and Borowiecki, 2010). The authors explain the evidence on clustering and speculate about the existence of positive externalities associated with geographic clusters. In this article I am able to analyze their hypothesis and to estimate the clustering benefit in terms of artistic productivity. The results provide important contributions that fill a gap in both strands of the literature.

The remainder of this article is organized as follows. In the next section, I provide an overview of the theory on externalities associated with geographic clusters and discuss the possible mechanism. In the third section, I describe the data. In the fourth section, I discuss the identification strategy. In the fifth section, I present the empirical findings, and in the last section, I provide concluding remarks.

2. The Mechanism

In the following, I describe how locating in a geographic cluster can impact composers’ productivity. I briefly outline formal theories of a benefit associated with geographic clustering, apply the arguments to the case of classical composers and provide anecdotal evidence.

There are three predominant theories that explain the incidence of geographic clustering and advocate the associated benefit of clustering or, in a broader sense, of urbanization. The economics of innovation literature provide arguments on the existence of geographic boundaries to information flows or knowledge spillovers, particularly tacit knowledge (Marshall, 1890, Arrow, 1962, Romer, 1986, Krugman, 2009). It is argued that the concentration of tacit knowledge increases with geographic proximity and leads to faster and easier spillover effects between firms in an industry. In other words, the cost of transmitting knowledge rises with distance; therefore proximity and location matter. The theory applies also to creative industries and classical music composition. In cities with a particularly high concentration of composers, when some kind of face-to-face contact between artists is enabled, synergies and spillovers may positively impact the individual's ability to innovate.

Historical archives assert that close contact and collaboration between prominent composers was common. For example, informal gatherings were repeatedly hosted by colleagues or friends, as recorded in a letter from Carl Kragen to his friend - Robert Schumann (1810-1856):

> *Tomorrow (...) [Franz] Liszt [1811-1886] is to play at our house with [Karol] Lipinski [1790-1861]! Do come for it! Ah, if you could only induce [Felix] Mendelssohn [1809-1847] and his wife to come too!* (Letter of 27 March 1840).

With geographic proximity many professional or private relationships were formed. Among all the composers and musicians Franz Liszt met during his career, his friendship with Hector Berlioz (1803-1869) holds an exceptional place. The relationship between the two towering figures of the musical and cultural world of their time began during Berlioz's first performance of Symphonie Fantastique (1830) at the Paris Conservatoire in the French capital. In a different geographic cluster Berlioz met Richard Wagner (1813-1883). The German composer recollects the encounter as well as his first impression of his new colleague's composition skills as follows:

> *When five years ago destiny brought us closer together in London, I boasted of having an advantage over you: I could understand and appreciate your works perfectly, while you could only get an imperfect idea of mine because of your lack of knowledge of the German language, to which my dramatic conceptions are so closely bound.* (Letter of 22 February1860).

Wagner had also a work relationship with Giacomo Meyerbeer (1791-1864) from whom he received not only financial support but more importantly a recommendation for his works to be staged in Paris in 1840 (Grove 2010). The exchange with Meyerbeer was also of benefit to

Wagner in an inspirational sense – the composition of the Italian master sent his protégé into a state of enthusiastic euphoria:

> *At this time I also saw the "Prophet" for the first time – the prophet of the new world: I felt happy and exalted.* (Letter of 13 March 1850)

The second theory advocating a clustering benefit is posited by Porter (1990). He agrees with the conclusion of Marshall and his followers but suggests a different mechanism. In Porter's view, the local competition in specialized, geographically-concentrated industries is the biggest stimulus for growth. It is posited that the presence of multiple rivaling individuals might be the source of important incentives for out-performing the competitor. Considering the economics of superstars in which a "small numbers of people earn enormous amounts of money and dominate the activities in which they engage" (Rosen, 1981) and a "Winner-Take-All Society" (Frank and Cook, 1995), the importance to write better works than the other individual seems to be of considerable importance also in classical music.

The high concentration of composers might create a very competitive working environment, where only extraordinary performance is acknowledged. Amadeus Mozart (1756-1791) was aware of that and was mostly motivated to make his presence in the French capital:

> *In Paris they are accustomed to hear nothing but Gluck's choruses. Only place confidence in me; I shall strive with all my might to do honor to the name of Mozart. I have no fears at all on the subject.* (Letter of 28 February 1778).

In 1778, the year Mozart spent in Paris, his productivity peaked and he wrote 19 influential compositions (6 concert and 13 chamber works), as recorded in Gilder and Port (1978). Mozart's productivity in Paris was three times higher than his average annual productivity of around 6.6 composition (2.9 concert and 3.2 chamber works). The atmosphere of fierce competition remained in the French metropolis for many following years. One of Wagner's rehearsals in Paris, as described in the composer's memoires, was attended by Berlioz - his rival in opera composition:

> *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'* (Wagner, 2008).

The third theory of positive externalities associated with geographic clusters is proposed by Jacobs (1969), who argues that the most important knowledge transfers come from outside the core industry. The dissemination of complementary knowledge between economic agents of diverse backgrounds facilitates search and experimentation in innovation. In a geographic cluster it is the presence of a high level of diversity that might lead to increasing returns and could give rise to so called "diversification" externalities. Knowledge may spillover between composers specializing in different types of works (e.g. concert or theater works) or between composers and other creative individuals (e.g. writers).

Composers of the time period analyzed were highly literate and fully part of the cultured world of the local elite. The diverse entourage of composers is well documented in a letter from Berlioz to his sister Adele:

> *Last Monday we had a kind of little country outing. My friends came to spend half a day with us. They included famous musicians and poets, Messrs. Alfred de Vigny, Antoni Deschamps, Liszt, Hiller and Chopin. We talked and discussed art, poetry, thought, music, drama, in short everything that constitutes life (…)* (Letter of 12 May 1834).

A letter from Liszt to the Parisian writer George Sand (1804-1876) provides further records of the diverse network of classical composers:

> *As the exigencies of my profession will not allow me leisure to return so soon to Paris, (...) I should beg you to let me do the honors (...) to Chopin* (Letter of 21 May 1845).

Franz Schubert's (1797-1828) tremendous productivity was mostly due to his unique ability to fuse poetry and music. Schubert continually sought out verse that conveyed meaning and was suited through its declamation for musical realization. His assiduous search led him to more than 150 poets, including Schiller, Goethe, Klopstock, and Ruckert. The literary works of Heinrich Heine (1797-1856), who spent the longest part of his career in Paris, were set to music by a number of composers such as Robert Schumann, Johannes Brahms (1833-1897), Hugo Wolf (1860-1903), Pietro Mascagni (1863-1945) and Felix Mendelsohn.

Further location benefits could stem from economies of scale as a result of sharing the same specific cultural infrastructure, for example, a concert hall and symphony orchestra or an opera house and opera company, i.e. infrastructure that is very cost intensive and necessitates a critical mass both in form of demand and supply. Clustering benefits might be also attributable to the use of the same distribution channels. A letter from Liszt to Chopin documents a recommendation of a Parisian editor: "(…) you will have every reason to be satisfied with his [the editors'] activity and with whatever he does. Mendelssohn, whom he met in Switzerland two years ago, has made him his exclusive editor for France, and I, for my part, am just going to do the same." (Letter of 21 May 1845). On a different occasion, Liszt had recommended the works of Schumann to Pacini, a music Publisher in Paris, "This second arrangement is by Schumann, a young composer of very great merit. It is more within the reach of the general public, and also more exact than my paraphrase."

Furthermore, additional location benefits might stem from backwards linkages that are emerging in geographic clusters: the presence of composers led to better production of musical instruments, the development of music journals and reviews, the improvement of sheet music publication, and the higher attractiveness of acting as impresarios.

On the other hand, it must be noted that there might exist also some cost of clustering with regard to artistic output. Composers opportunity cost of writing one additional work may be higher in geographic clusters because of the presence of several alternative sources of income. In locations where classical music played an important role, composers can engage in other activities, such as teaching in music school, delivering private tuition, performing, running music institutes or acting as an impresario. The availability of alternative engagements might not always be complementary to composition of new pieces.

3. Data

The sampling technique aims at assuring maximum objectivity and reliability. As a result of data availability issues I focus only on prominent individuals and use the list of the most important composers from Murray (2003).[4] Murray's work is based on numerous international references hence the risk of country- or marketing-biases in the selection is minimal. The study of human accomplishment is conducted for several fields, including

[4] The methodological approach is designed to mitigate the extreme non-random sample bias arising (see Identification Section).

classical music, and for each outstanding individual in every discipline an index score is determined, based on the amount of space allocated to her or him in the reference works. The index score is normalised for all individuals listed in each discipline so that the lowest score is one and the highest score is 100.

Data on composers' artistic output is taken from "The Dictionary of Composers and Their Music" (Gilder and Port, 1978). The two prominent musicologists provide a list of 275 composers born between 1500 and 1949 with their important works dated and arranged chronologically. Gilder and Port aim to provide a dictionary "of lasting value as a permanent reference (…) [that contains] (…) complete factual information about who wrote what, and when" (Gilder and Port, 1978, preface). The dictionary is a recognized survey of the most influential classical compositions and served often as a source for composer's output (e.g. Simonton, 1991). In a study like this it is important for a number of reasons to consider only the important works. First, the influential compositions are the reason why a composer is considered nowadays to be a prominent artist. Only such works made a significant contribution to the classical music canon and reflect composers' quality. Second, I eliminate the bias that would be caused by consideration of composers' jottings, trifling pieces or tentative works (i.e. by exercises of no lasting value), as well as propaganda pieces and some commercial productions (i.e. low-quality works written with a short-term profit orientation). A third implicit advantage is the omission of unfinished works.[5] Combining both sources (i.e. Gilder and Port, 1978, and Murray, 2003) for the period analyzed an intersection of 116 composers emerges.[6]

For these composers I extract background information from Grove Music Online (2009), the leading online source for music research. This large multivolume dictionary is detailed enough to track the movements of all 116 composers, especially work-related migration. It is "a critically organized repository of historically significant information" (Grove, 2009, Preface) and hence is an ideal source for the purposes of this article. In this study I focus only on the periods of a composer's life when music-related work was predominant, i.e. when a composer was composing, giving tours, conducting philharmonics,

[5] In the Robustness Section I employ Murray's Index Score as an alternative measure for composers' quality. The results remain consistent. I have also considered a number of other data sources on productivity, for example, performances at leading concert halls or CD releases. The alternative approaches are however hardly feasible, mostly due to lack of access to such data. Furthermore, one would not be able to disentangle the importance of a historical composer from the influence of a contemporary performer. Finally, concert repertoires and especially albums contain various works, sometimes even works written by different composers; separating the importance of a single piece would not be possible.

[6] Note that from now on with each reference to composer, I mean, *prominent* composer, the focus of this study. As the study encompasses only male composers, I use the male form.

teaching at music schools, managing music institutions, or travelling in search of inspiration. I therefore exclude from the analysis the infancy, time spent on education or training, retirement years, and periods when only other (i.e. not music-related) professions were exercised.[7]

In Table 1 (Panel A) one can observe that composers encompassed by this study were engaged in music-related work during most of their lives (around 45 out of 67 years).[8] The duration of music related education or training lasted on average nine years. The father, mother or any other family member was often engaged in a music-related activity (e.g. father was composing, mother played violin). The average yearly output is equal to 0.77 and suggests that an artist composed roughly three important works every four years. The mean of Murray's Index Score (MIS) is equal to 12.7 points. There exists a very high correlation of 0.62 between composers' total lifetime production and the MIS. Twelve per cent of the composers were born in the second half of the 18th century, one third were born in the first part of the 19th century and the remaining artists were born in the late 19th century (Panel B). In Panel C it can be observed that the number of observations for composer and year is sufficient for a reliable quantitative analysis and increases over time. France and the Germanic countries (i.e. Germany, Austria or Switzerland) accounted for the highest share of births of important composers – more than 20 per cent each, followed by Italy and Russia with each around 12 per cent of births (Panel D). The births of the remaining artists are fairly spread among other - mostly European - countries.

Next, I investigate what cities were the most important for classical music and composers. I conduct a ranking of major cities using four different criteria. First, I measure the total number of years all composers spent in each city encompassed by the data set. Second, I count composers who have visited a city at least once in their life. Third, I calculate how many times each location was chosen as the main work destination, i.e. where a composer spent the longest part of his musical career. Fourth, I total the number of composers' births for each city. The summary is presented in Table 2. It is obvious that Paris was the predominant location, where composers have spent a total of 1'589 years. The French capital was visited by 66 composers and was the birthplace of nine composers. While the French capital emerges as the most important geographic cluster, also other locations played a role. London was visited by 39 composers and chosen as primary destination by 13 artists,

[7] This restriction is relaxed in a robustness test that is based on composer's entire lifetime and when Murray's Index Score is used to measure individual's overall lifetime productivity. The test is described in Section 5.3.

[8] See Table A1 for an extended list and essential background information of composers included in this study (not for publication).

while Vienna was visited by 35 composers and served for nine artists as the main work location. The importance of the fourth most important city - St. Petersburg - is considerably lower and each further city played a smaller role.

The above observations can be reaffirmed when comparing the importance of cities throughout the entire time period. Figure 1 illustrates the number of composers located in Paris, Vienna, London, as well as in ten other cities that follow in importance the three exclusively-analyzed locations. Paris was consistently the single most important location throughout the entire time-period.[9] The significance of Vienna and London can also be confirmed.

In Table 3 I present a brief summary for each of the three predominant locations (i.e. geographic clusters). Information on all composers is compiled in Panel A and on composers born in any of the geographic clusters is summarized in Panel B. In accordance with O'Hagan and Borowiecki (2010) composers born in any of the geographic clusters (and especially in Paris) remained remarkably immobile. Out of the 10 artists born in Paris, three never left the city and for Paris-born artists the average time spent outside the French metropolis is lower than two years. The time spent outside the Viennese and London clusters - approximately 8 years - is also relatively low.

4. Identification

The aim of the econometric analysis is to estimate the causal relationship between composers' productivity and the incidence of geographic clustering. In order to deal with potential endogeneity of the incidence of clustering, I identify the location variable as follows:

$$\text{cluster}_{ijt} = \alpha_i + \alpha_t + \beta\ \text{distance}_{ij} + \gamma_1\ \text{age}_{it} + \gamma_2\ \text{age}_{it}^2 + \delta\ X_i + \varepsilon_{it}. \tag{1}$$

The geographic distance between the birthplace of composer *i* and the geographic cluster *j* (*distance*$_{ij}$) is employed to instrument in the first stage for the incidence of locating of composer *i* in cluster *j* at year *t* (*cluster*$_{ijt}$). The birthplace-cluster distance is captured as a logarithm in order to allow for decreasing importance of large distances.[10] It would be most

[9] The dominance of Paris was also argued by Hall (1998), albeit without quantitative support. Hall identified the French metropolis as "the capital of light" for cultural activity that attracted not only artists but also intellectuals throughout the world.

[10] An alternative way to account for decreasing importance of large distances is to use a quadratic distance polynomial. This however might lead to over-identification. With the aim to keep this research as simple and

desirable to use a measure of economic distance that accounts for travel times, travel cost and cultural differences. One possibility would be to approximate economic distance with trade flows. Inter-city trade data is however mostly unavailable or incomplete (Dittmar, 2010). I propose therefore, to use linear distance ("air-line distance").[11] Year-by-year variation of the distance term is not necessary in order to establish a correlation between the birthplace-cluster distance and the incidence of locating in a geographic cluster. It is argued that composers' probability of locating at a certain destination in a given year depends throughout his entire lifetime on the proposed instrumental variable. As the importance of the distance term might differ over individual's lifetime, I further control for composer-specific time effects with a quadratic age polynomial (age_{it} and age_{it}^2). The quadratic term takes also account of decreasing productivity levels at higher ages. The Equation (1) contains further composer dummies (α_i) to take account of composers' heterogeneity and I also introduce time dummies (α_t) to deal with intertemporal differences in travel and productivity differences. Furthermore, in some specifications I take account of composers' characteristics (X_i), such as music-background of family members or duration of composers' music-related education. The standard errors (ε_{it}) are clustered at the composer level, allowing for correlations between observations of a single composer (within individual i), but remaining independent between composers (i.e. individual i and j do not have correlated errors).

The analysis is conducted at composer-year level and I estimate the impact of locating in a city with a high geographic concentration of composers (i.e. in a geographic cluster) on their productivity levels. In the geographic clusters analyzed, apart from prominent composers (for only which data is available) many other composers whose life accomplishments were not great enough to be listed in Murray (2003) were located. It is also most likely that composers encompassed in the analysis interacted with other not-listed artists. By establishing the impact of locating in a geographic cluster, I therefore account partly for the benefit due to interactions with all other creative individuals located in the cluster location. In conclusion, the proposed identification strategy mitigates some of the non-random extreme sample selection bias.[12]

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robust as possible, primarily a single logarithm distance term is employed. The results remain however consistent throughout the entire article for different measures of the birthplace-cluster distance (e.g. distance measured at level or as a quadratic polynomial).

[11] A similar solution is proposed by Dittmar (2010) who employs linear distance from Mainz, where the printing press was invented, as an instrument for the incidence of printing technology adoption in European cities. As air-line distance is only an approximation of the unobserved economic or cultural distance, the correlation between the instrument and the endogeneous variable will contain some bias.

[12] An alternative way of estimating clustering benefits would be to estimate the total number of composers in each location and to establish its impact on composers' productivity. The problem arising with such an

The validity of the identification strategy rests on three assumptions. First, there exists a significant first-stage relationship with sufficient explanatory power. I investigate therefore the probability to locate in a geographic cluster as a function of the logged birthplace-cluster distance. The estimated probabilities to locate in Paris are presented in Panel A of Table 4. The first-stage relationship between birthplace-Paris distance and locating in Paris in a given year is determined precisely at confidence levels of over 99 percent. This relationship holds in probit (column (1) and (2)) and in ordinary least squares (OLS) specifications (column (3) and (4)) with and without composer-age controls. The estimations are robust to the inclusion of composer-specific controls (column (5)) and when further controls for the decade are included (column (6)). I further extend the analysis by including two further cities that were very important destinations for classical composers, i.e. Vienna and London. I report in Panel B of Table 4 the corresponding probability-to-locate-coefficients for all three predominant locations. The point estimates for all three cities are similar in size, sign and significance to the estimations for Paris on a stand-alone basis. The results using probit and linear specifications are very similar, and from now on, the attention is restricted to the linear specifications. There is also no sign of the instrument being weak (Cragg-Donald eigenvalue statstics are at least 79.06).[13] Composers born further away from the cluster are typically less probable to locate in the French capital. The negative, non-linear first-stage relationship for Paris and for all three geographic clusters is presented graphically in Figure 2, using a local polynomial regression method with an Epanechnikov kernel. The relationship would remain stable also if composers born in a cluster (i.e. individuals whose birthplace-cluster distance is equal to zero) are excluded.

The second required condition for the validity of the instrumental variable employed is that composers' output must depend on geographic clustering, and the birthplace-cluster distance impacts composers' productivity only through its impact on clustering. Now, it might be the case that composers who locate not directly in a cluster but in its vicinity, might benefit from the proximity to a cluster, for example, because of better access to demand or

identification strategy is that the distribution of non-prominent composers is not clear. Consider, for example, unique work-location choices due to individual specific reasons (e.g. Frederic Chopin and George Sand stay in Majorca in 1838-39). Nonetheless, as a robustness test I employ the alternative approach (i.e. geographic clustering measured by the number of prominent composers located in a city) and find consistent results (section 5.4).

[13] Stock and Yogo (2005) propose a test based on the Cragg-Donald minimum eigenvalue statistic to investigate for weak instruments. Stock and Yogo estimate the critical value of the Cragg-Donald eigenvalue statistic to be equal to 16.38 for a model with one endogenous regressors and one instruments, and 22.30 for a model with one endogenous regressors and three instruments. The reported Cragg-Donald eigenvalue statistics at the bottom of each Panel of Table 3 clearly exceed the critical values and hence indicate little risk of weak instrument bias.

cultural infrastructure. To prevent this kind of proximity-effect I treat all locations within a radius of 50-miles from Paris, Vienna or London as the geographic cluster itself.[14]

Third, the instrument needs to be as good as randomly assigned. Given that a person cannot affect his birth location after he is born and that births are almost uniformly dispersed over geographic space this assumption seems to be satisfied. Furthermore, there is relatively little parental choice over location of birth, especially in a period when migration was difficult. A potential violation might however result if families that, for example, place a strong emphasis on musical education chose to live in or close to a geographic cluster. Children of these families may have better musical skills or better access to a relevant social network. Either factor could induce a positive correlation between the incidence of clustering and the unobserved determinants of productivity (i.e. ε_{it} in Equation (1)) and hence violate the randomness assumption. I therefore employ data on musical background of composer's family members (as recorded in Grove, 2009) and investigate this concern below.

I begin by estimating the effect of engagement of any family member in a music-related activity on composers' probability to locate in any of the three geographic clusters. The results are reported in columns (1) to (4) of Table A2. It can be viewed in column (1) that the estimated coefficients are marginal, usually not significant and have almost no explanatory power. In column (2) I demonstrate that the controls introduced for the musical background of composers' family members do not bias the distance terms. Next, I split all composers into two samples depending on whether a composer's family members were engaged in any relevant music-related activity. I report in column (3) the impact of the birthplace-cluster distance on clustering for composers who had at least one family member engaged in any music related activity. In column (4) I present the results for composers with no such family member. The distance effect is very similar for both sub-samples and the exogeneity of the instrument can be once again confirmed. I further analyze the relationship between the indicators for musical background of composers' family members and the birthplace-cluster distance itself. The results are presented in column (5) of Table A2. This is the most demanding test as it analyzes to some extent the spatial distribution of composers' birth locations and not only the incidence to locate in the geographic cluster. It is reassuring that the family controls included or sub-sampling hardly affect the probability to locate in any

[14] The size of the radius was used by O'Hagan and Borowiecki (2010). In only three cases the locations had to be readjusted. Claude Debussy was born in St Germain-en-Laye and Georges Bizet spent some time during 1870's in Bougival. Both locations lie approximately 10 miles from the city center of Paris and are treated as Paris. Sir Arnold Bax was born in Streatham, less than 10 miles from the city center of London. At present, the three locations discussed are districts of Paris or London.

geographic clusters or the birthplace-cluster distance. Composers' decision to locate in Paris, Vienna or London, as well as their birth location was fairly independent from the influence of family and hence the risk of non-randomness of the instrument mitigates.

With further confidence in the validity of the proposed instrumental variables a brief demonstration of the unique importance of distance in historical time periods is provided. I argue that geographic distance was a decisive factor for the choice of a work location in time periods when travelling was heavily constrained, by time or cost. I therefore divide all annual observations equally into four different time-periods and investigate how the importance of the distance variable changes over time for the geographic clusters. The results are summarized in Panel A of Table A3. To facilitate interpretation of the distance coefficients a quadratic distance polynomial is introduced. The estimated coefficients are the largest in size and most precisely estimated for the earlier decades, until roughly the 19th century. If a composer was born 100 miles further away from Paris, he was roughly 16% less likely to migrate towards the French capital and this relationship exposes decreasing returns. From the beginning of the 20th century the relevance of distance diminishes markedly: the coefficients fall in size and the explanatory power of the restricted model drops (the *R*-squared term decreases from around 0.5 to below 0.1). In the last sub-period a birth-location 100 miles away from Paris, reflects a decrease in the probability to cluster in the French Metropolis only by around 1.2%. Employing average distances from Paris, Vienna or London I estimate the probability to locate in any of the three geographic clusters and find consistent results. Those patterns provide indication that the proposed identification strategy works best for historical time periods and indicates that travelling in such periods was indeed difficult and costly. Next, I move over to composers' productivity function.

The second-stage equation estimates the impact of clustering on composers' productivity:

$$\text{output}_{it} = \alpha_i + \alpha_t + \beta \text{ cluster}_{ijt} + \gamma_1 \text{ age}_{it} + \gamma_2 \text{ age}_{it}^2 + \delta \text{ X}_i + \varepsilon_{it}, \quad (2)$$

where the variable of main interest - composer's productivity ($output_{it}$) - measures the number of important works written by composer i in year t (as listed in Gilder and Port, 1978). I use two-stage least squares estimator as it is typically the most efficient instrumental variable estimator and should be preferred even in the case when the endogenous variable is dichotomous (see, for example, Wooldridge, 2002). The next section presents the main empirical findings.

5. The Effect of Geographic Clustering on Composers' Productivity

5.1 Main Results

In the following, I analyze the effect of locating in a geographic cluster on composers' productivity using the regression model proposed above. Table 5 summarizes the results for Paris (Panel A) and for Paris, Vienna or London (Panel B).

Column (1) shows the OLS relationship between locating in a geographic cluster and the number of written compositions in a given year. The correlation between clustering and composers' output is almost zero if it is controlled for composer-age, composer and time effects.[15] The instrumental variable (IV) estimates are presented in columns (2) to (5). The IV-results yield always a positive coefficient that is robust to the inclusion of controls for composer-specific age trends, composer controls, as well as the introduction of controls for time trends.[16] Since I have instrumented for the incidence of clustering, I make the causal assertion that composers benefited from the positive externalities associated with the geographic cluster. In the preferred specifications (after I control for age effects, composers' heterogeneity and time trends) the estimated IV-parameter is equal to around 0.25 (t-statistics 2.04): a composer who located in Paris or in any of the three geographic clusters was composing around one additional work every four years as a result of being located in the cluster. If one considers the average annual productivity of composers (i.e. 0.77 works per year, Table 1), the size of the estimated impact of clustering on productivity is economically relevant and indicates that around one third of composers' output was a result of the positive externalities associated with a cluster. I find very similar results, in terms of sign, size and significance, also for the aggregated analysis of Paris, Vienna and London.

In all specifications the estimated IV-parameters are always considerably higher than the corresponding OLS point estimates. There could be a number of reasons for this difference. First, there might exist a proxy measurement error leading to a bias of the OLS coefficients. Changes in composers productivity was not the result of their physical presence in the geographic cluster but rather their interaction with other creative individuals. A binary indicator that records whether or not a composer was located in a geographic cluster is only a

[15] If all controls are dropped I find a negative correlation between clustering in Paris and productivity (OLS-coefficient is equal to -0.189 and marginally significant with a *p*-value of 0.098). I report only the most robust regression.

[16] As described in the previous section, composer-specific time trend is estimated with a quadratic polynomial (i.e. *age* and *age-squared*), composer controls are estimated with an indicator function that is equal to one for each single composer and time controls are estimated with an indicator function that is equal to one for each decade.

rough approximation for social interactions. In consequence, measurement error might attenuate the OLS-coefficients, while the IV identification may pick up a more robust measure of the effect of geographic clustering. Second, it is possible that the geographic clusters not only positively impacted productivity of composers who worked in those locations but also attracted individuals who were less productive than the average artist. In this context, self-selection of composers to the most important locations for classical music might somewhat equalize the clustering benefit and hence attenuate the OLS estimates.[17]

Another reason why higher IV-parameters have been obtained might be the fact that these parameters can be interpreted as a Local Average Treatment Effect as proposed by Imbens and Angrist (1994). It is possible that certain types of composers benefit to a different extent from clustering. This could be the case if the best composers who cluster are able to benefit more from the location due to, for example, better inter-personal skills. As a result the clustering effect for those composers might be greater. I investigate this possibility by dividing composers into top 10 composers (ranked by Murray's Index Score), all remaining composers and the bottom 16 composers.[18] The OLS and IV results are reported in columns (3) to (8) in Table 6 (columns (1) and (2) report the baseline results). While the OLS coefficients remain very low and fairly stable for all three sub-groups, I find major differences in the IV point estimates. Column (4) presents the IV results for the highest ranked composers. It is obvious that clustering returns to composers' productivity are considerably higher for the top 10 composers than for the full sample. I report in column (6) the IV-estimates for all remaining composers (i.e. after the top 10 composers are excluded) and conclude that the coefficients slightly decrease, remain however consistent with the baseline findings. Column (8) shows the clustering effect on the output of the worst 16 composers. Interestingly, the productivity of the lowest-ranked composers decreases due to the incidence of locating in a geographic cluster. That suggests that clustering might have had also a detrimental effect on productivity levels.[19] The results are similar for Paris as well as if further Vienna and London are included. Furthermore, I find that the Cragg-Donald EV

[17] The identification strategy does not allow however to shed light on the reverse relationship between geographic clustering and productivity, i.e. whether geographic clusters attracted systematically better (or worse) composers.

[18] The worst composers are individuals with a Murray's Index Score of 2 or below. It is the lowest possible cut-off point, as none of the 3 composers with a Murray's Index Score of 1 has visited any of the cluster locations.

[19] This finding is consistent with Waldinger (2010) who studied peer effects among university scientists. Waldinger found the highest clustering externalities for students in top 10 departments and no peer effect in lower-ranked departments. Given that the data is an extreme selection (and already the full sample contains only prominent composers), the estimated positive and significant coefficients for "all remaining composers" (i.e. after excluding the top 10 composers), are not in contradiction with the findings of Waldinger (2010).

statistic is the lowest for the top 10 composers and the highest for the worst composers. This indicates that the instrument has the highest effect on the lower ranked composers. One possible reason why geographic distance matters most for the worse composers might be the fact that the less successful artists are more likely to face higher cost of travel, be it because of their financial disadvantage or inferior network.

One further source of heterogeneous responses to geographic clustering might depend on whether the individual was born in the cluster or moved to it during his life. It is again quite likely that composers who moved to the geographic cluster have experienced very different location benefits at the new destination than the local artist. This could be attributable to, for example, the diverse background and experience of the migrant composer. I analyze this possibility by excluding from the full sample composers who were born in one of the geographic clusters analyzed.[20] In Panel A of Table 6 I first drop ten composers who were born in Paris and re-estimate the parameters based on 106 artists who, if located in Paris, then only due to migration from other locations. In Panel B of Table 6 I exclude 18 composers who were born in Paris, Vienna or London. Table 6 reports the correlations (column (9)) and the causal effect (column (10)) between the incidence of geographic clustering and the number of compositions written. The OLS-coefficients are comparable with the estimates of the unrestricted sample. The IV-estimates for the migrant composers yield markedly higher coefficients of around 0.5, while remaining significant at the 1%-significance level. The estimated parameters for the migrant composers roughly double in size and indicate that migrant composers experienced a distinctly higher benefit due to the positive externalities associated with a geographic cluster. I conclude that in geographic clusters top composers as well as migrant composers were greater beneficiaries than the average artist.

5.2 Robustness Analysis

In the following, I report a large number of tests that indicate that the findings are very robust. I present the results in Table 7. First, in addition to the binary control variables for individual effects, I include an indicator function whether any parent of the composer was engaged in a music related activity. Given that the source of the data set - the Grove Music Dictionary - records music-related engagements of the parents only if they are of considerable quality and importance, the variable should serve as a good proxy of composers'

[20] Note that all of the excluded composers have also spent the longest part of their work lives in the geographic cluster (i.e. in their birth locations).

musical skills. The results are presented in column (2) of Table 7 (column (1) reports the baseline results). The estimated coefficients are now somewhat larger and estimated with higher precision. This indicates that depending on composers' parental background, the experienced clustering benefit slightly varied. The main results find nevertheless strong support for their reliability.

During composers' music related education, whether it was private tuition or formal studies in conservatoires, meaningful personal ties were likely to have been established. It is therefore likely that individuals' clustering benefit varied depending on the music-related education time. I hence introduce further controls for the duration of each composer's musical education as recorded in Grove (2009). The point estimates, reported in column (3) provide further support for the robustness of the main findings. It is encouraging that the introduction of these powerful individual controls (parental music background and duration of music education) hardly changes the findings.

One may worry that some of the composers' visits to a geographic cluster were so brief that exchange with other artists was not possible due to time constraints. In such cases, the estimated coefficients might be biased. I therefore re-estimate the regressions omitting the observations in which composers remained in the cluster less than one year.[21] The results which are reported in column (4) hardly change.

A related concern is that while only 18 composers were born in any of the three geographic clusters, markedly more died in Paris (30 composer deaths), Vienna (8) or London (7), and the death year of each individual was not a full year of creative work, unless the death occurred on the last day of December which is very unlikely. I analyze this issue by estimating the regressions after the death year has been excluded from the analysis. The coefficients reported in column (5) are estimated with high precision and remain positive. Encouragingly, the results can be reaffirmed.

Another worry is that composers might have visited not only the geographic cluster but also a different location in a given year. This could bias the clustering effect due to the externalities associated with the other location. I investigate this concern by re-estimating the regressions after excluding observations for years in which a composer has visited apart any of the geographic clusters also a different location. Again, the results, as reported in column (6), are very similar.

It is possible that the incidence of war influences the productivity of a creative

[21] Note that while Grove (2009) includes very detailed information on composer travels, the data is very often available only on annual basis.

individual. Borowiecki (2010) demonstrates that historical wars had a heterogeneous impact on classical composers' creative production. Depending on the type of war, military conflict might have had a positive or a negative effect. As the analysis is conducted for a very long time period during which a number of wars occurred, I address this concern by re-estimating the regressions while focusing only on years with no major exogenous shocks, such as war or epidemics.[22] The IV-results, as presented in column (7), indicate that the results are not driven by any exogenous disruptions.

I further investigate whether the results are not driven by composers with extreme productivity levels. For this robustness test I exclude composers whose Murray's index was one standard deviation above or below the average. In column (8) can be viewed that the coefficients on the geographic cluster effect hardly change and the robustness of the findings can be once again concluded.[23]

Finally, as I establish the effect of locating in a certain city on composers' productivity, one could worry about correlated standard errors within cities. I analyze this possibility by clustering the standard errors at the city level, allowing for correlations between observations of a single city (e.g. within Paris), but remaining independent between cities (e.g. Paris and Vienna do not have correlated errors). The IV-estimates are reported in column (9) and are statistically undistinguishable from zero at 99.9 percent confidence intervals.

5.3 Alternative Productivity Measure

One might criticize the shortcomings of the output variable. The number of written important compositions does not account for composer's achievements due to other music-related engagements such as teaching or performing. This might be especially the case for composers located in geographic clusters, as in those locations other engagements might have been particularly attractive and good available, leading to higher opportunity costs of composing. In this section I investigate this possibility and employ a broader measure of composers' lifetime productivity.

[22] I exclude the years in which any of the following conflicts or epidemics occurred: the French Revolution (1789-99), Napoleonic Wars (1799-1815), the cholera outbreak in 1832 and 1849, the war on Prussia (1870-71) and both World Wars (1914-18 and 1939-44). I find consistent results also after excluding only single observations for composers who were located in a given year in a country that was engaged in war or in a region affected by the epidemic outbreaks. I report the results only for the stronger test.

[23] As one might expect, the point estimates somewhat decrease in size. This is attributable to the left-skewed distribution of productivity and by excluding composers with extreme productivity levels I drop mostly the higher ranked composers who were the greatest beneficiaries of geographic clustering.

Murray's Index Score (MIS) is the broadest available measure of composers' lifetime achievements. Murray (2003) conducted a vast survey of outstanding classical composers employing a wide selection of international references and based on the amount of space allocated to each composer in the reference works he calculates the MIS. The index is normalized for all composers so that the lowest score is 1 and the highest score is 100.

The MIS is a time-invariant measure of composers' lifetime accomplishments, which enforces the robustness test to be conducted for composers' entire lifetime. As in previous parts, the focus is on establishing the relationship between geographic clustering and composers overall lifetime productivity, measured with the MIS. For this reason I propose two ways to capture geographic clustering. First, I measure the total music-related working time that a composer spent in a cluster location. Second, I use a binary indicator with the value one if a geographic cluster was composer's main work destination, i.e. if the composer has spent the longest part of his musical career in the cluster. In order to deal with varying longevities and to allow for a typical concave age-productivity profile I introduce a quadratic life duration polynomial. I further control for time trends by introducing indicator functions for each of the three half-century birth cohorts.[24]

Table A4 reports the OLS-estimates (columns (1) and (3)) and the IV-results (columns (2) and (4)). The correlation coefficients for Paris and London are negative, albeit often not significant. For Vienna I find positive and significant OLS-estimates. The IV-parameters are always positive and significant at the usual confidence levels. Furthermore, the regressions yield always markedly higher IV-estimates than the corresponding OLS-coefficients. Every year the composer spent in Paris resulted in a 0.24 point increase of his MIS and the choice of the French capital as the primary work destination resulted in a marked increase of 9.52 points on Murray's scale. For Vienna I obtain the highest and most precise IV-results, presumably because of the intense concentration of top composers in the Austrian capital (O'Hagan and Borowiecki, 2010). Encouragingly, the main findings are confirmed. The employment of a very different measure for composers' lifetime accomplishments and a different methodological approach (lifetime analysis instead of annual) does not alter the conclusions from the previous analyses.

5.4 Peer Effect and Large City Effect

[24] The estimated equation is:

$$MIS_i = \beta_1 + \beta_2(\text{Geographic cluster})_i + \beta_3(\text{Life duration})_i + \beta_4(\text{Life duration})^2_i + \textstyle\sum_{j=1}^{3} \beta_j(\text{Birth cohort})_{ij} + \varepsilon_i.$$

It is possible that composers benefited in the geographic clusters analyzed not only due to the concentration of other artists (i.e. positive peer effects), but also due to some large city specific factors. In large cities one might expect, for example, higher demand for cultural goods, better cultural infrastructural or easier access to related industries (e.g. sheet music publishers). All such large city amenities correlate highly with composers' clustering intensity. Composers are most likely to be found in cities with high demand for cultural goods and with good cultural infrastructure; music publishers are most prone to be located where the concentration of composers is the highest etc. It is therefore unlikely that any of the estimated geographic cluster effects might not be related (directly or indirectly) to composers' clustering intensity. Nonetheless, I address this issue by investigating the impact of composers' concentration rate on their productivity levels.

I decompose the positive location benefit associated with geographic clusters (i.e. Paris, Vienna and London) into a peer effect and a large city effect. This approach enables also to shed some light on the size of the productivity gains associated with the clustering intensity. For this exercise I count all composers located in each location that is recorded in the data set and estimate the impact of geographic concentration rate on composers' productivity. In order to obtain a causal impact of the clustering rate (rather than simply a correlation) I use geographic distance as instrumental variables. In analogy to the main identification strategy, I use three instrumental variables (i.e. logged distances between composers' birthplace and Paris, Vienna or London) in order to instrument for the concentration rate, as well as the incidence of locating in any of the geographic clusters. It is argued that composers born further away from a geographic cluster have experienced a lower number of other composers during their life. The parameters for the distance terms are estimated with high precision (not reported) and I obtain a large Cragg-Donald eigenvalue statistic.

Columns (1) to (6) of Table A5 show OLS and IV results for the analysis of composers' clustering intensity. All OLS and IV returns from clustering intensity are positive and mostly significant. It is also obvious that the IV-estimates are larger in size than the correlation parameters. The IV-coefficient estimated with the usual controls and reported in column (2) indicates that composers' productivity increases by approximately 0.2 works annually for every ten more composers located in his location. I further introduce controls for the incidence of locating in any of the geographic clusters (i.e. in only Paris or in Paris, Vienna or London). This separates the clustering effect from the noise associated with the large city effect. I find even greater IV-coefficients for the clustering intensity and negative

IV-estimates for the geographic clusters. I conclude that the previously estimated location benefits associated with the analyzed geographic clusters are resulting from positive peer effects. Furthermore, the negative location coefficients indicate that if in Paris, Vienna or London were no composers present, locating in those three large cities would be detrimental to artists' productivity. This result provides important support for the singular importance of geographic clustering and the associated peer effects. Composers' productivity increased due to the benefits associated with peer effects and not as a result of large city specific factors.

6. Conclusion

This study addresses an important methodological problem that lies at the core of empirical literature on the positive externalities associated with geographic clusters. I overcome potential heterogeneity bias and endogeneity of clustering issues by using a novel data set for 116 important classical composers born between 1750 and 1899. The research design allows control for individual effects and to use exogenous distances between composer's birthplace and a geographic cluster as instrumental variables for the incidence of locating in any of those clusters. I find that composers who located in a geographic cluster benefited significantly in terms of written compositions or overall lifetime accomplishments in the sphere of music-related engagements. The location benefit is even greater for top composers or migrant composers, i.e. artists who moved to the cluster. Given the findings, the study contributes as well to migration economics research: individuals who migrated towards a geographic cluster were able to use more effectively the positive externalities associated with the locations analyzed. Furthermore, this study provides empirical evidence for a posited hypothesis in cultural economics literature that artistic production experience benefits in geographic clusters.

If one believes in generality of the results from this research, policy implication can be derived for authorities responsible for developing special economic zones (i.e. geographic clusters). If the main beneficiaries of locating in clusters are individuals (or firms) coming from outside the region, it may be possible to generate mutual gains by cooperation between existing clusters. One example would be exchange programs that enable individuals to switch between clusters; or programs that facilitate firms to launch branches in other geographic clusters. These prescriptions are offered with the cautionary note that further research is urgently needed to shed light upon the optimal size and concentration rate of geographic clusters.

7. Tables

TABLE 1. Summary statistics (116 Composers).

	Mean	Standard Deviation
	A: Background information	
Life span (in years)	66.85	15.07
Duration of career (in years)	44.94	14.31
Education or training time (in years)	8.90	5.38
Father's music-related engagement	0.41	0.49
Mother's music-related engagement	0.26	0.44
Music-related engagement of any other family member	0.31	0.46
Compositions (per annum)	0.77	1.35
Murray's Index Score	12.67	17.16
	B: Birth cohort	
Birth cohort 1750-1799	0.12	0.33
Birth cohort 1800-1849	0.33	0.47
Birth cohort 1850-1899	0.55	0.50
	C: Composer-years observations	
Period 1750-1799	99	-
Period 1800-1849	744	-
Period 1850-1899	1655	-
Period 1900-1989	2715	-
	D: Birth country	
British Isles	0.08	0.27
France	0.22	0.42
Germanic Countries	0.23	0.42
Italy	0.13	0.34
Russia	0.12	0.33
Spain	0.03	0.16
Eastern Europe	0.09	0.28
Rest of Europe	0.03	0.18
Rest of World	0.06	0.13

SOURCES: Grove (2009), Gilder and Port (1978) and Murray (2003).
NOTE: The British Isles include composers from England, Scotland, Ireland and Wales. Eastern Europe relates to composers born in7 any of the Eastern Europe countries as classified by United Nations Statistical Division, with the exclusion of Russia. The Germanic Countries relate to the three German-speaking countries of Germany, Austria and Switzerland. Rest of Europe covers composers from all other European countries. Rest of World relates to composers that do not fit in any of the other categories.

Table 2. Important cities for classical composers.

Aggregated time spent during musical career (in years)		Visits during musical career (in composers)		Primary destination (in composers)		Births (in composers)	
Paris	1589	Paris	66	Paris	34	Paris	9
London	413	London	39	Vienna	13	Vienna	5
Vienna	365	Vienna	35	London	9	London	3
St. Petersburg	354	Berlin	26	St. Petersburg	8	St. Petersburg	3
Berlin	193	New York	23	Moscow	5	Cologne	2
Moscow	150	St. Petersburg	20	Berlin	4	Hamburg	2
New York	142	Rome	18	Budapest	3	Venice	2
Rome	135	Rome	15	Milan	3	Berlin	1
Budapest	111	Boston	11	Rome	3	Copenhagen	1
Milan	106	Moscow	11	Copenhagen	2	Leipzig	1
Venice	92	Milan	10	Leipzig	2	Naples	1
Copenhagen	91	Prague	9	Venice	2	Prague	1
Boston	84	Venice	7	Boston	1	Rome	1
Prague	43	Dresden	6	Dresden	1	Stockholm	1
Leipzig	35	Leipzig	5	Naples	1	Budapest	0
Naples	29	Naples	5	Prague	1	Dresden	0
Dresden	27	Budapest	4	Stockholm	1	Madrid	0
Stockholm	27	Cologne	4	Hamburg	0	Milan	0
Madrid	22	Copenhagen	3	New York	0	Moscow	0
Hamburg	17	Madrid	3	St. Petersburg	0	New York	0

SOURCES: See Table 1.

TABLE 3. Geographic clusters: Summary statistics.

	Paris	Vienna	London
	A: All composers		
Visits during musical career (in composers)	66	35	39
Primary destination (in composers)	34	13	8
Years spent in cluster during musical career	13.70	3.15	3.56
	(19.66)	(8.99)	(10.45)
Birthplace-cluster distance (in 1000 mile)	0.75	0.38	0.57
	(1.15)	(0.27)	(0.43)
Compositions (per annum)	0.63	1.55	1.04
	(1.10)	(2.62)	(1.25)
	B: Composers born in cluster		
Births (in composers)	9	5	3
Never left cluster (in composers)	3	1	0
Time outside cluster (in years)	1.90	8.40	8.00
	(1.66)	(12.18)	(3.46)

SOURCES: See Table 1.

TABLE 4. Birthplace-cluster distance and clustering (116 composers).

Dependent Variable: Locating in cluster

	PROBIT		ORDINARY LEAST SQUARES			
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
	A: Cluster (Paris)					
Birthplace-Paris distance	-0.171***	-0.408***	-0.118***	-0.118***	-0.147***	-0.130***
	(0.0335)	(0.0439)	(0.00705)	(0.00713)	(0.000710)	(0.00830)
composer-age controls		Yes		yes	yes	yes
composer controls		Yes			yes	yes
time controls		Yes				yes
Observations	5213	2441	5213	5213	5213	5213
R-squared	0.249	0.5298	0.280	0.280	0.758	0.769
Cragg-Donal EV Statistic			281.9	274.2	136.1	121.3
	B: Cluster (Paris, Vienna, London)					
Birthplace-Paris distance	-0.159***	-0.472***	-0.130***			-0.133***
	(0.0320)	(0.0104)	(0.00830)			(0.00879)
Birthplace-Vienna distance	-0.0360*	-0.566***		-0.160***		-0.156***
	(0.0209)	(0.0545)		(0.00999)		(0.0247)
Birthplace-London distance	-0.0884***	-0.476***			-0.128***	-0.135***
	(0.0231)	(0.00785)			(0.00314)	(0.00667)
composer-age controls		yes	yes	yes	yes	yes
composer controls		yes	yes	yes	yes	yes
time controls		yes	yes	yes	yes	yes
Observations	5213	3502	5213	5213	5213	5213
R-squared	0.243	0.4838	0.769	0.663	0.667	0.684
Cragg-Donal EV Statistic			121.3	71.6	73.1	79.1

NOTE: Standard errors are clustered at the composer level and reported in parentheses. Columns (1) and (2) present marginal probit effects, evaluated at explanatory variable mean values, and pseudo R-square terms. The birthplace-cluster distances are logged. I do not report composer-specific age time trend (estimated with a quadratic polynomial), composer controls (estimated with an indicator function that is equal to one for each single composer) and time controls (estimated with an indicator function that is equal to one for each decade). ***/**/* indicate estimates that are significantly different from zero at 99/95/90 percent confidence.

TABLE 5. Clustering and artistic output of composers (116 composers).

Dependent Variable: Number of compositions

	OLS	INSTRUMENTAL VARIABLE			
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
	A: Cluster (Paris)				
Cluster (Paris)	-0.00209	0.0864	0.0615	0.277***	0.252**
	(0.0931)	(0.212)	(0.202)	(0.0158)	(0.123)
composer-age controls	yes		yes	yes	yes
composer controls	yes			yes	yes
decade controls	yes				yes
Observations	5213	5213	5213	5213	5213
R-squared	0.445	.	0.013	0.424	0.443
Cragg-Donal EV Statistic		281.9	274.2	136.1	121.3
	B: Cluster (Paris, Vienna, London)				
Cluster (Paris, Vienna, London)	0.0803	0.217	0.194	0.278***	0.253**
	(0.0866)	(0.193)	(0.191)	(0.0153)	(0.124)
composer-age controls	yes		yes	yes	yes
composer controls	yes			yes	yes
time controls	yes				yes
Observations	5213	5213	5213	5213	5213
R-squared	0.445	0.002	0.027	0.425	0.444
Cragg-Donal EV Statistic		99.7	96.2	89.1	79.1

NOTE: Standard errors are clustered at the composer level and reported in parentheses. The first-stage results are presented in Panel A and Panel C of Table 2. The incidence of locating in a geographic cluster is estimated with a logged birthplace-cluster distance. I do not report composer-specific age time trend (estimated with a quadratic polynomial), composer controls (estimated with an indicator function that is equal to one for each single composer) and time controls (estimated with an indicator function that is equal to one for each decade). ***/**/* indicate estimates that are significantly different from zero at 99/95/90 percent confidence.

TABLE 6. Heterogeneity in returns.

Dependent Variable: Number of compositions

Explanatory Variables	All Composers		Top 10 composers		All remaining composers		Worst 16 composers		Migrant Composers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	A: Cluster (Paris)									
Cluster (Paris)	-0.00209	0.252**	0.0716	1.553***	0.0226	0.228***	0.00316	-0.287***	0.00524	0.519***
	(0.0931)	(0.123)	(0.570)	(0.135)	(0.0890)	(0.0633)	(0.147)	(0.0818)	(0.0996)	(0.0847)
composer-age controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
composer controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
decade controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Composers	116	116	10	10	106	106	16	16	106	106
Observations	5213	5213	413	413	4800	4800	754	754	4782	4782
Cragg-Donal EV Statistic		121.3		57.4		135.9		227.2		79.1
	B: Cluster (Paris, Vienna, London)									
Cluster (Paris, Vienna, London)	0.0803	0.253**	-0.0712	3.563***	0.0778	0.227***	-0.0520	-0.292***	0.0929	0.483***
	(0.0866)	(0.124)	(0.375)	(0.724)	(0.0786)	(0.0628)	(0.0869)	(0.0823)	(0.0963)	(0.0894)
composer-age controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
composer controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Composers	116	116	10	10	106	106	16	16	98	98
Observations	5213	5213	413	413	4800	4800	754	754	4436	4436
Cragg-Donal EV Statistic		79.1		35.8		92.8		127.6		68.9

NOTE: See Table 5.

TABLE 7. Robustness of instrumental variable results.

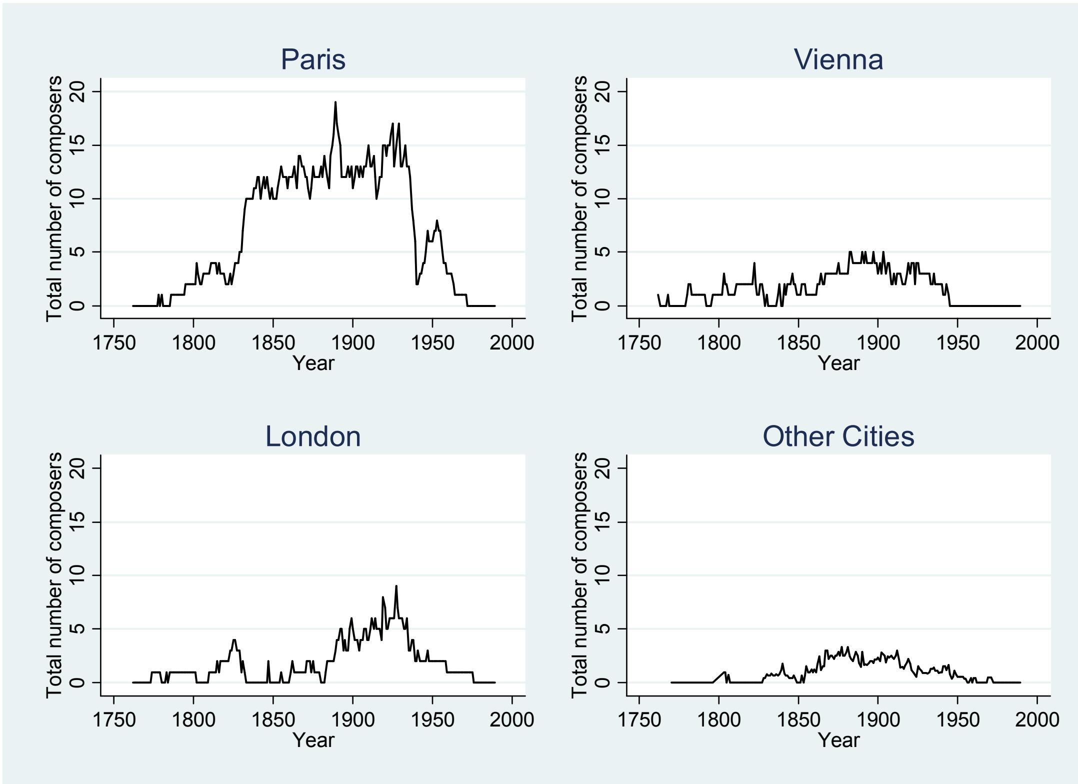
Dependent Variable: Number of compositions

	Full sample	Full sample	Full sample	Short visits excluded	Death year excluded	Multiple locations excluded	Extreme events excluded	Extreme composers excluded	St. Err. clustered at city level
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	IV	IV	IV	IV	IV	IV	IV	IV	IV
	A: Cluster (Paris)								
Cluster (Paris)	0.252**	0.354***	0.321***	0.265**	0.224***	0.239**	0.241*	0.187*	0.252***
	(0.123)	(0.0947)	(0.0711)	(0.123)	(0.0673)	(0.116)	(0.138)	(0.0968)	(0.069)
composer-age controls	yes	yes	yes	yes	yes	yes	yes	yes	Yes
composer controls	yes	yes	yes	yes	yes	yes	yes	yes	Yes
time controls	yes	yes	yes	yes	yes	yes	yes	yes	Yes
music background of parents controls		yes							
music-related education controls			yes						
Composers	116	116	116	116	116	116	116	101	116
Observations	5213	5213	5213	5182	5118	5135	4625	4588	5213
Cragg-Donal EV Statistic	121.3	121.3	121.3	134.2	127.5	135.2	111.8	126.0	121.3
	B: Cluster (Paris, Vienna, London)								
Cluster (Paris, Vienna, London)	0.253**	0.343***	0.319***	0.261**	0.223***	0.270**	0.246*	0.184*	0.253***
	(0.124)	(0.0635)	(0.0703)	(0.125)	(0.0666)	(0.123)	(0.141)	(0.0954)	(0.069)
composer-age controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
composer controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
time controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
music background of parents controls		yes							
music-related education controls			yes						
Composers	116	116	116	116	116	116	116	101	116
Observations	5213	5213	5213	5167	5118	5091	4625	4588	5213
Cragg-Donal EV Statistic	79.1	79.1	79.1	83.2	83.8	87.5	70.3	90.1	79.1

NOTE: See Table 5.

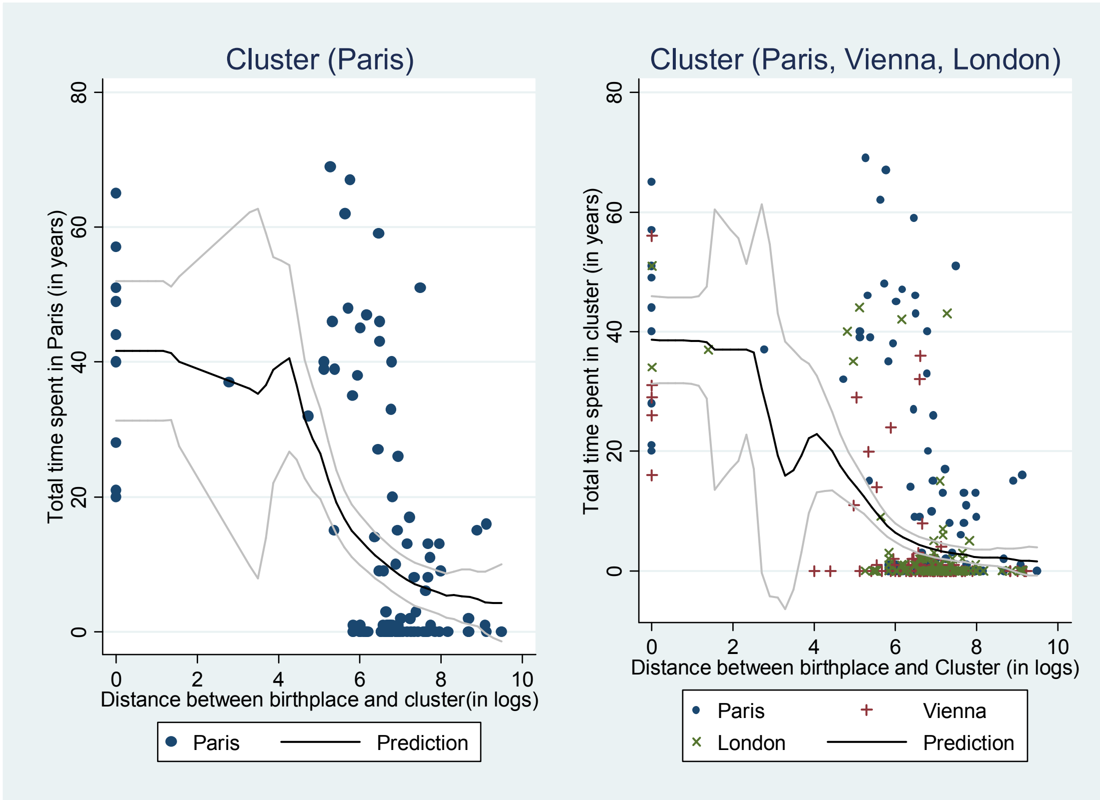
8. Figures

FIGURE 1. Importance of geographic clusters.



NOTE: The panel with 'Other Cities' depicts the composer count for the ten largest cities after Paris, Vienna and London, deciding upon "Aggregated time spent during musical career" criterion (i.e. St. Petersburg, Berlin, Moscow, New York, Rome, Budapest, Milan, Venice, Copenhagen and Boston).

FIGURE 2. Birthplace-cluster distance and clustering.



NOTE: The depicted prediction is based on a local polynomial regression method with an Epanechnikov kernel and it is presented along with a 95%-confidence interval.

9. Appendix

Table A1. Composers included in this study.

(Table A1 - NOT FOR PUBLICATION)

Name	Year of Birth	Year of Death	Country of Birth	Total works during lifetime	Murray's Index Score	Total years in Paris	Total years in Vienna	Total years in London
Adam, Adolphe	1803	1856	France	8	3	28	0	2
Albeniz, Isaac	1860	1909	Spain	6	4	1	0	5
Arensky, Anton Stepanovich	1861	1906	Russia	3	1	0	0	0
Auber, Daniel-Francois-Esprit	1782	1871	France	7	5	69	0	0
Balakirev, Mily Alekseyevich	1836	1910	Russia	17	6	0	0	0
Bartok, Bela	1881	1945	Hungary	55	18	2	2	0
Bax, Sir Arnold	1883	1953	England	86	3	0	0	37
Beethoven, Ludwig van	1770	1827	Germany	223	100	0	32	0
Bellini, Vincenzo	1801	1835	Italy	9	9	3	0	0
Berg, Alban	1885	1935	Austria	14	14	0	31	0
Berlioz, Hector	1803	1869	France	26	41	35	0	1
Berwald, Franz Adolf	1796	1868	Sweden	20	2	0	4	0
Bizet, Georges	1838	1875	France	20	10	21	0	0
Bliss, Sir Arthur	1891	1975	England	69	2	0	0	51
Bloch, Ernest	1880	1959	Switzerland	49	3	1	0	2
Boieldieu, Francois Adrien	1775	1834	France	6	5	32	0	0
Borodin, Aleksandr	1833	1887	Russia	11	8	0	0	0
Brahms, Johannes	1833	1897	Germany	99	35	0	36	0
Bruch, Max	1838	1920	Germany	17	2	0	0	0
Bruckner, Anton	1824	1896	Austria	24	19	0	29	0
Busoni, Ferruccio	1866	1924	Italy	29	8	0	1	0
Casella, Alfredo	1883	1947	Italy	43	4	14	0	0
Chabrier, Emmanuel	1841	1894	France	10	5	38	0	0
Charpentier, Gustave	1860	1956	France	7	2	67	0	0
Chausson, Ernest	1855	1899	France	17	3	20	0	0
Chavez, Carlos	1899	1978	Mexico	43	2	0	0	0
Cherubini, Luigi	1760	1842	Italy	14	10	40	2	15
Chopin, Fryderyk Franciszek	1810	1849	Poland	63	32	17	1	0
Clementi, Muzio	1752	1832	Italy	0	5	2	2	43
Cui, Cesar	1835	1918	Russia	18	3	0	0	0
Dargomizhsky, Aleksandr Sergeyevich	1813	1869	Russia	4	3	0	0	0
Debussy, Claude	1862	1918	France	81	45	37	2	1
Delibes, Leo	1836	1891	France	5	2	39	0	0
Delius, Frederick	1862	1934	England	31	7	27	0	9
Dohnanyi, Ernst von	1877	1960	Hungary	24	2	0	0	7
Donizetti, Gaetano	1797	1848	Italy	11	9	9	0	0
Dukas, Paul	1865	1935	France	17	4	49	0	1
Dvorak, Antonin	1841	1904	Czech	89	13	0	1	2
Elgar, Edward	1857	1934	England	54	8	0	0	44
Enesco, Georges	1881	1955	Romania	19	2	51	0	0
Falla, Manuel de	1876	1946	Spain	14	9	8	0	2
Faure, Gabriel	1845	1924	France	56	13	59	0	0
Field, John	1782	1837	Ireland	2	3	1	1	1
Flotow, Friedrich Freiherr von	1812	1883	Germany	1	2	20	3	0
Franck, Cesar	1822	1890	France	31	15	48	0	0
Gade, Niels Wilhelm	1817	1890	Denmark	33	3	0	0	0
Gerhard, Roberto	1896	1970	Spain	30	1	0	0	0

Gershwin, George	1898	1937	USA	7	6	0	0	0
Glazunov, Aleksandr Konstantinovich	1865	1936	Russia	41	4	8	0	3
Glier, Reingol'd Moritsevich	1875	1956	Russia	21	1	0	0	0
Glinka, Mikhail Ivanovich	1804	1857	Russia	13	8	9	0	0
Gounod, Charles-Francois	1818	1893	France	22	13	51	0	3
Grieg, Edvard Hagerup	1843	1907	Norway	21	11	0	0	0
Harris, Roy	1898	1979	USA	66	3	1	0	0
Hindemith, Paul	1895	1963	Germany	60	19	0	0	1
Holst, Gustav	1874	1934	England	75	5	0	0	35
Honegger, Arthur	1892	1955	France	41	9	40	0	0
Humperdinck, Engelbert	1854	1921	Germany	10	3	1	1	1
Ibert, Jacques	1890	1962	France	21	2	40	0	0
Indy, Vincent d'	1851	1931	France	43	9	57	0	0
Janacek, Leos	1854	1928	Czech	22	7	0	0	0
Kodaly, Zoltan	1882	1967	Hungary	31	7	0	0	1
Lalo, Edouard	1823	1892	France	13	3	46	0	0
Leoncavallo, Ruggero	1857	1919	Italy	4	3	13	0	1
Liszt, Franz	1811	1886	Hungary	30	43	0	0	0
Mahler, Gustav	1860	1911	Austria	18	23	0	11	0
Malipiero, Gian Francesco	1882	1973	Italy	60	5	1	0	0
Martin, Frank	1890	1974	Switzerland	51	3	0	0	0
Martinu, Bohuslav	1890	1959	Czech	54	3	15	0	1
Mascagni, Pietro	1863	1945	Italy	22	3	1	1	1
Massenet, Jules Emile Frederic	1842	1912	France	32	9	47	0	0
Mendelssohn, Felix	1809	1847	Germany	90	30	0	0	2
Meyerbeer, Giacomo	1791	1864	Germany	6	14	33	0	0
Milhaud, Darius	1892	1974	France	85	13	46	1	1
Mozart, Wolfgang Amadeus	1756	1791	Austria	237	100	1	14	0
Musorgsky, Modeste Petrovich	1839	1881	Russia	25	16	0	0	0
Nicolai, Otto	1810	1849	Germany	11	2	0	8	0
Nielsen, Carl	1865	1931	Denmark	29	3	1	0	0
Offenbach, Jacques	1819	1880	Germany	8	6	45	1	0
Orff, Carl	1895	1982	Germany	21	5	0	0	0
Piston, Walter	1894	1976	USA	60	2	2	0	0
Poulenc, Francis	1899	1963	France	97	8	44	1	0
Prokofiev, Sergey	1891	1953	Russia	82	12	11	0	5
Puccini, Giacomo	1858	1924	Italy	10	10	0	0	0
Rachmaninoff, Serge	1873	1943	Russia	44	7	13	0	1
Ravel, Maurice	1875	1937	France	36	23	43	0	0
Reger, Max	1873	1916	Germany	54	7	0	0	0
Respighi, Ottorino	1879	1936	Italy	46	3	0	0	0
Rimsky-Korsakov, Nikolay Andreyevich	1844	1908	Russia	35	15	1	0	0
Rossini, Gioachino	1792	1868	Italy	22	22	10	1	6
Roussel, Albert	1869	1937	France	23	5	15	0	0
Saint-Saens, Camille	1835	1920	France	40	13	65	0	0
Satie, Erik	1866	1925	France	46	7	39	0	0
Schoenberg, Arnold	1874	1951	Austria-Hungary	29	39	0	26	1
Schubert, Franz	1797	1828	Austria	74	44	0	16	0
Schumann, Robert	1810	1856	Germany	46	42	0	1	0
Sessions, Roger	1896	1985	USA	31	4	0	0	0
Sibelius, Jean	1865	1957	Finnland	54	10	0	1	0
Spontini, Gaspare	1774	1851	Italy	5	6	26	0	0

Stanford, Sir Charles Villiers	1852	1924	Britain	29	3	0	0	42
Strauss, Johann (Jr.)	1825	1899	Austria	8	5	0	56	0
Strauss, Richard	1864	1949	Germany	44	26	0	24	2
Stravinsky, Igor	1882	1971	Russia	66	45	13	0	2
Sullivan, Sir Arthur	1842	1900	England	35	5	1	1	34
Szymanowski, Karol	1882	1937	Poland	13	4	6	1	0
Tchaikovsky, Pyotr Il'yich	1840	1893	Russia	35	20	0	0	0
Thomas, Ambroise	1811	1896	France	26	3	62	0	0
Thomson, Virgil	1896	1989	USA	42	3	15	0	0
Vaughan Williams, Ralph	1872	1958	England	83	9	0	0	40
Verdi, Giuseppe	1813	1901	Italy	28	30	9	2	3
Villa-Lobos, Heitor	1887	1959	Brazil	83	4	16	0	0
Wagner, Richard	1813	1883	Germany	15	79	3	0	2
Weber, Carl Maria von	1786	1826	Germany	22	27	0	2	2
Webern, Anton	1883	1945	Austria	28	19	1	29	0
Wolf, Hugo	1860	1903	Austria	13	11	0	20	0
Wolf-Ferrari, Ermanno	1876	1948	Italy	14	2	0	0	0

SOURCE: Data on composers are obtained from Grove Music Online (2009). Number of important compositions is taken from Gilder and Port (1978).

Table A2. Clustering and parental background.

Dependent Variable:	Locating in cluster				Birthplace-cluster distance
	Full sample (1)	Full sample (2)	Composers with any family member engaged in any music-related activity (3)	Composers with no family member engaged in any music-related activity (4)	Full sample (5)
	A: Cluster (Paris)				
Birthplace-Paris distance		-0.116***	-0.116***	-0.128***	
		(0.00768)	(0.00614)	(0.0200)	
Father engaged in any music-related activity	-0.0661	-0.0356			0.263
	(0.0776)	(0.0631)			(0.412)
Mother engaged in any music-related activity	0.152	0.0618			-0.773
	(0.0918)	(0.0665)			(0.601)
Any other family member engaged in any music-related activity	-0.0556	-0.0745			-0.162
	(0.0815)	(0.0626)			(0.466)
Observations	5213	5213	3363	1850	5213
R-squared	0.029	0.280	0.328	0.220	0.032
	B: Cluster (Vienna)				
Birthplace-Vienna distance		-0.0839***	-0.0849***	-0.0912***	
		(0.0139)	(0.0195)	(0.0180)	
Father engaged in any music-related activity	0.0623	0.0304			-0.380
	(0.0394)	(0.0326)			(0.312)
Mother engaged in any music-related activity	-0.0907***	-0.0369*			0.642***
	(0.0275)	(0.0218)			(0.244)
Any other family member engaged in any music-related activity	0.0479	0.0135			-0.410
	(0.0458)	(0.0328)			(0.404)
Observations	5213	5213	3363	1850	5213
R-squared	0.048	0.298	0.245	0.458	0.061
	C: Cluster (London)				
Birthplace-London distance		-0.0956***	-0.103***	-0.0914***	
		(0.0136)	(0.0227)	(0.0190)	
Father engaged in any music-related activity	0.0271	0.0200			-0.0746
	(0.0442)	(0.0355)			(0.270)
Mother engaged in any music-related activity	-0.0501	-0.0209			0.306
	(0.0364)	(0.0335)			(0.242)
Any other family member engaged in any music-related activity	0.00635	0.00295			-0.0356
	(0.0475)	(0.0384)			(0.256)
Observations	5213	5213	3363	1850	5213
R-squared	0.009	0.246	0.201	0.327	0.010

NOTE: See Table 4.

Table A3. Importance of geographic distance over time.

Dependent Variable: Locating in cluster

EXPLANATORY VARIABLES	Entire period (1762-1989)	1st quartile (1762-1868)	2nd quartile (1869-1902)	3rd quartile (1903-1928)	4th quartile (1929-1989)
	(1)	(2)	(3)	(4)	(5)
			A: Cluster (Paris)		
Birthplace-Cluster distance	-0.342***	-1.677***	-1.659***	-0.243**	-0.118*
	(0.0790)	(0.229)	(0.182)	(0.0932)	(0.0649)
(Birthplace-Cluster distance)^2	0.0417***	0.671***	0.634***	0.0280**	0.0120
	(0.0135)	(0.118)	(0.0997)	(0.0130)	(0.00838)
Observations	5213	1336	1301	1299	1277
R-squared	0.144	0.353	0.478	0.077	0.064
			B: Cluster (Paris, Vienna, London)		
Birthplace-Cluster distance	-0.673***	-1.401***	-1.786***	-0.619***	-0.439***
	(0.0727)	(0.295)	(0.167)	(0.102)	(0.0953)
(Birthplace-Cluster distance)^2	0.103***	0.549***	0.685***	0.0957***	0.0645***
	(0.0137)	(0.162)	(0.110)	(0.0181)	(0.0163)
Observations	5213	1336	1301	1299	1277
R-squared	0.301	0.277	0.570	0.254	0.252

NOTE: Standard errors are clustered at the composer level and reported in parentheses. The birthplace-cluster distances are measured at level and the unit is a thousand miles. The aggregated cluster distance (Panel B) is calculated with the following formula:

$distance_{it} = c_t \, distance_{birthplace,cluster} + (1-c_t)/C \sum_{c=1}^{C} (distance_{birthplace,\, cluster})$, where c=1 if cluster={1,2,…,C}, 0 otherwise.

***/**/* indicate estimates that are significantly different from zero at 99/95/90 percent confidence.

Table A4. Composers' lifetime accomplishments.

Dependent Variable: Murray's Index Score

	Full sample	Full sample	Full sample	Full sample
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
	A: Cluster (Paris)			
Total time spent in cluster (in years)	-0.0888	0.239*		
	(0.0677)	(0.127)		
Primary destination (binary)			-4.408	9.521**
			(3.190)	(4.557)
Life duration controls	yes	yes	yes	yes
Birth cohort controls	yes	yes	yes	yes
Composers	116	116	116	116
Observations	116	116	116	116
R-squared	0.157	0.027	0.161	0.030
Cragg-Donal EV Statistic		3.88		3.43
	B: Cluster (Vienna)			
Total time spent in Cluster (in years)	0.600*	1.469***		
	(0.309)	(0.491)		
Primary destination (binary)			20.45***	38.34***
			(7.141)	(10.75)
Life duration controls	yes	yes	yes	yes
Time controls	yes	yes	yes	yes
Composers	116	116	116	116
Observations	116	116	116	116
R-squared	0.245	0.041	0.279	0.179
Cragg-Donal EV Statistic		1.18		2.83
	C: Cluster (London)			
Total time spent in cluster (in years)	-0.124*	0.563*		
	(0.0677)	(0.315)		
Primary destination (binary)			-5.465**	24.69*
			(2.512)	(14.31)
Life duration controls	yes	yes	yes	yes
Birth cohort controls	yes	yes	yes	yes
Composers	116	116	116	116
Observations	116	116	116	116
R-squared	0.153	.	0.154	.
Cragg-Donal EV Statistic		2.27		1.65

NOTE: Standard errors are clustered at the composer level and reported in parentheses. The incidence of clustering is estimated with birthplace-cluster distance. The life duration controls are estimated with a quadratic polynomial (not reported). Time controls are estimated with an indicator function that is equal to one if composer's birth occurred in a given half century (not reported). ***/**/* indicate estimates that are significantly different from zero at 99/95/90 percent confidence.

Table A5. Peer Effect and Large City Effect.

Dependent Variable: Number of compositions

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Clustering intensity	0.0123*	0.0203**	0.0284**	0.114	0.0128	0.0380**
	(0.00639)	(0.00986)	(0.0120)	(0.108)	(0.0104)	(0.0154)
Cluster (Paris)			-0.282	-1.159		
			(0.174)	(1.429)		
Cluster (Paris, Vienna, London)					-0.00815	-0.221***
					(0.132)	(0.0811)
composer-age controls	yes	yes	yes	yes	yes	yes
composer controls	yes	yes	yes	yes	yes	yes
decade controls	yes	yes	yes	yes	yes	yes
Observations	5213	5213	5213	5213	5213	5213
R-squared	0.445	0.445	0.446	0.431	0.445	0.444
Cragg-Donal EV Statistic		81.9		81.9		81.9

NOTE: Standard errors are clustered at the composer level and reported in parentheses. I do not report composer-specific age time trend (estimated with a quadratic polynomial), composer controls (estimated with an indicator function that is equal to one for each single composer) and time controls (estimated with an indicator function that is equal to one for each decade). The 'Clustering intensity' variable measures the number of composers located in each city. I instrument for it with three logged distances between composers' birthplace and Paris, Vienna or London. ***/**/* indicate estimates that are significantly different from zero at 99/95/90 percent confidence.

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